Ramp/Soak Controller

PF900
PF901

User's Manual

This manual describes mounting, wiring and basic operation only. Refer to the PF900/PF901 Instruction Manual (IMR02L03-E□) for Host communication, control (Fixed set point control, Manual control etc.), operation for function and Troubleshooting.

RKC RKC INSTRUMENT INC.

IMR02L04-E4

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- 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.

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

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

⚠ CAUTION

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

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

This manual indicates 11-segment display characters as shown below.

0	1	2	3	4	5	6	7	8	9	Minus	Period
											

A	B (b)	C	c	D (d)	E	F	G	H	I	J	K
											

L	M	N (n)	O (o)	P	Q	q	R	r	S	T	t
											

U	u	V	W	X	Y	Z	Prime	/	*	Temperature units	
											

%	→	_
		

	Dim lighting
	Bright lighting

	Flashing

■ Abbreviation Symbols

The names of some items are indicated by alphabetical abbreviations in this manual.

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	DI (1 to 6)	Digital input (1 to 6)
SV	Set value	DO (1 to 12)	Digital output (1 to 12)
AT	Autotuning	FBR	Feedback resistance
ST	Self-tuning		
OUT (1 to 3)	Output (1 to 3)		
HBA (1 or 2)	Heater break alarm (1 or 2)		
CT (1 or 2)	Current transformer (1 or 2)		
LBA	Control loop break alarm		
LBD	LBA deadband		

Document Configuration

There are six manuals pertaining to this product. Please be sure to read all manuals specific to your application requirements. If you do not have a necessary manual, please contact RKC sales office, the agent, or download from the official RKC website.

The following manuals can be download from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

Manual	Manual Number	Description	Remarks
PF900/PF901 Installation Manual	IMR02L12-E☐	This manual explains the mounting and wiring.	Enclosed with instrument
PF900/PF901 Quick Operation Manual	IMR02L13-E☐	This manual explains the basic key operation, mode menu, and data setting.	
PF900/PF901 Parameter List	IMR02L12-E☐	This list is a compilation of the parameter data of each mode.	
PF900/PF901 User's Manual	**IMR02L04-E4**	This Manual. This document describes installation, wiring and basic operation.	This manual can be downloaded from the official RKC website.
PF900/PF901 Instruction Manual	IMR02L03-E☐	This manual explains the method of the mounting and wiring, the operation of various functions, and troubleshooting.	
PF900/PF901 Pattern Record Sheet	IMR02L05-E☐	This spreadsheet is to record patterns for Program control operation.	

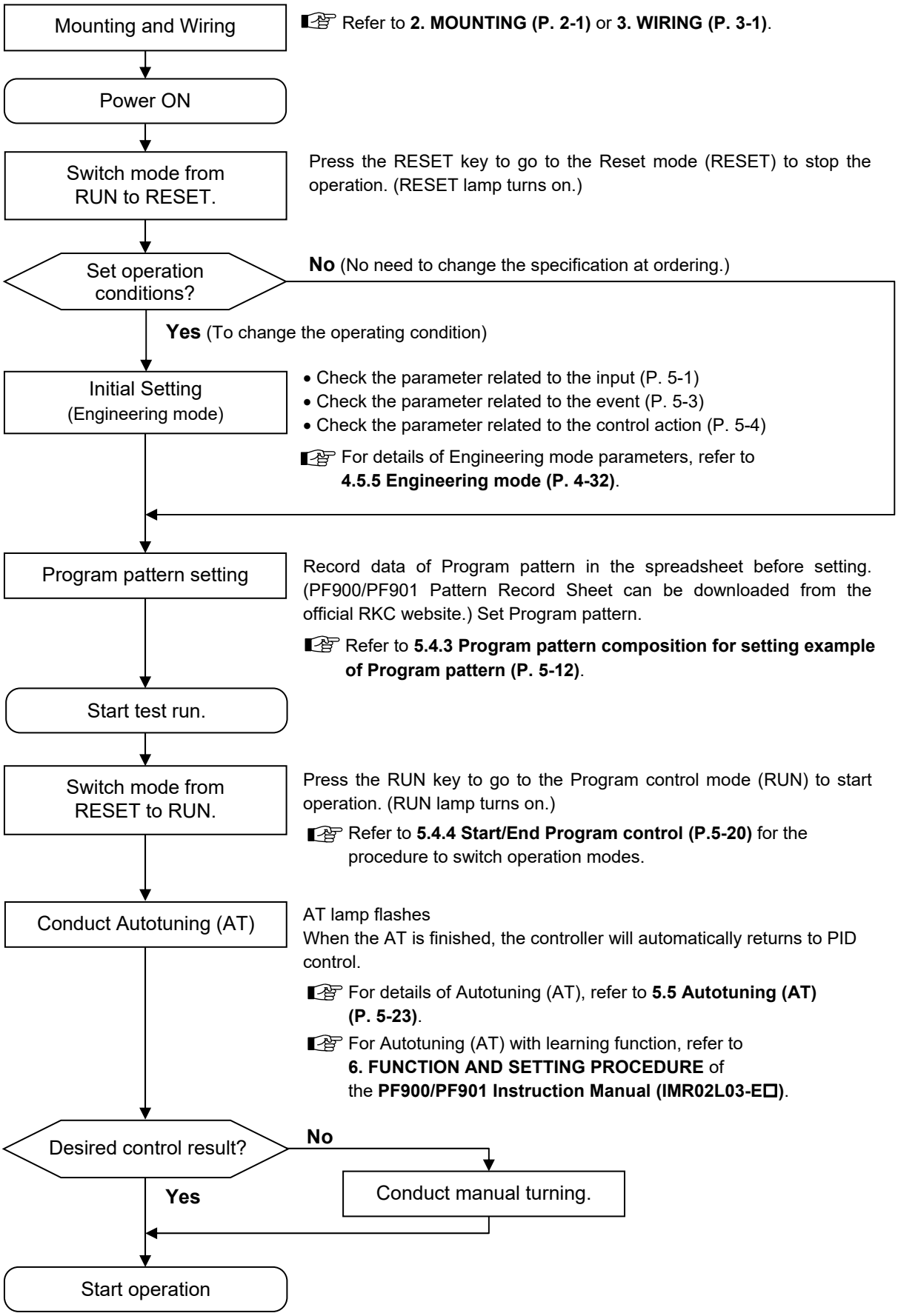
Contents

Contents (Categorized by purpose)

1. OUTLINE

1.1 Handling Procedure to Operation

Conduct necessary setting before operation according to the procedure described below.



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)

Details	Q'TY	Remarks	
☐ Instrument (PF900 or PF901)	1	————	
☐ Mounting brackets (with screw)	4	————	
☐ Seal (parts code: SAP-306)	1	————	
☐ Waterproof/Dustproof rubber packing (parts code: KFB900-36<1>)	1	For waterproof/dustproof Placed on the case	
☐ PF900/PF901 Installation Manual (IMR02L12-E☐)	1	Enclosed with instrument	
☐ PF900/PF901 Quick Operation Manual (IMR02L13-E☐)	1	Enclosed with instrument	
☐ PF900/PF901 Parameter List (IMR02L14-E☐)	1	Enclosed with instrument	
☐ PF900/PF901 User's Manual (IMR02L04-E4)	1	This manual (Sold separately)	This manual can be downloaded from the official RKC website.
☐ PF900/PF901 Instruction Manual (IMR02L03-E☐)	1	Sold separately	This manual can be downloaded from the official RKC website.
☐ PF900/PF901 Pattern Record Sheet (IMR02L05-E☐)	1	This manual can be downloaded from the official RKC website.	
☐ CD-ROM	1	Sold separately Contents of CD-ROM • ReadMe • PF900/PF901 Instruction Manual (IMR02L03-☐☐) • PF900/PF901 User's Manual (IMR02L04-E☐) • PF900/PF901 Pattern Record Sheet (IMR02L05-E☐) • Z-☐☐☐Specification (IMR02L☐☐-☐☐) * * This manual is for a specially designed product with the special specification (shown as the Z number). This manual is intended for the users who have the applicable product.	
☐ Terminal cover (parts code: KFB400-511(1))	2	Sold separately	
☐ Front cover (parts code: KF9-35<2>)	1	Sold separately	
☐ Current transformer CTL-6-P-N [for 0 to 30 A] or CTL-12-S56-10L-N [for 0 to 100 A]	Depending on the order quantity	Sold separately	

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

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.

■ Suffix code

Specifications		Suffix code										
		Hardware coding only								Quick start code1		
PF900 (PV display: Green, SV display: Orange) **PF901** (PV and SV displays: White)		(1) – □	(2) □	(3) □	(4) – □	(5) * □	(6) □	(7) □	(8) □ –	(9) □	(10) □□□	/Y
Output 1 (OUT1) [1]	Relay contact	M										
	Voltage pulse	V										
	Voltage/Current [Refer to Output Code Table (P. 1-5)]	□										
	Triac	T										
	Open collector	D										
Output 2 (OUT2) [1]	None		N									
	Relay contact		M									
	Voltage pulse		V									
	Voltage/Current [Refer to Output Code Table (P. 1-5)]		□									
	Triac		T									
	Open collector		D									
Output 3 (OUT3) [1]	None			N								
	Voltage pulse			V								
	Voltage/Current [Refer to Output Code Table (P. 1-5)]			□								
	Open collector			D								
Power supply voltage	24 V AC/DC				3							
	100 to 240 V AC				4							
Digital output (DO1 to DO12) [2]	4 points (DO1 to DO4) [Standard]					4						
	12 points (DO1 to DO12)					C						
CT input or Feedback resistance input	None						N					
	CT input (2 points)						T					
	Feedback resistance input [3]						F					
Communication function Digital input (DI1 to DI6) [4]	None							N				
	Communication 1 (RS-232C) and DI1 to DI6, No communication 2							1				
	Communication 1 (RS-422A) and DI1 to DI6, No communication 2							4				
	Communication 1 (RS-485) and DI1 to DI6, No communication 2							5				
	Communication 1 (RS-232C), Communication 2 (RS-485) [5] and DI1 to DI6							W				
	Communication 1 (RS-485), Communication 2 (RS-485) [5] and DI1 to DI6							X				
	Communication 1 (None), Communication 2 (RS-485) [5] and DI1 to DI6							Y				
	DI1 to DI6							D				
Quick start code	No quick start code (Configured to factory set value) [6]								N			
	Specify quick start code 1								1			
	Specify quick start code 1 and 2 (For Quick start code 2, refer to page 1-7)								2			
Control Method [Quick start code 1]	Quick start code 1 is not specified									No code		
	PID control with AT (Reverse action)									F		
	PID control with AT (Direct action)									D		
	Heat/Cool PID control with AT (Cooling gain linear type)									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 without FBR (Reverse action)									Z		
	Position proportioning PID control without FBR (Direct action)									C		
Measured input and Range [Quick start code 1]	Quick start code 1 is not specified										No code	
	Refer to Range Code Table. (P.1-5, P. 1-6)										□□□	
Instrument specification	Version symbol											Y

[1] Some output types are not specifiable. Refer to the Output type availability on page 1-4.
[2] The output type for DO1 to DO4 is Relay: for DO5 to DO12 is Open collector.
[3] When Feedback resistance input is specified with other control method than Z or C, the factory set value is fixed to "Z: Position proportioning PID control without FBR (Reverse action)."
[4] Digital input 7 (DI7) to 11 (DI11) are standard.
[5] Communication 2 is for the Intercontroller communication.
[6] Set initial setting parameters in the Engineering mode. Refer to **4.5.5 Engineering mode (P.4-32)** for description of the parameters.

● Output type availability

PID control with AT

[×: Usable –: Not usable]

Output type		Details of output				
		Manipulated output value 1 (MV1) [a]	Manipulated output value 2 (MV2) [a]	Transmission output		Event output
				Other [b]	Output program	
Output 1 (OUT1)	Relay contact	×	–	–	×	–
	Voltage pulse	×	–	–	×	–
	Voltage/Current	×	–	–	×	–
	Triac	×	–	–	×	–
	Open collector	×	–	–	×	–
Output 2 (OUT2)	Relay contact	×	–	–	×	×
	Voltage pulse	×	–	–	×	×
	Voltage/Current	×	–	×	×	–
	Triac	×	–	–	×	×
	Open collector	×	–	–	×	×
Output 3 (OUT3)	Voltage pulse	×	–	–	×	×
	Voltage/Current	×	–	×	×	–
	Open collector	×	–	–	×	×

[a] MV1 and MV2 can be used as Transmission output.
[b] Other: Transmission output of Measured value (PV), Deviation value (DEV), Set value (SV) monitor and Segment time (percentage)

Heat/Cool PID control with AT

[×: Usable –: Not usable]

Output type		Details of output				
		Manipulated output value 1 (MV1) [heat-side] [a]	Manipulated output value 2 (MV2) [cool-side] [a]	Transmission output		Event output
				Other [b]	Output program	
Output 1 (OUT1)	Relay contact	×	–	–	×	–
	Voltage pulse	×	–	–	×	–
	Voltage/Current	×	–	–	×	–
	Triac	×	–	–	×	–
	Open collector	×	–	–	×	–
Output 2 (OUT2)	Relay contact	×	×	–	×	×
	Voltage pulse	×	×	–	×	×
	Voltage/Current	×	×	×	×	–
	Triac	×	×	–	×	×
	Open collector	×	×	–	×	×
Output 3 (OUT3)	Voltage pulse	×	×	–	×	×
	Voltage/Current	×	×	×	×	–
	Open collector	×	×	–	×	×

[a] MV1 and MV2 can be used as Transmission output.
[b] Other: Transmission output of Measured value (PV), Deviation value (DEV), Set value (SV) monitor and Segment time (percentage)

Position proportioning PID control without FBR

[×: Usable –: Not usable]

Output type		Details of output				
		Manipulated output value 1 (MV1) [open-side] [a]	Manipulated output value 2 (MV2) [close-side] [a]	Transmission output		Event output
				Other [b]	Output program	
Output 1 (OUT1)	Relay contact	×	–	–	×	–
	Voltage pulse	×	–	–	×	–
	Voltage/Current	×	–	–	×	–
	Triac	×	–	–	×	–
	Open collector	×	–	–	×	–
Output 2 (OUT2)	Relay contact	–	×	–	×	×
	Voltage pulse	–	×	–	×	×
	Voltage/Current	–	×	× [c]	×	–
	Triac	–	×	–	×	×
	Open collector	–	×	–	×	×
Output 3 (OUT3)	Voltage pulse	–	–	–	×	×
	Voltage/Current	–	–	×	×	–
	Open collector	–	–	–	×	×

[a] MV1 and MV2 can be used as Transmission output.
[b] Other: Transmission output of Measured value (PV), Deviation value (DEV), Set value (SV) monitor and Segment time (percentage)
[c] When Position proportioning PID control is selected, it is still possible to assign PV, SV, SV monitor or Transmission output of Segment time (percentage) to OUT 2 while Manipulated output value 2 (MV2) [close-side] cannot be used.

● Output Code Table

Output type	Code	Output type	Code
Voltage (0 to 1 V DC) Available for OUT3 only	3	Voltage (1 to 5 V DC)	6
Voltage (0 to 5 V DC)	4	Current (0 to 20 mA DC)	7
Voltage (0 to 10 V DC)	5	Current (4 to 20 mA DC)	8

● Range Code Table

Thermocouple (TC) input [voltage (low) group]

Type	Code	Measured range	Code	Measured range
K	K02	0 to 400 °C	KA4	0.0 to 800.0 °F
	K06	0 to 1200 °C	KB4	0.0 to 2400.0 °F
	K09	0.0 to 400.0 °C	KC5	−328 to +2502 °F
	K23	0.0 to 1300.0 °C	KC9	−328.0 to +2502.0 °F
	K35	−200.0 to +400.0 °C		
	K41	−200 to +1372 °C		
	K42	−200.0 to +1372.0 °C		
J	J15	−200 to +1200 °C	JB5	0.0 to 2100.0 °F
	J16	0.0 to 1200.0 °C	JB6	0.0 to 800.0 °F
	J27	−200.0 to +400.0 °C	JB9	−328 to +2192 °F
	J29	−200.0 to +1200.0 °C	JC9	−328.0 to +2192.0°F
T	T06	0.0 to 400.0 °C	TA7	0.0 to 700.0 °F
	T13	−200.0 to +200.0 °C	TB7	−300.0 to +700.0 °F
	T16	−200 to +400 °C	TC2	−328.0 to +752.0 °F
	T19	−200.0 to +400.0 °C	TC9	−328 to +752 °F
E	E06	−200 to +1000 °C	EA6	0.0 to 1800.0 °F
	E08	0.0 to 1000.0 °C	EB1	−328 to +1832 °F
	E17	−200.0 to +200.0 °C	EB3	−328.0 to +1832.0 °F
	E20	−200.0 to +1000.0 °C		
L	L04	0.0 to 900.0 °C	LA3	0 to 1652 °F
	L05	0 to 900 °C	LA6	0.0 to 1600.0 °F
			LB1	0.0 to 1652.0 °F
U	U04	0.0 to 600.0 °C	UB1	0.0 to 1100.0 °F
	U08	0 to 600 °C	UB3	0.0 to 1112.0 °F
			UB4	0 to 1112 °F
N	N02	0 to 1300 °C	NA4	0.0 to 2300.0 °F
	N05	0.0 to 1300.0 °C	NA7	0 to 2372 °F
			NA8	0.0 to 2372.0 °F
R	R05	0.0 to 1700.0 °C	RA5	0.0 to 3200.0 °F
	R07	−50 to +1768 °C	RA7	−58 to +3214 °F
	R08	−50.0 to +1768.0°C	RA8	−58.0 to +3214.0 °F
S	S04	0.0 to 1700.0 °C	SA5	0.0 to 3200.0 °F
	S06	−50 to +1768 °C	SA7	−58 to +3214 °F
	S07	−50.0 to +1768.0 °C	SA8	−58.0 to +3214.0 °F
B	B03	0 to 1800 °C	BA9	0.0 to 3200.0 °F
	B04	0.0 to 1800.0 °C	BB2	0 to 3272 °F
			BB3	0.0 to 3272.0 °F
W5Re/W26Re	W03	0 to 2300 °C	WA2	0 to 4200 °F
	W04	0.0 to 2300.0 °C	WA6	0.0 to 2200.0 °F
	W06	0.0 to 1200.0 °C	WA8	0.0 to 4200.0 °F
PLII	A02	0 to 1390 °C	AA2	0 to 2534 °F
	A05	0.0 to 1300.0 °C	AA5	0.0 to 2300.0 °F
	A06	0.0 to 1390.0 °C	AA7	0.0 to 2534.0 °F
PR40-20	F01	0.0 to 1800.0 °C	FA1	0.0 to 3200.0 °F
	F02	0 to 1800 °C	FA2	0 to 3200 °F

Resistance temperature detector (RTD) input [voltage (low) group]

Type	Code	Measured range	Code	Measured range
Pt100	D21	–200.0 to +200.0 °C	DB8	–300.0 to +1200.0 °F
	D25	–200.0 to +600.0 °C	DC9	–328.0 to +1562.0 °F
	D34	–100.00 to +150.00 °C	DD2	–328 to +1562 °F
	D35	–200.0 to +850.0 °C		
	D36	–200 to +850 °C		
JPt100	P10	0.0 to 500.0 °C		
	P21	–200.0 to +200.0 °C		
	P26	–200.0 to +600.0 °C		
	P29	–100.00 to +150.00 °C		
	P30	–200.0 to +640.0 °C		
	P31	–200 to +640 °C		

Voltage input, Current input

Type	Code	Voltage input group	Measured range
Voltage 0 to 10 mV DC	101	Voltage (low) input group	Programmable range Setting range: –19999 to +32000 [The decimal point position is selectable] (Factory set value: 0.0 to 100.0)
Voltage 0 to 100 mV DC	201		
Voltage 0 to 1 V DC	301		
Voltage 0 to 5 V DC	401	Voltage (high) input group	
Voltage 0 to 10 V DC	501		
Voltage 1 to 5 V DC	601		
Current 0 to 20 mA DC	701	Current input group	
Current 4 to 20 mA DC	801		
Voltage –100 to +100 mV DC	901	Voltage (low) input group	
Voltage –1 to +1 V DC	902		
Voltage –10 to +10 mV DC	903		
Voltage –10 to +10 V DC	904	Voltage (high) input group	
Voltage –5 to +5 V DC	905		

■ Quick start code 2 (Initial setting code)

Quick start code 2 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 via the manual.

Specifications		Quick start code 2 (Initial setting code)						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		□ – □		□	□	□ – □		□
DI assignment	DI1 to DI6 [Refer to DI Assignment Code Table (P. 1-7)]	□						
Digital output 1 (DO1)	Event 1 [Deviation high]		N					
	Assign other DO type [Refer to DO Type Code Table (P. 1-8)]		□					
Digital output 2 (DO2)	Event 2 [Deviation low]			N				
	Assign other DO type [Refer to DO Type Code Table (P. 1-8)]			□				
Digital output 3 (DO3)	Time signal 1				N			
	Assign other DO type [Refer to DO Type Code Table (P. 1-9)]				□			
Digital output 4 (DO4)	Pattern end signal					N		
	Assign other DO type [Refer to DO Type Code Table (P. 1-9)]					□		
CT type	No CT1 and CT2						N	
	CT1: CTL-6-P-N CT2: No use						P	
	CT1: CTL-12-S56-10L-N CT2: No use						S	
	CT1: CTL-6-P-N CT2: CTL-6-P-N						T	
	CT1: CTL-12-S56-10L-N CT2: CTL-12-S56-10L-N						U	
Communication 1 protocol	None							N
	RKC communication (ANSI X3.28-1976)							1
	Modbus							2

Factory set value of DO5 through DO12 (optional) is Time signal.

● DI Assignment Code Table (DI1 to DI6: Optional DI7 to DI11: Standard function)

DI number	Code (0 to 5)					
	0	1	2	3	4	5
Digital input 1 (DI1)	PTN1	PTN1	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 2 (DI2)	PTN2	PTN2	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 3 (DI3)	PTN4	PTN4	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 4 (DI4)	PTN8	PTN8	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 5 (DI5)	PTN16	PTN16	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 6 (DI6)	P. SET	P. SET	WAIT release	WAIT release	WAIT release	WAIT release
Digital input 7 (DI7)	RESET	RESET	PTN1	PTN1	RESET	RESET
Digital input 8 (DI8)	RUN	RUN	PTN2	PTN2	RUN	RUN
Digital input 9 (DI9)	STEP	STEP	PTN4	PTN4	STEP	STEP
Digital input 10 (DI10)	HOLD	PTN32	PTN8	PTN8	HOLD	HOLD
Digital input 11 (DI11)	PTN32	PTN64	P. SET	PTN16	Direct/Reverse	PTN_INC

PTN1, 2, 4, 8, 16, 32, 64: Pattern number switch
P. SET: Pattern set
WAIT release: Wait state release
RESET: Reset mode (RESET) setting
RUN: Program control mode (RUN) setting
STEP: Step (STEP) function
HOLD: Hold (HOLD) function
Direct/Reverse: Direct/Reverse action switching
PTN_INC: Pattern increment

● DO Type Code Table

Digital output 1 (DO1)

Code	Type	Code	Type	Code	Type
N	None	L	Event 1 process low with hold action	1	Event 1 manipulated output value (MV1) high [heat-side]
A	Event 1 deviation high	P	Heater break alarm 1 (HBA1)	2	Event 1 manipulated output value (MV1) low [heat-side]
B	Event 1 deviation low	Q	Heater break alarm 2 (HBA2)	3	Event 1 manipulated output value (MV2) high [cool-side]
C	Event 1 deviation high/low	R	Control loop break alarm (LBA)	4	Event 1 manipulated output value (MV2) low [cool-side]
D	Event 1 band	S	FAIL (de-energized fixed)	5	Time signal 1
E	Event 1 deviation high with hold action	T	Feedback resistance (FBR) input error	6	Time signal 2
F	Event 1 deviation low with hold action	U	Event 1 band (High/Low individual setting)	7	Time signal 3
G	Event 1 deviation high/low with hold action	V	Event 1 set value (SV) high	8	Time signal 4
H	Event 1 process high	W	Event 1 set value (SV) low	9	Pattern end signal
J	Event 1 process low	X	Event 1 deviation high/low (High/Low individual setting)		
K	Event 1 process high with hold action	Y	Event 1 deviation high/low with hold action (High/Low individual setting)		

Digital output 2 (DO2)

Code	Type	Code	Type	Code	Type
N	None	L	Event 2 process low with hold action	1	Event 2 manipulated output value (MV1) high [heat-side]
A	Event 2 deviation high	P	Heater break alarm 1 (HBA1)	2	Event 2 manipulated output value (MV1) low [heat-side]
B	Event 2 deviation low	Q	Heater break alarm 2 (HBA2)	3	Event 2 manipulated output value (MV2) high [cool-side]
C	Event 2 deviation high/low	R	Control loop break alarm (LBA)	4	Event 2 manipulated output value (MV2) low [cool-side]
D	Event 2 band	S	FAIL (de-energized fixed)	5	Time signal 1
E	Event 2 deviation high with hold action	T	Feedback resistance (FBR) input error	6	Time signal 2
F	Event 2 deviation low with hold action	U	Event 2 band (High/Low individual setting)	7	Time signal 3
G	Event 2 deviation high/low with hold action	V	Event 2 set value (SV) high	8	Time signal 4
H	Event 2 process high	W	Event 2 set value (SV) low	9	Pattern end signal
J	Event 2 process low	X	Event 2 deviation high/low (High/Low individual setting)		
K	Event 2 process high with hold action	Y	Event 2 deviation high/low with hold action (High/Low individual setting)		

Digital output 3 (DO3)

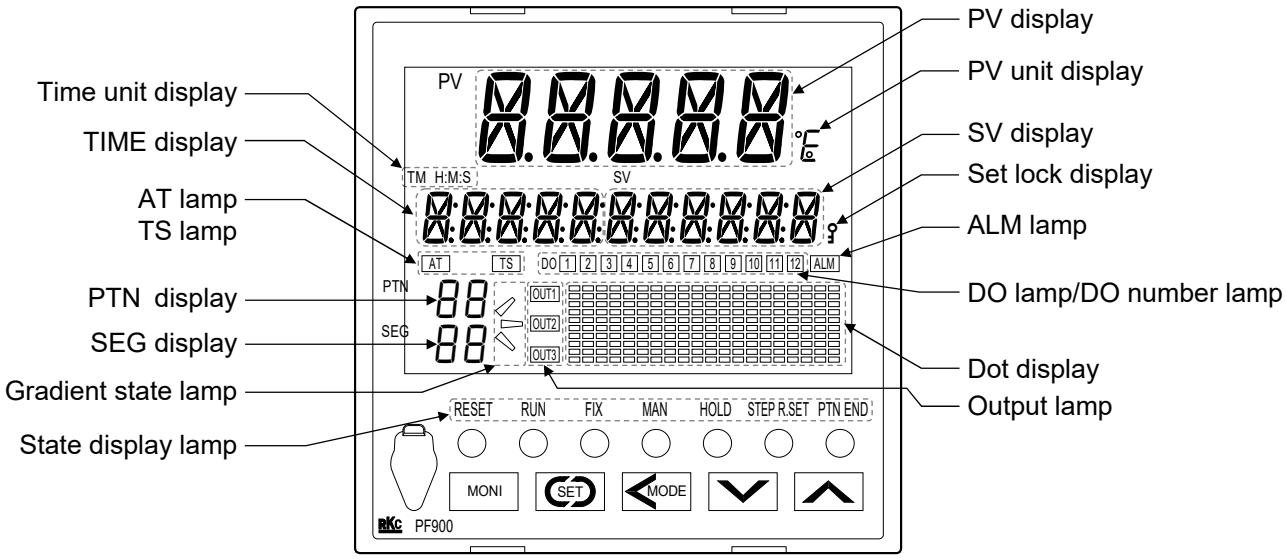
Code	Type	Code	Type	Code	Type
N	None	L	Event 3 process low with hold action	1	Event 3 manipulated output value (MV1) high [heat-side]
A	Event 3 deviation high	P	Heater break alarm 1 (HBA1)	2	Event 3 manipulated output value (MV1) low [heat-side]
B	Event 3 deviation low	Q	Heater break alarm 2 (HBA2)	3	Event 3 manipulated output value (MV2) high [cool-side]
C	Event 3 deviation high/low	R	Control loop break alarm (LBA)	4	Event 3 manipulated output value (MV2) low [cool-side]
D	Event 3 band	S	FAIL (de-energized fixed)	5	Time signal 1
E	Event 3 deviation high with hold action	T	Feedback resistance (FBR) input error	6	Time signal 2
F	Event 3 deviation low with hold action	U	Event 3 band (High/Low individual setting)	7	Time signal 3
G	Event 3 deviation high/low with hold action	V	Event 3 set value (SV) high	8	Time signal 4
H	Event 3 process high	W	Event 3 set value (SV) low	9	Pattern end signal
J	Event 3 process low	X	Event 3 deviation high/low (High/Low individual setting)		
K	Event 3 process high with hold action	Y	Event 3 deviation high/low with hold action (High/Low individual setting)		

Digital output 4 (DO4)

Code	Type	Code	Type	Code	Type
N	None	L	Event 4 process low with hold action	1	Event 4 manipulated output value (MV1) high [heat-side]
A	Event 4 deviation high	P	Heater break alarm 1 (HBA1)	2	Event 4 manipulated output value (MV1) low [heat-side]
B	Event 4 deviation low	Q	Heater break alarm 2 (HBA2)	3	Event 4 manipulated output value (MV2) high [cool-side]
C	Event 4 deviation high/low	R	Control loop break alarm (LBA)	4	Event 4 manipulated output value (MV2) low [cool-side]
D	Event 4 band	S	FAIL (de-energized fixed)	5	Time signal 1
E	Event 4 deviation high with hold action	T	Feedback resistance (FBR) input error	6	Time signal 2
F	Event 4 deviation low with hold action	U	Event 4 band (High/Low individual setting)	7	Time signal 3
G	Event 4 deviation high/low with hold action	V	Event 4 set value (SV) high	8	Time signal 4
H	Event 4 process high	W	Event 4 set value (SV) low	9	Pattern end signal
J	Event 4 process low	X	Event 4 deviation high/low (High/Low individual setting)		
K	Event 4 process high with hold action	Y	Event 4 deviation high/low with hold action (High/Low individual setting)		

1.4 Parts Description

■ Front panel view



● PV display [PF900: Green/PF901: White]

Displays Measured value (PV) or various parameter symbols.

● PV unit display [PF900: Green/PF901: White]

Displays °C, °F or %. Displays % only for parameters on a percentage basis.

● SV display [PF900: Orange/PF901: White]

Displays segment level, Set value (SV), Manipulated output value (MV) or various parameter set values.

● Set lock display [PF900: Orange/PF901: White]

Displays key character "⚷" when the key operation is prohibited.

● ALM lamp [Red]

Lights when Event occurs (Event 1 through 4, HBA1, HBA2, LBA, Self-diagnostic error, communication error or FAIL). Event type may be checked by Event state monitor (except Self-diagnostic error, communication error and FAIL).

● DO lamp/DO number lamp [PF900: Green/PF901: White]

DO: Lights alphabet of the DO lamp at all times (when the power is on).
DO number (1 to 12):
Lights when the output corresponding to each lamp is ON.

● Dot display [White] (20 dots for horizontal axis, 10 dots for vertical axis)

The bar graph displays the progress of program pattern, or increase and decrease of Manipulated output value (MV). Segments in process flash in the Program control mode.
It is possible to change the color of dots into red for Event or Self-diagnostic error.

● Output lamp [PF900: Green/PF901: White]

OUT1: Lights when output 1 is turned on.*
OUT2: Lights when output 2 is turned on.*
OUT3: Lights when output 3 is turned on.*
* For voltage output or current output, the output lamp flashes when the output value goes below 0 % and lights when the value goes above 0 %.

● State display lamp [Green or Orange]

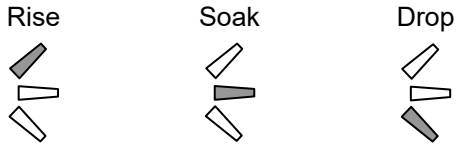
The control mode in progress and the operation function lamps will be lit.

Character	Lamp color	Details
RESET	Green or Orange	Reset mode (RESET) light will be orange. When other modes are selected the light will be green.
RUN	Green or Orange	Program control mode (RUN) light will be orange. When other modes are selected the light will be green.
FIX	Green or Orange	Fixed set point control mode (FIX) light will be orange. When other modes are selected the light will be green.
MAN	Green or Orange	Manual control mode (MAN) will be orange. When other modes are selected the light will be green.
HOLD	Green	Light is green when HOLD key is operative.
STEP R.SET	Green	Light is green when STEP R.SET key is operative.
STEP **R.SET**	Green	Light is green when STEP R.SET key is operative.
PTN END	Green	Light is green when PTN END key is operative.
PTN **END**	Green	Light is green when PTN END key is operative.

Flashing of State display lamp
When Direct key type is “Press twice,” State display lamp flashes when the Direct key is pressed once (except the PTN END key).

● Gradient state lamp [PF900: Green/PF901: White]

Lights the lamp of the gradient in process.



In the Program control mode (RUN):
Lights the lamp of the gradient of the segment in process.
Fixed set point control mode (FIX):
Lights soak lamp
In the Manual control mode (MAN) or the Reset mode (RESET):
Gradient state lamp does not light.

● SEG display [PF900: Green/PF901: White]

Displays segment number (from 1 to 99).

In the Reset mode (RESET):
Displays the segment number before running the operation.

In the Program control mode (RUN):
Displays the segment number in process.

In the Fixed set point control mode (FIX) or the Manual control mode (MAN):
Displays the segment being displays in the previous mode.

● PTN display [PF900: Green/PF901: White]

Displays program pattern number (from 1 to 99).

In the Reset mode (RESET):
Displays the Program pattern number being set.

In the Program control mode (RUN):
Displays the program pattern number in process.

In the Fixed set point control mode (FIX) or the Manual control mode (MAN):
Displays Program pattern number in the previous mode.

● TS lamp [PF900: Green/PF901: White]

Lights when Time signal output is turned on.

● AT lamp [PF900: Green/PF901: White]

Flashes during the Autotuning (including Autotuning with learning function).
(AT end: AT lamp turns off)

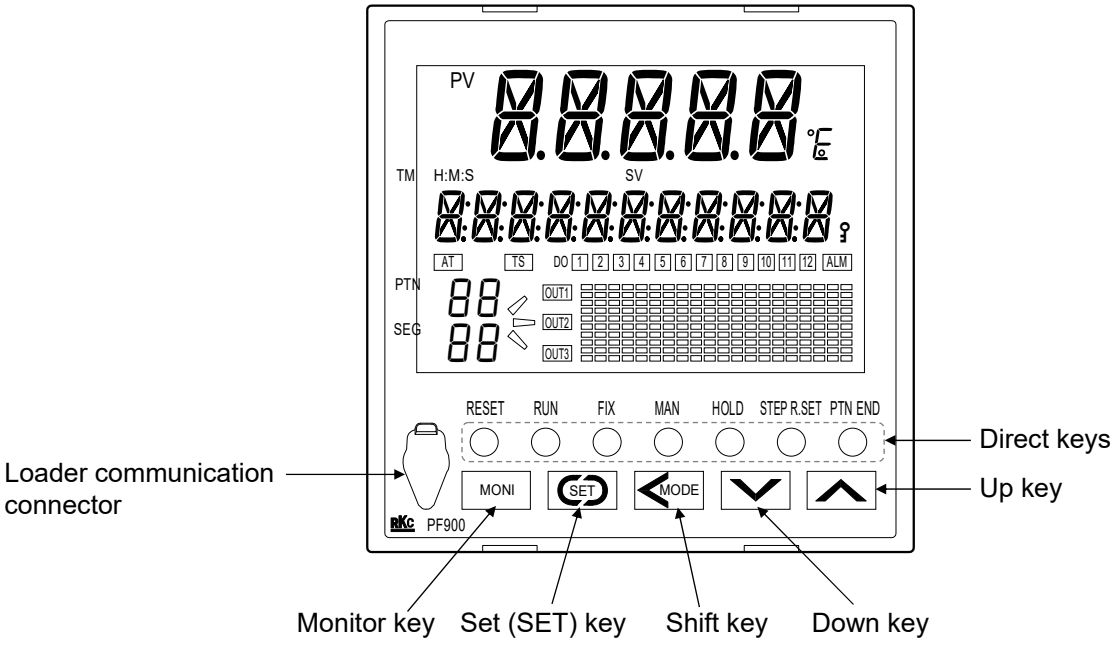
● TIME display [PF900: Orange/PF901: White]

Displays segment time or character of parameter.

● Time unit display [PF900: Green/PF901: White]

Displays time unit of Segment time. [hour (H): minute (M) or minute (M): second (S)]

■ Key operation



● Direct keys

It is possible to easily change the operation mode or switch the state of operation in process by using the direct keys. Use the RESET key, RUN key, FIX key or MAN key to change the operation mode. Use the HOLD key, STEP key, R.SET key, PTN key or END key to switch the state of operation.

Key name	Lamp to be lit	Details
RESET key	**RESET**	Press the RESET key to go to the Reset mode (RESET).
RUN key	**RUN**	Press the RUN key to go to the Program control mode (RUN).
FIX key	**FIX**	Press the FIX key to go to the Fixed set point control mode (FIX).
MAN key	**MAN**	Press the MAN key to go to the Manual control mode (MAN).
HOLD key	**HOLD**	Press the HOLD key to suspend the operation in process. Press again to release the Hold mode. [Hold (HOLD) function]
STEP R.SET key	**STEP** R.SET	It is possible to skip one segment of the program pattern in progress by pressing the STEP R.SET key. [Step (STEP) function]
	STEP **R.SET**	Press the SET key once to go back to the previous parameter when passing the parameter setting item to be changed.
PTN END key	**PTN** END	Switch display to the setting display of the Execution pattern number [PTN].
	PTN **END**	Switch display to the Program end screen [P. End].

● Up key

– Increase numerals. *
– Press the Up key to set segment time in the Program control mode (RUN).
To scroll through numbers faster, press and hold the Up key. *

● Down key

– Decrease numerals. *
– Press the DOWN key to turn back to the previous value when passing the segment time to be set in the Program control mode. To scroll back through numbers faster, press and hold the DOWN key. *

● Shift key

– Shift digits when settings are changed.
– Used to selection operation between modes.

● Set (SET) key

Used for parameter calling up and set value registration.

● Monitor key

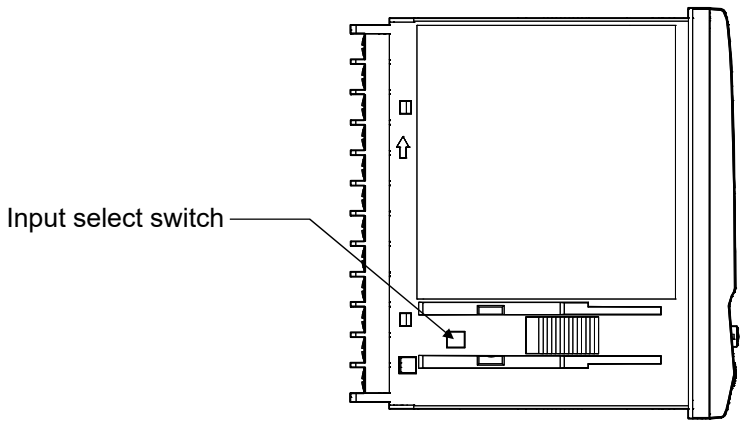
Use to switch the monitor screen.
Pressing the MONI key while any screen other than the Monitor mode screen is being displayed returns to the PV/SV monitor screen.

● Loader communication connector

Designed to connect with W-BV-03 cable for loader communication (RKC product)

* Continuously pressing the ∧ and the ∨ keys will accelerate number change.
The following acceleration settings may be changed by using communication:
– Key accelerating speed setting [Communication identifier KV] **
– Key acceleration speed Forward/Back-up [Communication identifier KW] **
** Refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Side view

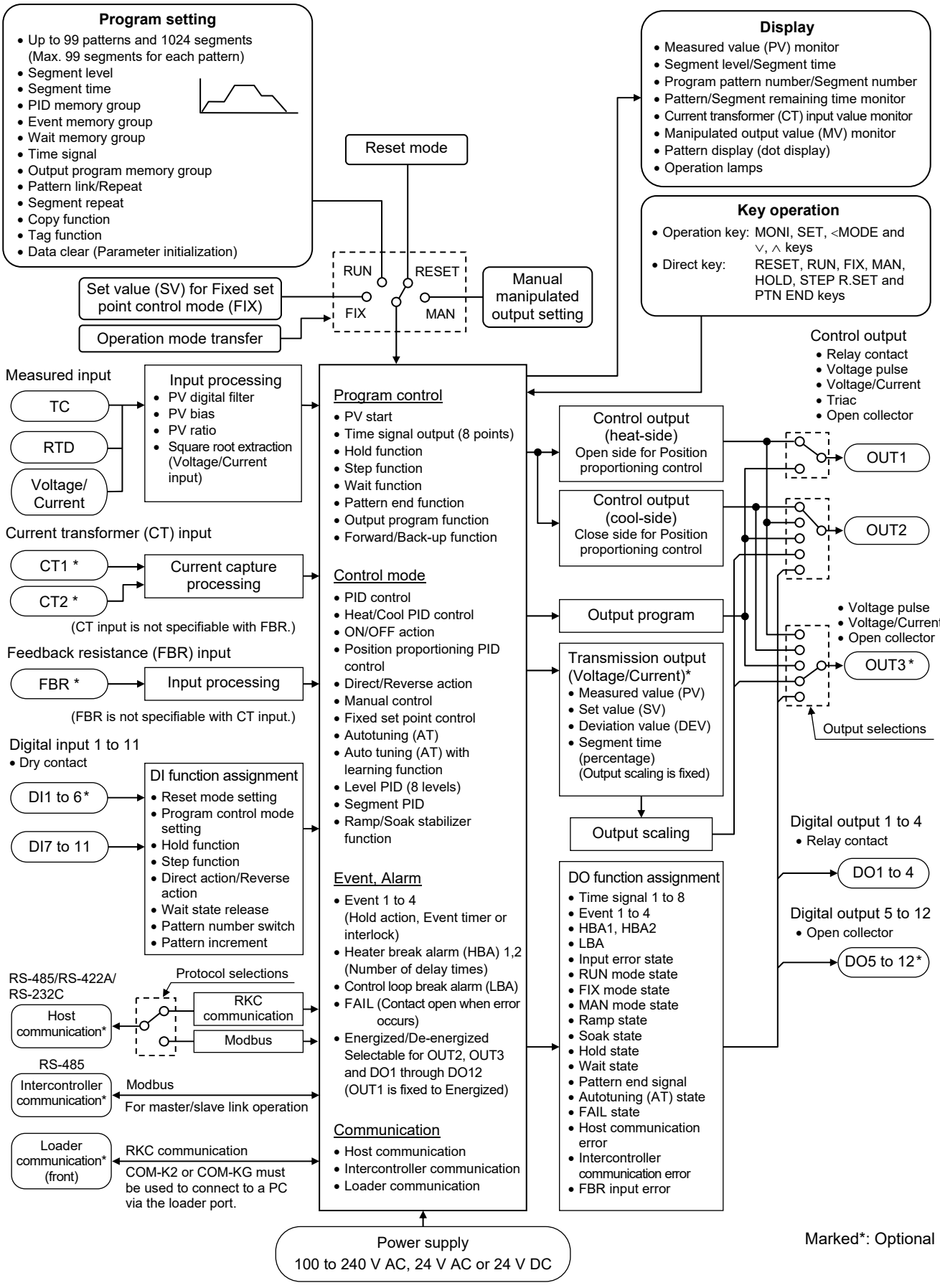


● Input select switch

Use to switch Input groups of Measurement input. Set Voltage (low) input group, Voltage (high) input group or Current input group. (Refer to P. 3-8)

1.5 Input/Output and Function Blocks

This section describes the input/output and function blocks of the instrument.



MEMO

2. MOUNTING

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

2.1 Mounting Environment

(1) The PF900/901 is intended to be used under the following environmental conditions.
- IEC61010-1 OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2
  Indoor use, Altitude up to 2000 m

(2) Use this instrument within the following allowable range:
- Allowable ambient temperature: −10 to +55 °C
- Allowable ambient humidity: 5 to 95 %RH
  (Absolute humidity: MAX.W.C 29 g/m^3 dry air at 101.3 kPa)

(3) Do not use this instrument in the following environment:
- Sudden change in ambient temperature
- Condensation or icing
- Corrosive or inflammable gases.
- Strong vibration or impact
- 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.
- Direct radiant heat

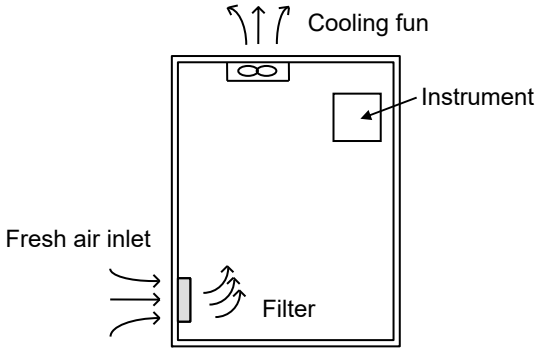
(4) If this instrument is permanently connected to equipment, it is important to include a switch or circuit-breaker into the installation. This should be in close proximity to the equipment and within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

2.2 Mounting Cautions

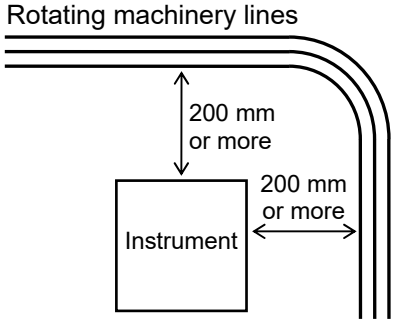
To avoid problems, consider the following cautions when mounting the PF900/901:

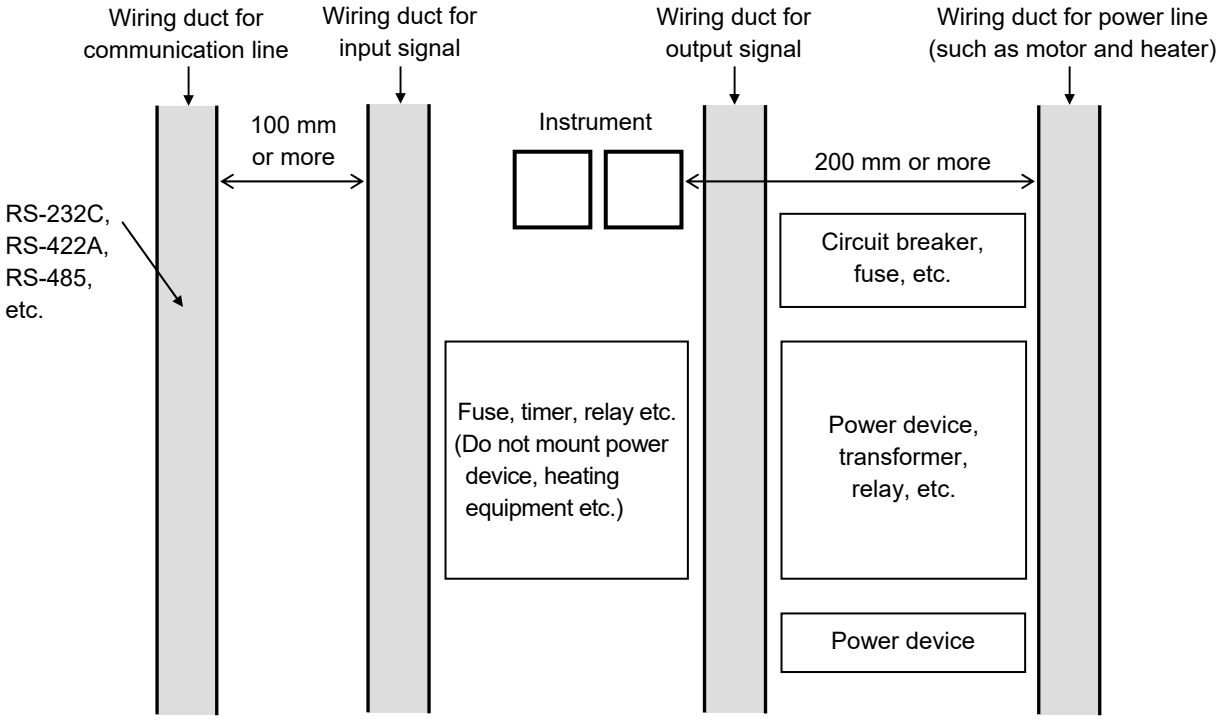
- Allow space for draft to release heat.
- Make sure to cool down the ambient temperature by using forced-air cooling system when the ambient temperature exceeds 55 °C. Do not expose this instrument directly to cool air from the forced-air cooling system.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- To improve noise immunity or safety, consider the following cautions:
  High voltage equipment: Do not mount within the same panel.
  Power lines: Separate at least 200 mm.
  Rotating machinery: Separate as far as possible.

Example of cooling panel



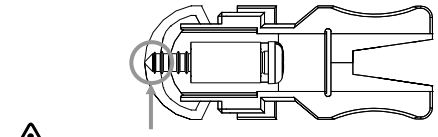
Distance from rotating machinery lines





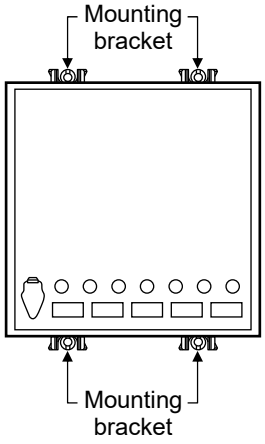
- Mount PF900/901 within the range of installation position (±90°).
- Concern the viewing angle of the display when mounting PF900/901.
  Viewing angle: Horizontal 90°/vertical 90° (contrast ratio 20:1)

- Take caution to avoid being hurt by the sharp-pointed tip of the screw installed in the mounting bracket.

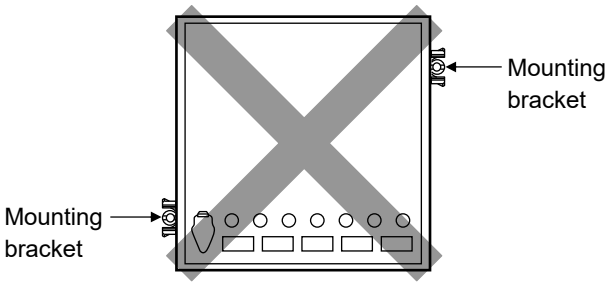


⚠ Tip of screw installed in mounting bracket

- Install two mounting brackets each on top and the bottom of the instrument. Do not install them in the grooves located on the side surfaces.



Correct installation

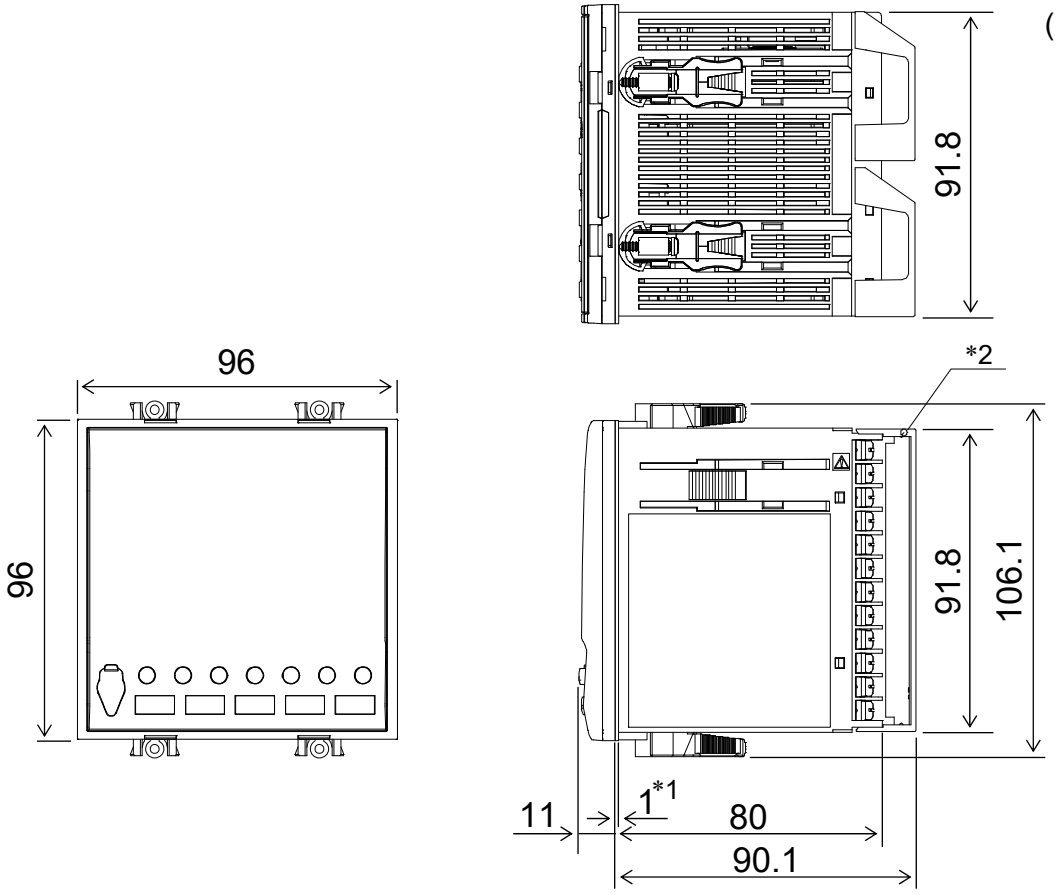


Incorrect installation

2.3 Dimensions

● Dimensions

(Unit: mm)

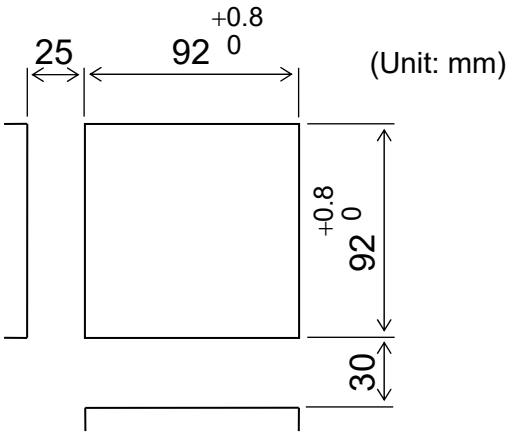


[Panel thickness: 1 to 10 mm]

*1 Waterproof/dustproof rubber packing (Model code: KFB900-36 <1>)
*2 Terminal cover [sold separately] (Model code: KFB 400-511(1))

● Panel cutout

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.



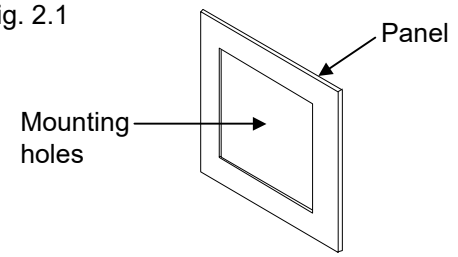
2.4 Procedures of Mounting and Removing

■ Mounting procedures

The front of the controller conforms to **IP55 (NEMA Type 3)** when mounted to the panel. For effective Waterproof/Dustproof, the waterproof/dustproof rubber packing must be securely placed between instrument and panel without any gap. If waterproof/dustproof rubber packing is damaged, please contact RKC sales office or the agent.

1. Prepare the panel cutout as specified in **2.3 Dimensions**. (Panel thickness: 1 to 10 mm)

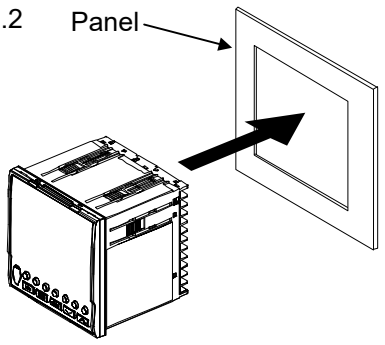
Fig. 2.1



2. Set the water/dustproof rubber packing on the case from the back side of the instrument shown in Fig. 2.2. Insert the instrument through the panel cutout.

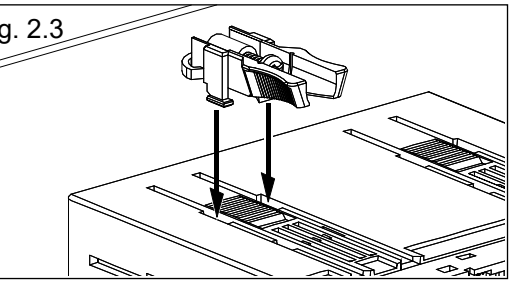
☞ To replace Waterproof/dustproof rubber packing, refer to **APPENDIX** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

Fig. 2.2



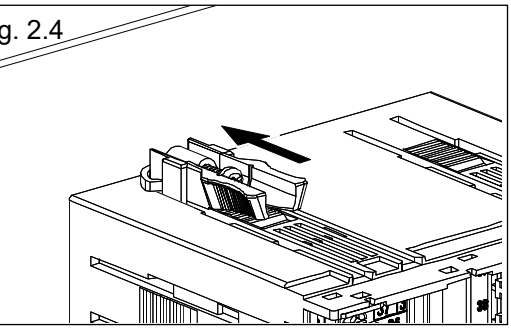
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.3)

Fig. 2.3



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

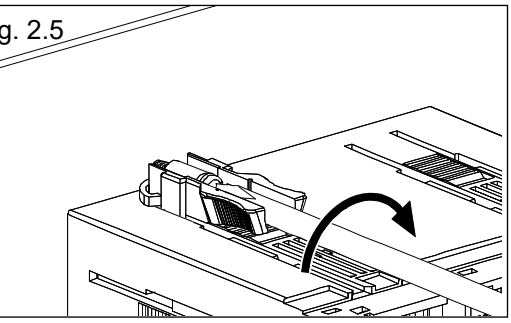
Fig. 2.4



5. Turn only one full revolution after the screw touches the panel. (Fig. 2.5)

📖 If the screw has been rotated too tight, the screw may turn idle. In such a case, loosen the screw once and tighten it again until the instrument is firmly fixed.

Fig. 2.5



6. The other mounting bracket should be installed the same way described in ***3*** to ***5***.

■ 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 up (Fig. 2.7 [A]) and forward (Fig. 2.7 [B]) while holding the rear (Fig. 2.6).
5. The other mounting bracket 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. 2.8)

Use long-nose pliers to remove mounting brackets from the instrument that is installed in a narrow place or installed tightly in a vertical position.

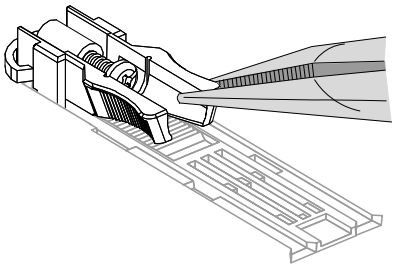


Fig. 2.6

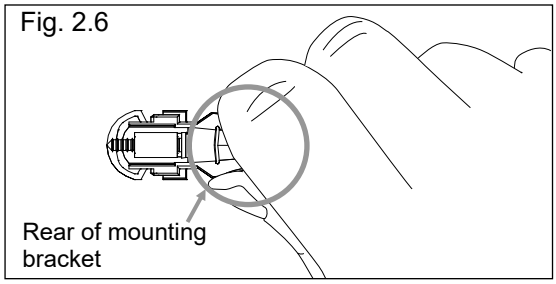


Fig. 2.7

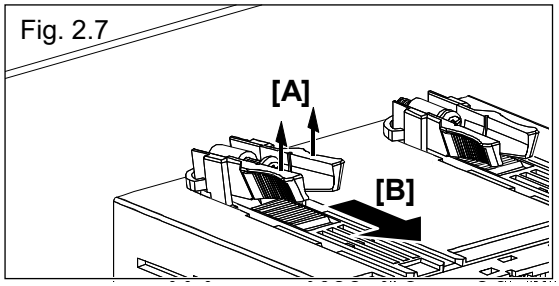
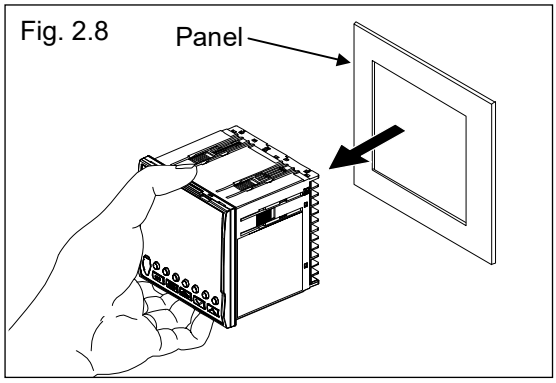


Fig. 2.8



☞ To remove by using a slotted screwdriver, refer to ■ **Removal procedures by using slotted (standard) screwdriver** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

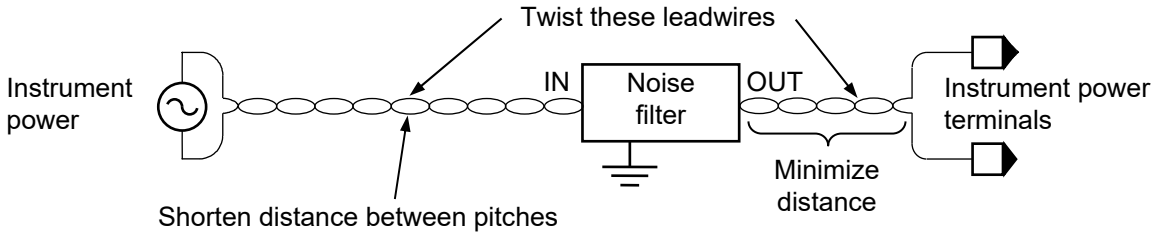
3. WIRING

> **⚠ 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.

3.1 Wiring Cautions

■ Power supply wiring

- 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.

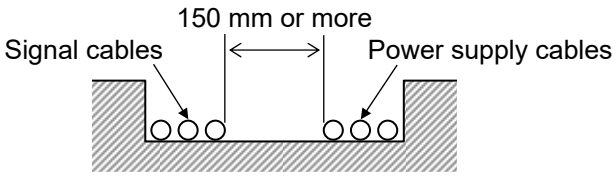


- Power supply wiring must be twisted and have a low voltage drop.
- About 5 seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch is required, install close to the instrument.
  Recommended fuse rating: Rated voltage 250 V, Rated current 1 A
  Fuse type: Time-lag fuse
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).

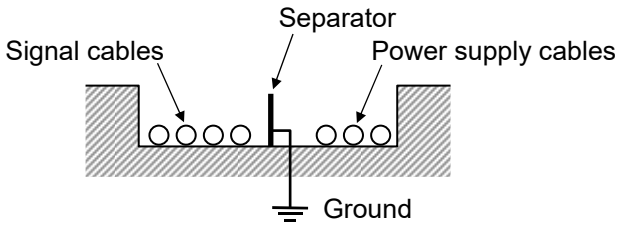
■ Input/Output wiring

- 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.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

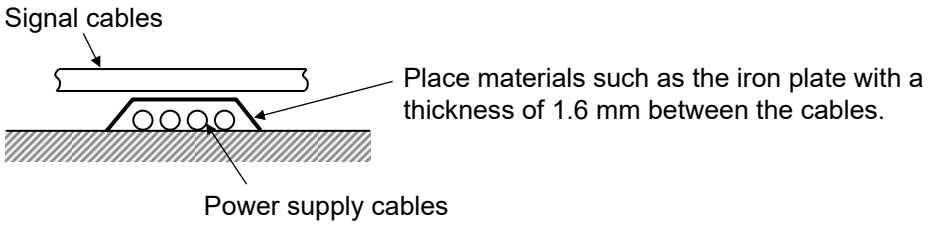
Example: Keep 150 mm or more between the cables.



Example: Locate separator.



Example: Cross the cables at a right angle.

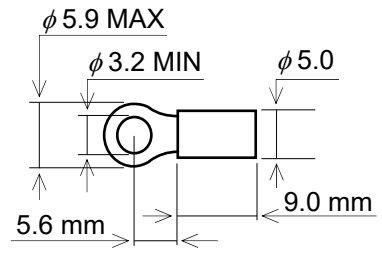


- Use independent ducts for the input/output wires and power circuits inside and outside the panel.

■ Wiring method

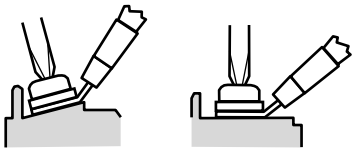
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3 × 7 (With 5.8 × 5.8 square washer)
  Recommended tightening torque:
  0.4 N・m (4 kgf・cm)
  Applicable wire: Solid/Twisted wire of 0.25 to 1.65 mm^2
  Specified dimension: Refer to Fig. 3.1
  Specified solderless terminals:
  Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation
  V1.25-MS3
  (M3 screw, width 5.5 mm, hole diameter 3.2 mm)

Fig 3.1



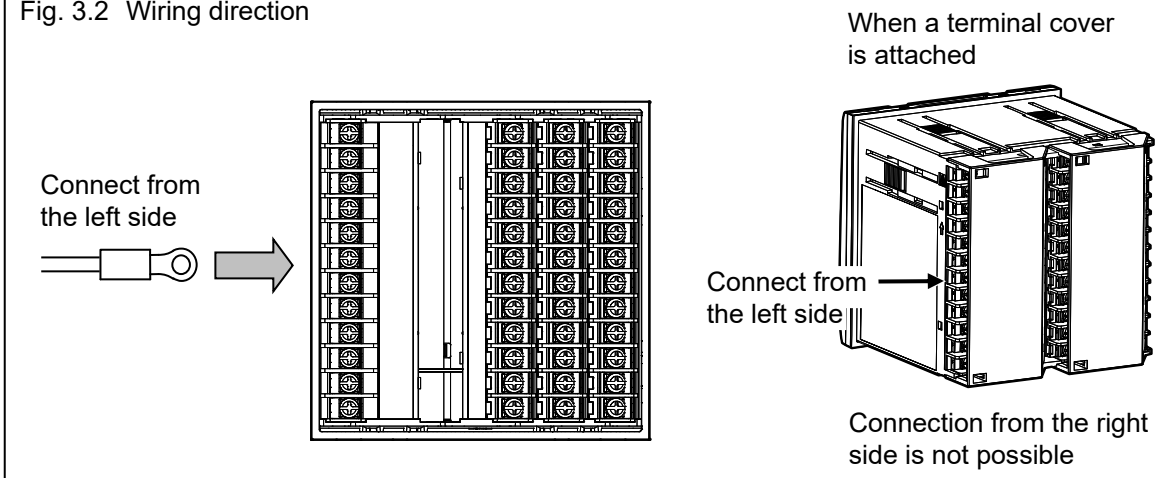
- Make sure that during field wiring parts of conductors can not come into contact with adjacent conductive parts.

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.



- When making the connections, route from the left side toward the rear terminals as shown in Fig. 3.2. The central and right columns of terminals are slanted to facilitate connection from the left. If a terminal cover is used, connection from the right side is not possible.

Fig. 3.2 Wiring direction



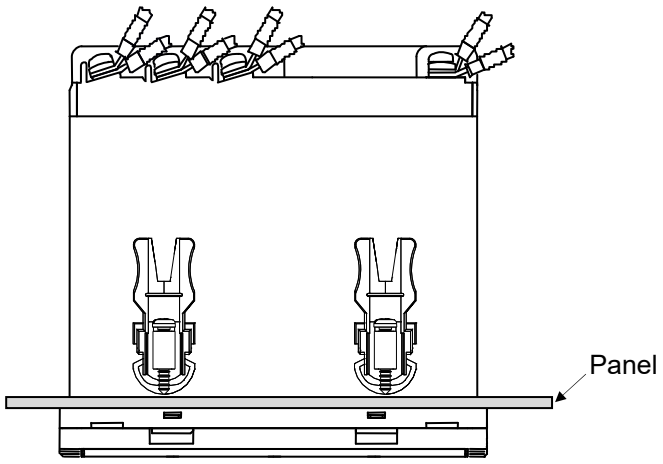
- Up to two solderless terminal lugs can be connected to one terminal screw.
  However, in this case, reinforced insulation cannot be used.

NOTE

Bend the solderless terminals for multi-drop wiring to avoid damage to the screws by securing forcibly. (Refer to Fig. 3.3)

If two solderless terminal lugs are connected to one terminal screw, a terminal cover cannot be used.

Fig. 3.3 Image of how to bend each solderless terminal lug



3.2 Terminal Layout

■ Terminal configuration

The PF900 and the PF901 offer the same terminal configuration.

Digital output (DO5 to 12) [optional]
Open collector
☞ Refer to P. 3-14.

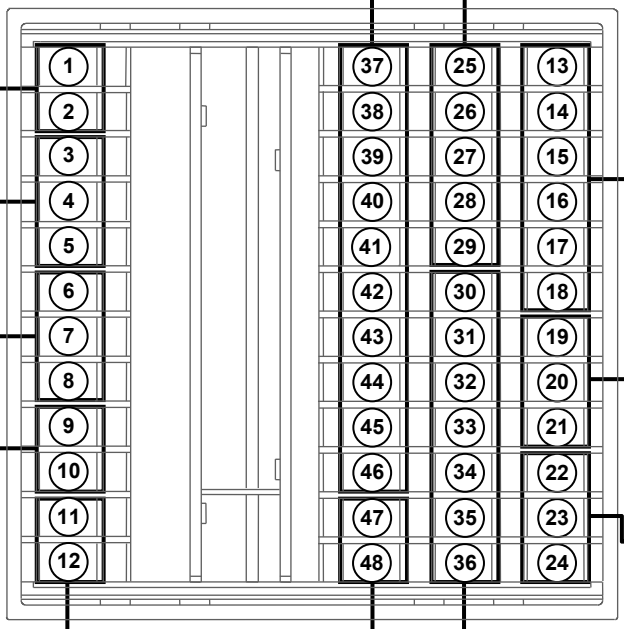
Power supply voltage
100 to 240 V AC
24 V AC
24 V DC
☞ Refer to P. 3-7.

Digital output 3 (DO3), Digital output 4 (DO4)
Relay contact
☞ Refer to P. 3-13.

Digital output 1 (DO1), Digital output 2 (DO2)
Relay contact
☞ Refer to P. 3-13.

Output 2 (OUT2)*
Relay contact
Voltage pulse
Voltage
Current
Triac
Open collector
☞ Refer to P. 3-9.

Output 1 (OUT1)
Relay contact
Voltage pulse
Voltage
Current
Triac
Open collector
☞ Refer to P. 3-9.



Output 3 (OUT3)*
Voltage pulse
Voltage
Current
Open collector
☞ Refer to P. 3-11.

Communication 1 [optional]
RS-232C
RS-422A
RS-485

Communication 2 [optional]
RS-485
☞ Refer to P. 3-16.

Digital input (DI7 to DI11)
Dry contact
☞ Refer to P. 3-12.

Current transformer (CT) input [optional] or Feedback resistance (FBR) input [optional]
☞ Refer to P. 3-15.

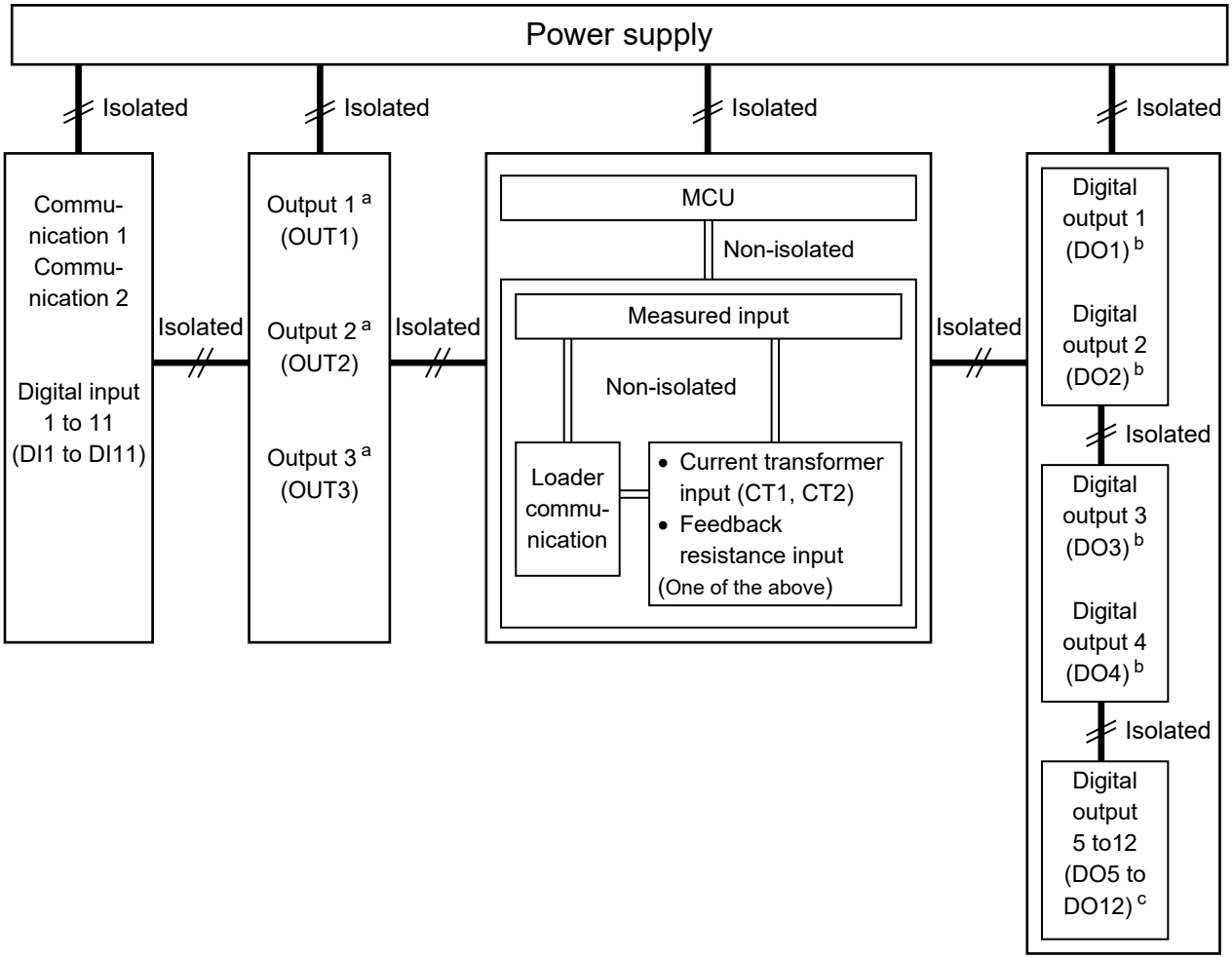
Measured input [universal input]
Thermocouple (TC)
Resistance temperature detector (RTD)
Voltage
Current
☞ Refer to P. 3-8.

Digital input (DI1 to DI6) [optional]
Dry contact
☞ Refer to P. 3-12.

***** Specify when ordering

■ Isolations of the instrument

For isolated device Input/Output blocks, refer to the following:



[a] OUT1, OUT2 and OUT3 are isolated when relay contact or triac is specified for OUT1 and OUT2.

[b] Not isolated between DO1 and DO2 or DO3 and DO4

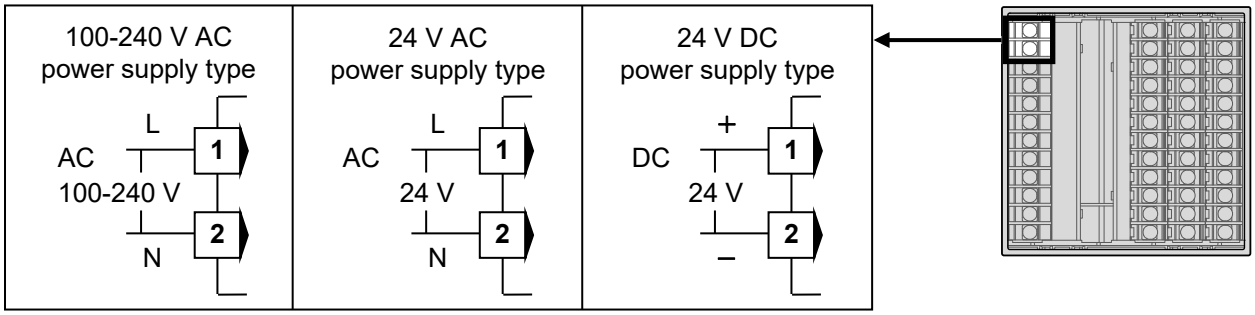
[c] Digital outputs from DO5 to DO12 are not isolated.

3.3 Wiring of Each Terminal

Prior to conducting wiring, always check the polarity of each terminal.

■ Power supply

- Connect the power to terminal numbers 1 and 2.



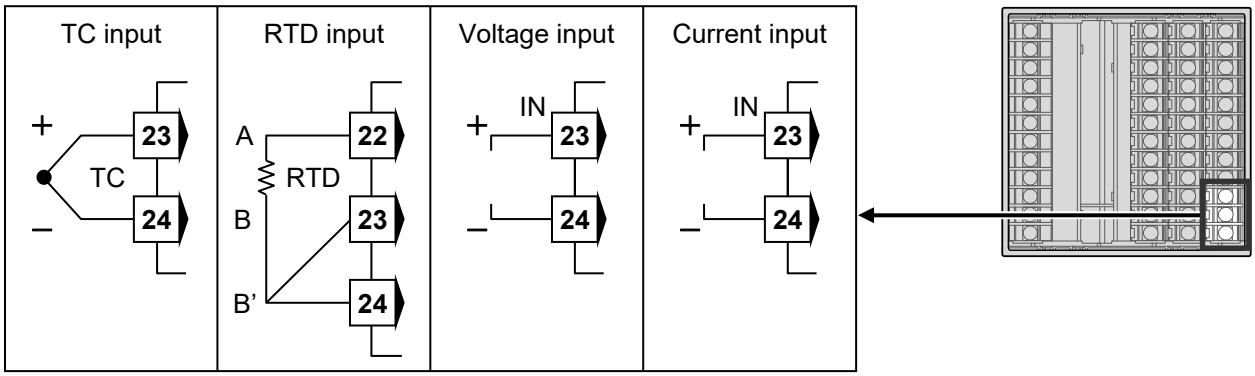
- The power supply types must be specified when ordering. Power supply voltage for the controller must be within the range shown below for the controller to satisfy the control accuracy in the specifications.

Specification code	Power supply type	Power consumption	Rush current
4	100-240 V AC power supply type: 85 to 264 V AC (Power supply voltage range) [Rating 100 to 240 V AC] Power supply frequency: 50/60 Hz	9.5 VA max. (at 100 V AC) 13.5 VA max. (at 240 V AC)	At 100 V AC: 7.5 A or less At 240 V AC: 17.5 A or less
3	24 V AC power supply type: 20.4 to 26.4 V AC (Power supply voltage range) [Rating 24 V AC] Power supply frequency: 50/60 Hz	8.5 VA max. (at 24 V AC)	8.5 A or less
	24 V DC power supply type: 20.4 to 26.4 V DC (Power supply voltage range) (Rating 24 V DC)	230 mA max. (at 24 V DC)	6.0 A or less

- 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.
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch is required, install close to the instrument.
  Recommended fuse rating: Rated voltage 250 V, Rated current 1 A
  Fuse type: Time-lag fuse
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- A suitable power supply should be considered in the end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).

■ Measured input (TC/RTD/Voltage/Current) [universal input]

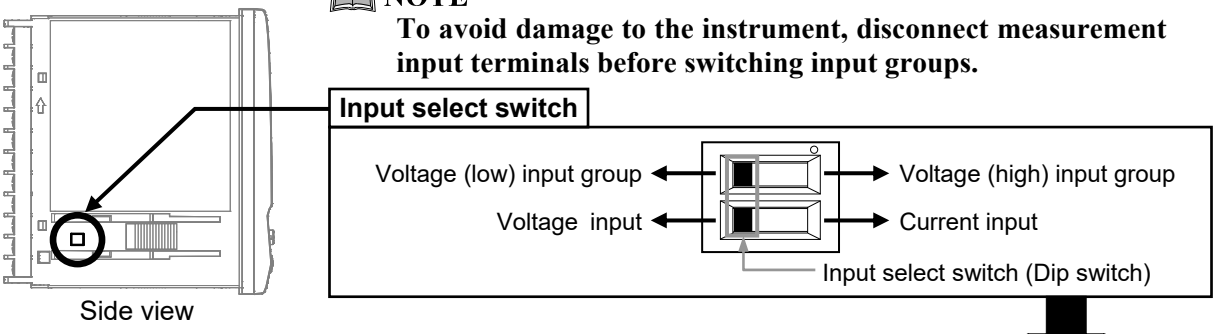
- For the Measured input type, terminals 22 through 24 are allocated to the Measured input.

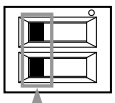
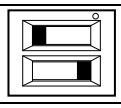
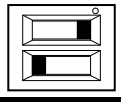


- Select the Voltage (low) input group, the Voltage (high) input group or the Current input group to conform to the input type to be set.

How to switch Input group:
Switch the input group by using the upper Input select switch at the bottom left of the left side of this instrument. Select the voltage input or the current input by using the lower input select switch (refer to the description below).

NOTE
To avoid damage to the instrument, disconnect measurement input terminals before switching input groups.

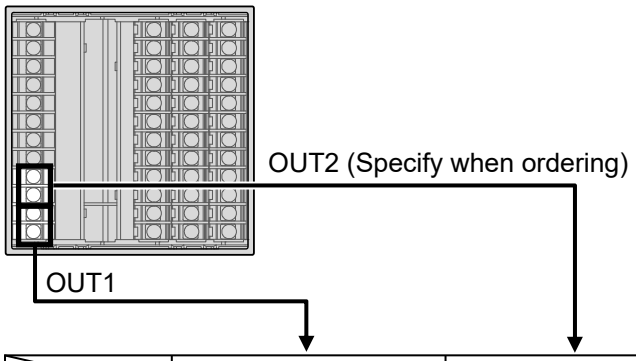


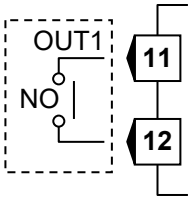
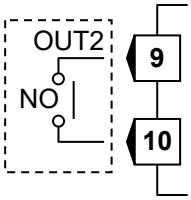
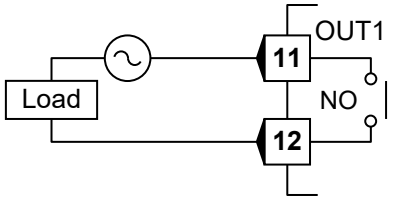
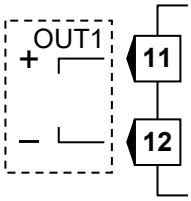
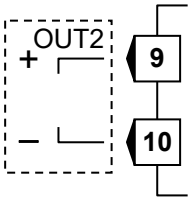
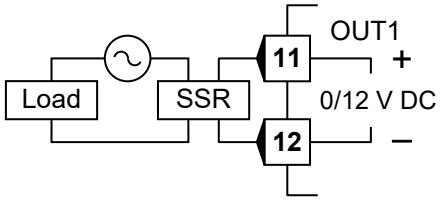
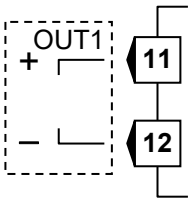
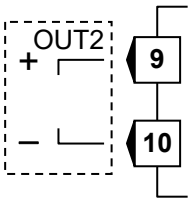
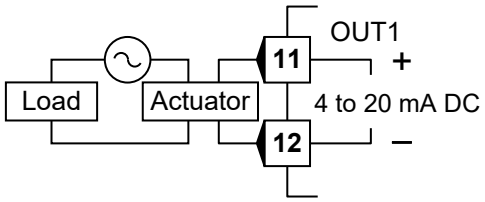
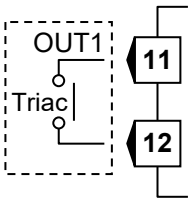
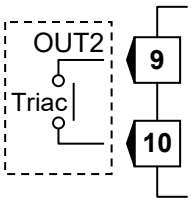
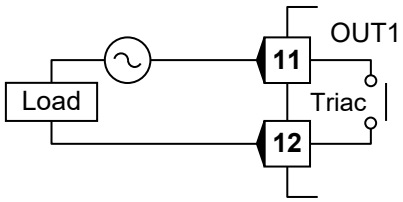
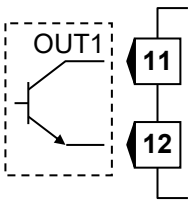
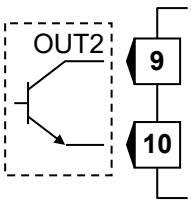
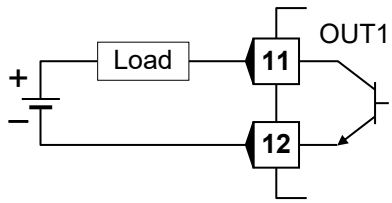
Input group		Input type	Input select switch
Voltage (low) input group	TC input	K, J, E, T, S, R, B, N (JIS-C1602-1995) PLII (NBS) W5Re/W26Re (ASTM-E988-96) U, L (DIN43710-1985) PR40-20 (ASTM-E1751-00)	 Input select switch (Dip switch)
	RTD input	Pt100 (JIS-C1604-1997) JPt100 (JIS-C1604-1981 Pt100)	
	Voltage (low) input	0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC, –10 to +10 mV DC, –100 to +100 mV DC, –1 to +1 V DC	
Current input group	Current input	0 to 20 mA DC, 4 to 20 mA DC	
Voltage (high) input group	Voltage (high) input	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	

- For TC input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wires with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

■ Output 1 (OUT1)/Output 2 (OUT2)

- Number of outputs must be specified when ordering.
- Terminal 11 and 12 are for output 1 (OUT1); Terminal 9 and 10 are for output 2 (OUT2).
- Connect an appropriate load according to the output type. (Specify when ordering)



	OUT1	OUT2	Wiring example
Relay contact			
Voltage pulse			
Voltage, Current			
Triac			
Open collector			

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

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

Specification code	Output type	Specifications
N		None
M	Relay contact	250 V AC 3 A (Resistive load)/30 V DC 1 A (Resistive load) 1a contact
V	Voltage pulse	0/12 V DC (Allowable load resistance: 600 Ω or more) Allowable load resistance is 300 Ω or more (within 40 mA) when using only OUT1.
4	Voltage	0 to 5 V DC (Allowable load resistance: 1 kΩ or more)
5		0 to 10 V DC (Allowable load resistance: 1 kΩ or more)
6		1 to 5 V DC (Allowable load resistance: 1 kΩ or more)
7	Current	0 to 20 mA DC (Allowable load resistance: 600 Ω or less)
8		4 to 20 mA DC (Allowable load resistance: 600 Ω or less)
T	Triac	Output method: Zero-cross output Allowable load current: 0.5 A (Ambient temperature 40 °C or less) [Derating: –0.02 A/°C when ambient is 40 °C or more.] Load voltage: 75 to 250 V AC Minimum load current: 30 mA ON voltage: 1.6 V or less (at maximum load current)
D	Open collector	Allowable load current: 100 mA Load voltage: 30 V DC or less ON voltage: 2 V or less (at maximum load current) Leakage current at OFF: 0.1 mA or less

- Assign Control output, Transmission output or Event output as described in the table below.

Output terminal	Details of output	Setting screen
OUT1	Control output, Transmission output *	Engineering mode F31.01: OUT1 assignment (LoUt1) [Refer to P. 4-36.]
OUT2	Control output, Transmission output or Event output	Engineering mode F32.01: OUT2 assignment (LoUt2) [Refer to P. 4-36, 37.]

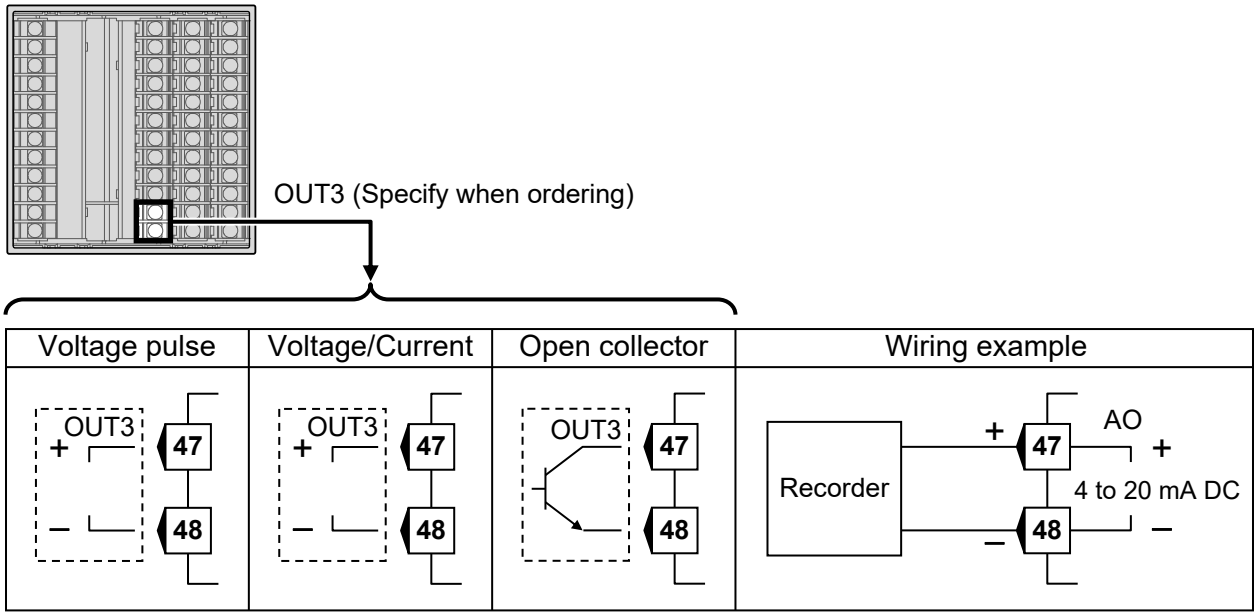
* Transmission output of OUT1 is only available for Output program.

Refer to the description below for general output assignment for each control action.

Control action	Details of assignment
PID control	OUT1: Control output: Manipulated output value 1 (MV1) (reverse action or direct action) OUT2: Transmission output or Event output
Heat/Cool PID control	OUT1: Control output: Manipulated output value 1 (MV1) [heat-side] OUT2: Control output: Manipulated output value 2 (MV2) [cool-side]
Position proportioning PID control without FBR	OUT1: Control output: Manipulated output value 1 (MV1) [open-side output] OUT2: Control output Manipulated output value 2 (MV2) [close-side output] Make sure to assign the output as described for the Position proportioning PID control.

■ Output 3 (OUT3)

- Number of outputs must be specified when ordering.
- Terminal 47 and 48 are for OUT3.
- Connect an appropriate load according to the output type. (Specify when ordering)



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

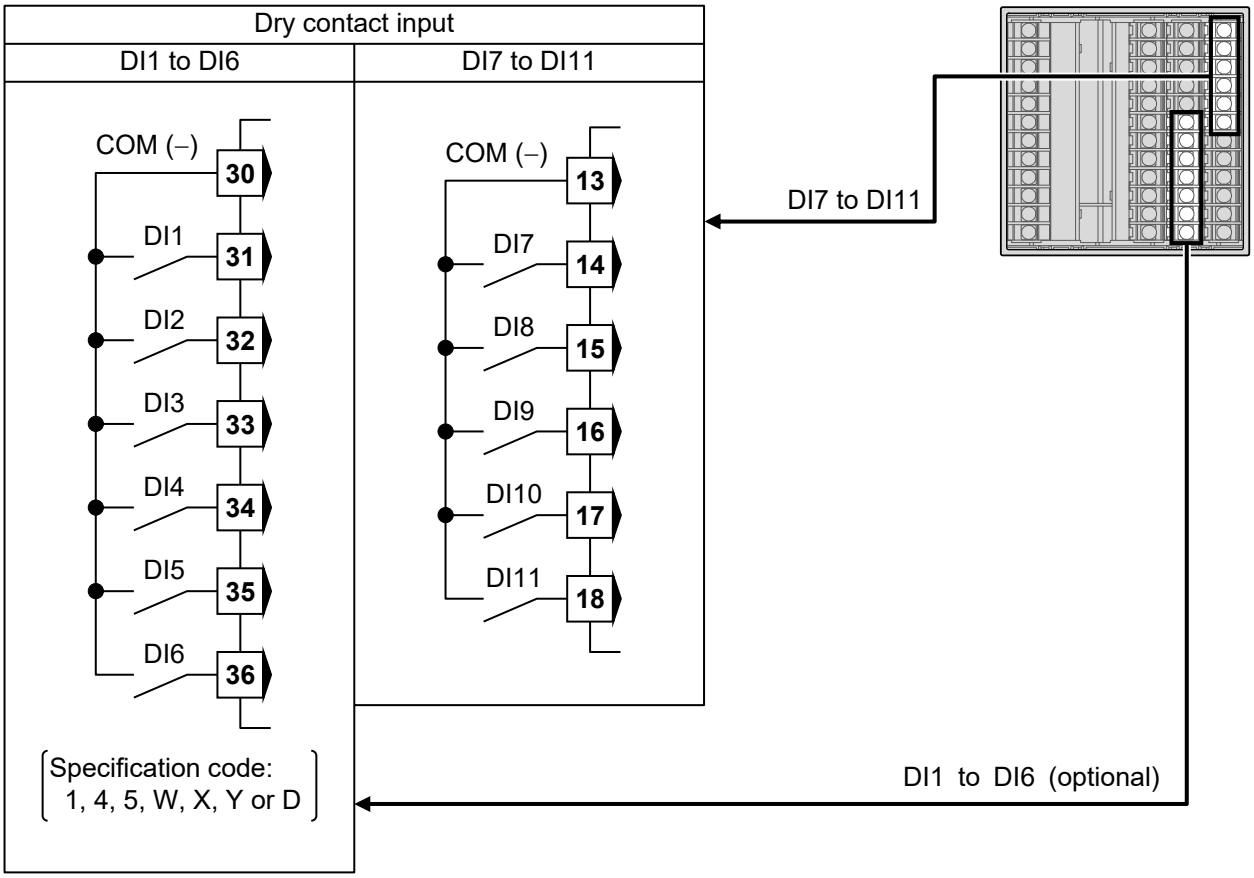
Specification code	Output type	Specifications
N		None
V	Voltage pulse	0/12 V DC (Allowable load resistance: 600 Ω or more)
3	Voltage	0 to 1 V DC (Allowable load resistance: 1 kΩ or more)
4		0 to 5 V DC (Allowable load resistance: 1 kΩ or more)
5		0 to 10 V DC (Allowable load resistance: 1 kΩ or more)
6		1 to 5 V DC (Allowable load resistance: 1 kΩ or more)
7	Current	0 to 20 mA DC (Allowable load resistance: 600 Ω or less)
8		4 to 20 mA DC (Allowable load resistance: 600 Ω or less)
D	Open collector	Allowable load current: 100 mA Load voltage: 30 V DC or less ON voltage: 2 V or less (at maximum load current) Leakage current at OFF: 0.1 mA or less

- Assign Control output, Transmission output or Event output at OUT3 assignment (LoGC3). *

* Refer to P. 4-37.

■ Digital input 1 to 11 (DI1 to DI6 [optional], DI7 to DI11 [standard])

- Terminals 30 through 36 for DI1 to DI6; and Terminals 13 through 18 for DI7 to DI11.



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

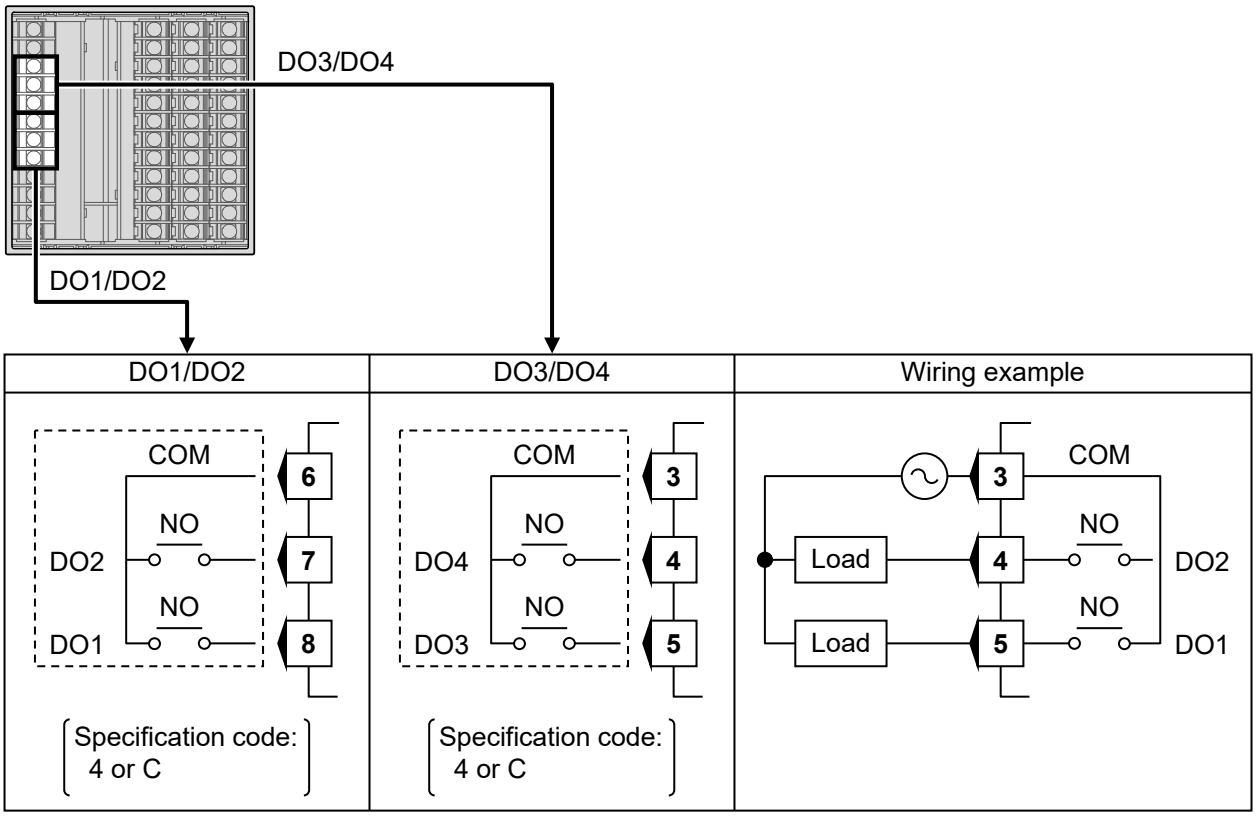
  Contact specifications: At OFF (contact open): 10 kΩ or more
  At ON (contact closed): 1 kΩ or less
  Contact current: 5 mA or less
  Capture judgment time: Approx. 200 ms + 1 sampling cycle

- The following functions can be assigned to Digital inputs. (Can be specified when ordering.)
  - Reset mode (RESET) setting
  - Program control mode (RUN) setting
  - Step function (STEP)
  - Hold function (HOLD)
  - Direct/Reverse action switching
  - Wait state release
  - Pattern number switch
  - Pattern increment

☞ For DI assignment, refer to **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Digital output 1 to 4 (DO1 to DO4) [standard]

- With DO optional, terminals 3 through 5 (DO3, DO4) and 6 through 8 (DO1, DO2) are allocated to the DO.



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

- Output type is only relay contact output.

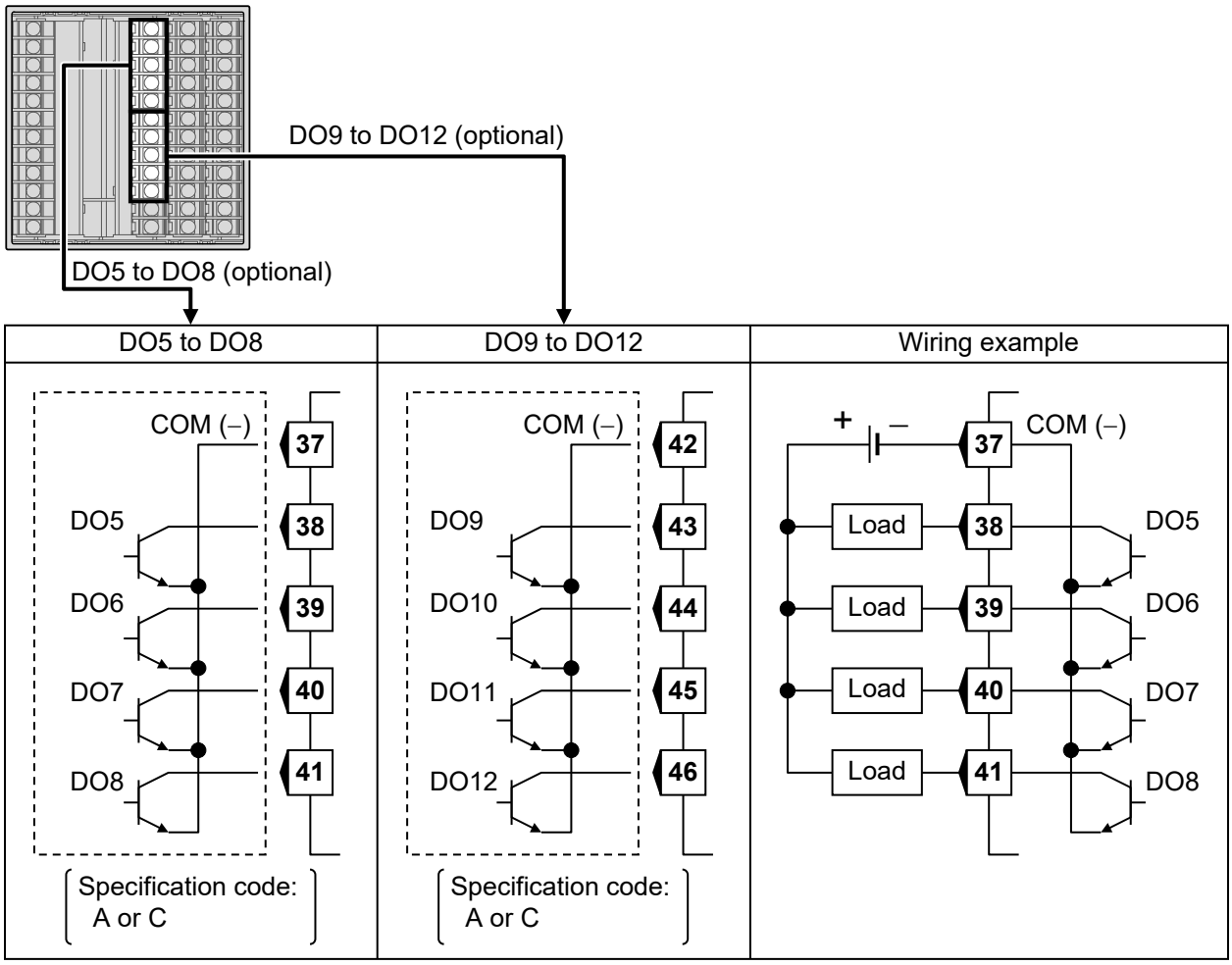
  Contact type: 1a contact
  Contact rating (Resistive load): 250 V AC 1 A, 30 V DC 1 A
  Electrical life: 300,000 times or more (Rated load)

- Assign Event type at the setting screen below.

Digital output terminal	Setting screen
DO1	Engineering mode F34.01: DO1 assignment (Ldo1) [Refer to P. 4-38.]
DO2	Engineering mode F34.02: DO2 assignment (Ldo2) [Refer to P. 4-38.]
DO3	Engineering mode F34.03: DO3 assignment (Ldo3) [Refer to P. 4-38.]
DO4	Engineering mode F34.04: DO4 assignment (Ldo4) [Refer to P. 4-38.]

■ Digital output 5 to 12 (DO5 to DO12) [optional]

- With DO optional, terminals 37 through 41 (DO5 to DO8) and 42 through 46 (DO9 to DO12) are allocated to the DO.



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

- Output type is only open collector output.

Output method: Sink type
Allowable load current: 100 mA
Load voltage: 30 V DC or less
ON voltage: 2 V or less (at maximum load current)
Leakage current at OFF: 0.1 mA or less

- Assign Event type at the setting screen below.

Digital output terminal	Setting screen
DO5	Engineering mode F34.05: DO5 assignment (Ldo5) [Refer to P. 4-38.]
DO6	Engineering mode F34.06: DO6 assignment (Ldo6) [Refer to P. 4-38.]
DO7	Engineering mode F34.07: DO7 assignment (Ldo7) [Refer to P. 4-38.]
DO8	Engineering mode F34.08: DO8 assignment (Ldo8) [Refer to P. 4-38.]
DO9	Engineering mode F34.09: DO9 assignment (Ldo9) [Refer to P. 4-38.]
DO10	Engineering mode F34.10: DO10 assignment (Ldo 10) [Refer to P. 4-38.]
DO11	Engineering mode F34.11: DO11 assignment (Ldo 11) [Refer to P. 4-38.]
DO12	Engineering mode F34.12: DO12 assignment (Ldo 12) [Refer to P. 4-38.]

■ Current transformer (CT) input/Feedback resistance (FBR) input [optional]

- With CT input or FBR input, terminals 19 through 21 are allocated to the specified input.
- When using CT input, connect CTs to the relevant terminals.

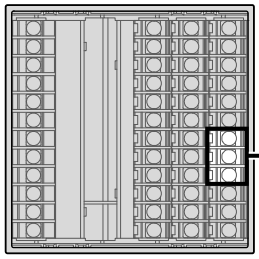
  CT: CTL-6-P-N [input range 0 to 30 A] (sold separately)

  CTL-12-S56-10L-N [input range 0 to 100 A] (sold separately)

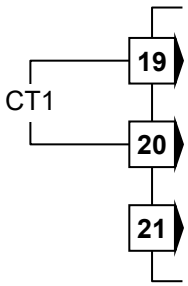
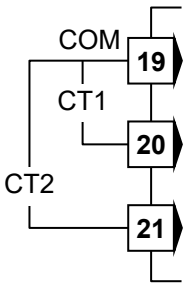
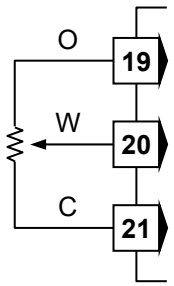
  When CT type is not specified at ordering, the factory set value of the CT ratio is "800." To use CTL-12-S56-10L-N, change the set value of CT ratio into "1000" at the setting screen described below.

CT input terminal	Setting screen
CT1	Engineering mode F45.01: CT1 ratio (CTR1) [Refer to P. 4-40.]
CT2	Engineering mode F46.01: CT2 ratio (CTR2) [Refer to P. 4-40.]

- When using FBR input, connect a potentiometer to the relevant terminals.

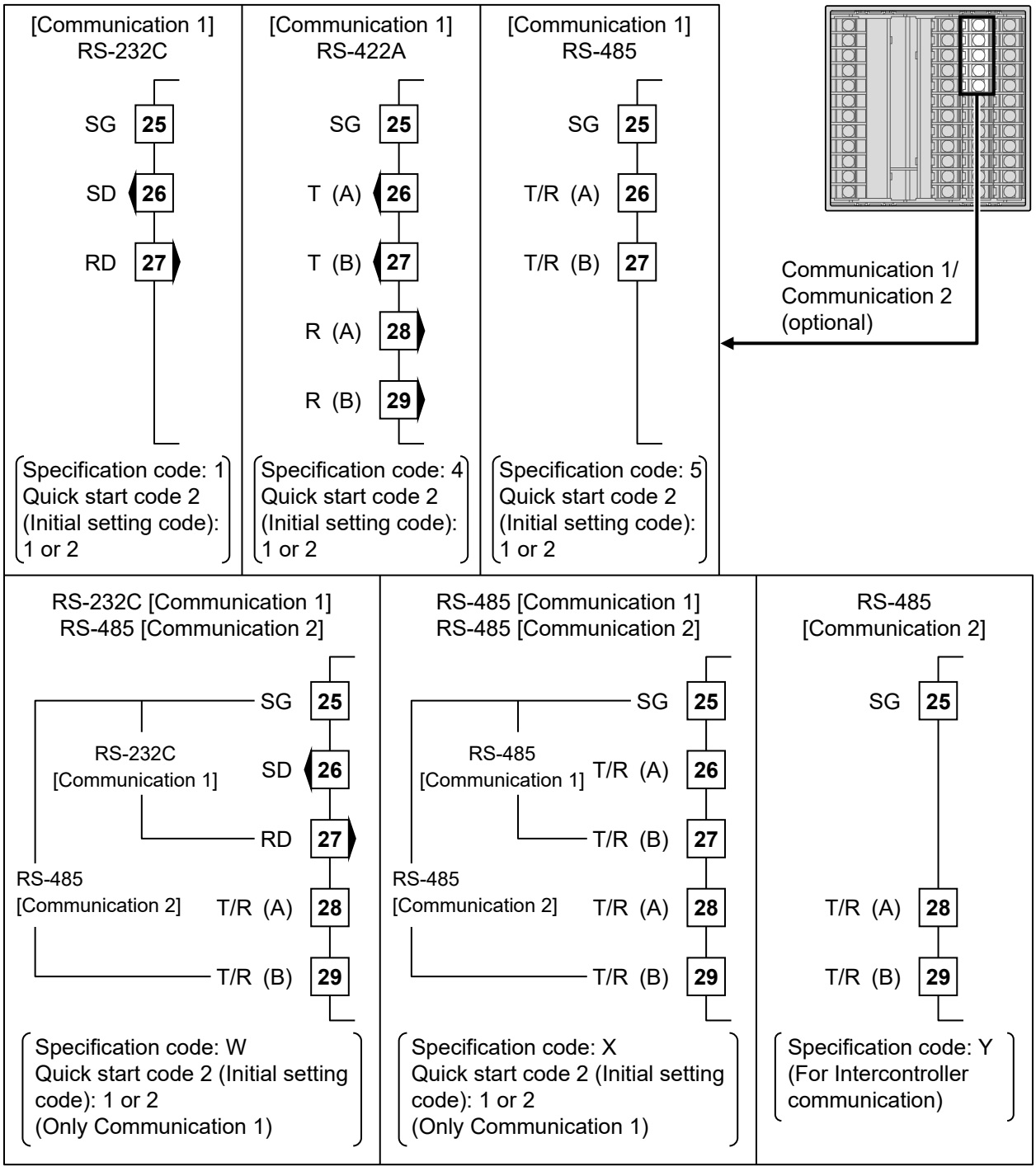


CT1/CT2/FBR (optional)

CT input (1 point)	CT input (2 points)	FBR input
		Allowance resistance: Standard 135 Ω (Availability: 100 Ω to 10 kΩ)  O: OPEN W: WIPE C: CLOSE
Specification code: T Quick start code 2 (Initial setting code): P or S	Specification code: T Quick start code 2 (Initial setting code): T or U	Specification code: F

■ Communication 1/Communication 2 [optional]

- With Communication function, terminals 25 through 29 are allocated to Communication.
- Before wiring, confirm the proper terminals to be used for the communication interface being specified. For wiring, refer to **7.1 Connections** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.



- Communication 2 (RS-485) is for intercontroller communication.

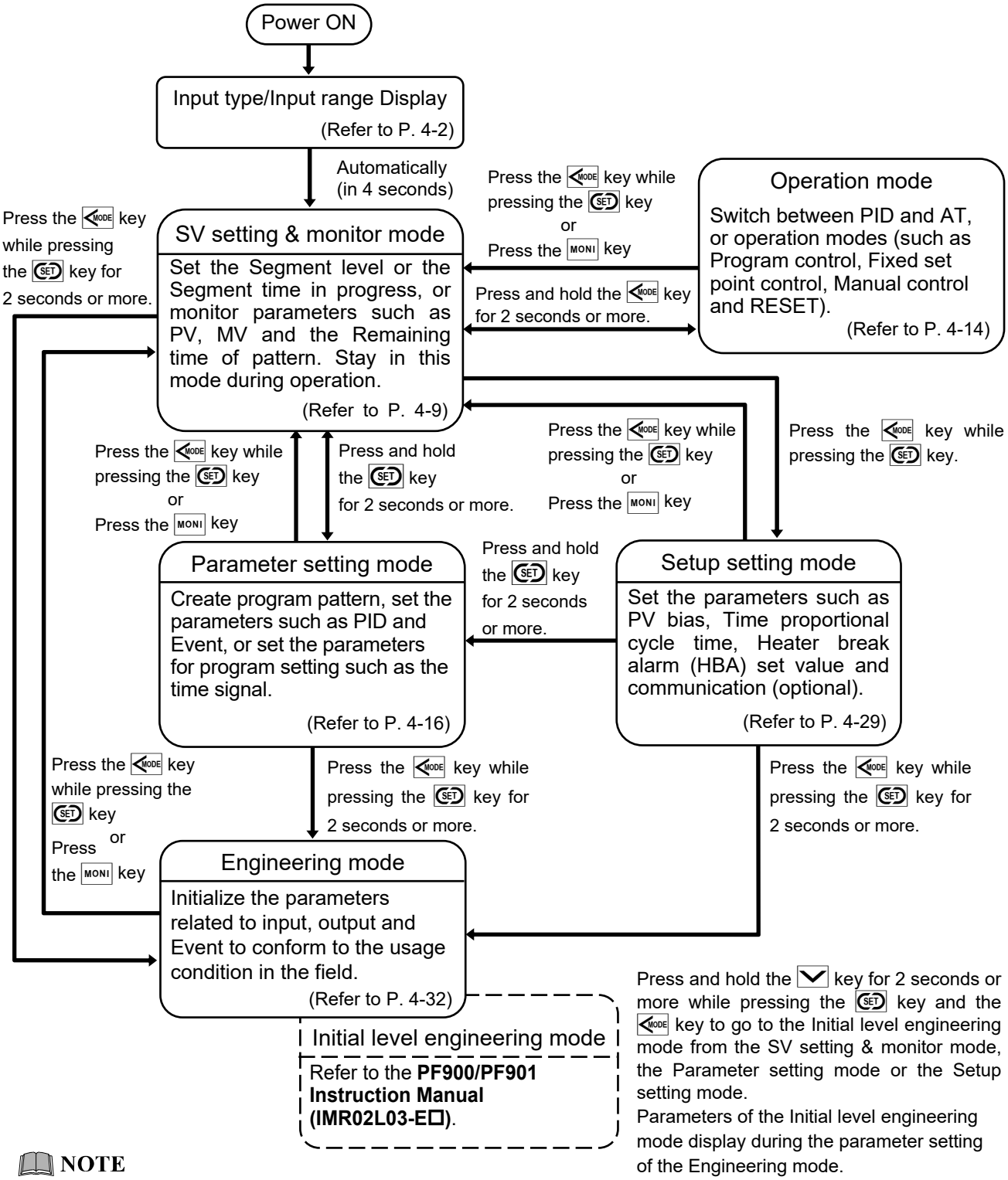
☞ For the intercontroller communication, refer to **6.7 Intercontroller Communication Function** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

4. BASIC OPERATION

4.1 Operation Menu

4.1.1 Mode switching

There are 5 setting modes. Switch mode by using the SET key, the MODE key or the MONI key.



NOTE

Make sure to be in the RESET mode before conducting parameter setting in the Engineering mode. It is possible to set parameters in the function block 10 (F10) and the function block 11 (F11) in the RUN mode, the FIX mode and the MAN mode.

It is also possible to go back to the SV setting & monitor mode by pressing the MODE key while pressing the SET key.

4.1.2 Input type and input range display

This instrument immediately confirms inputs type symbol and input range following power ON.

Example: When sensor type is K thermocouple

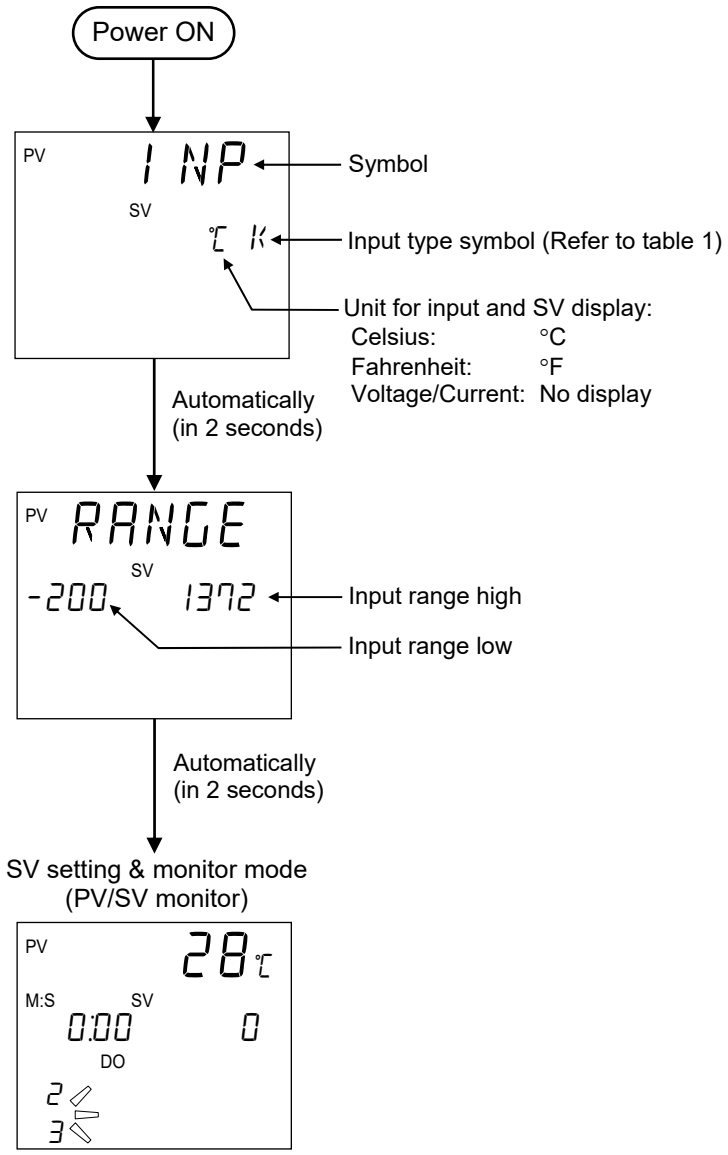


Table 1: Input type symbol table

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
JP	RTD JPt100
V	Voltage (mV, V)
I	Current (mA)

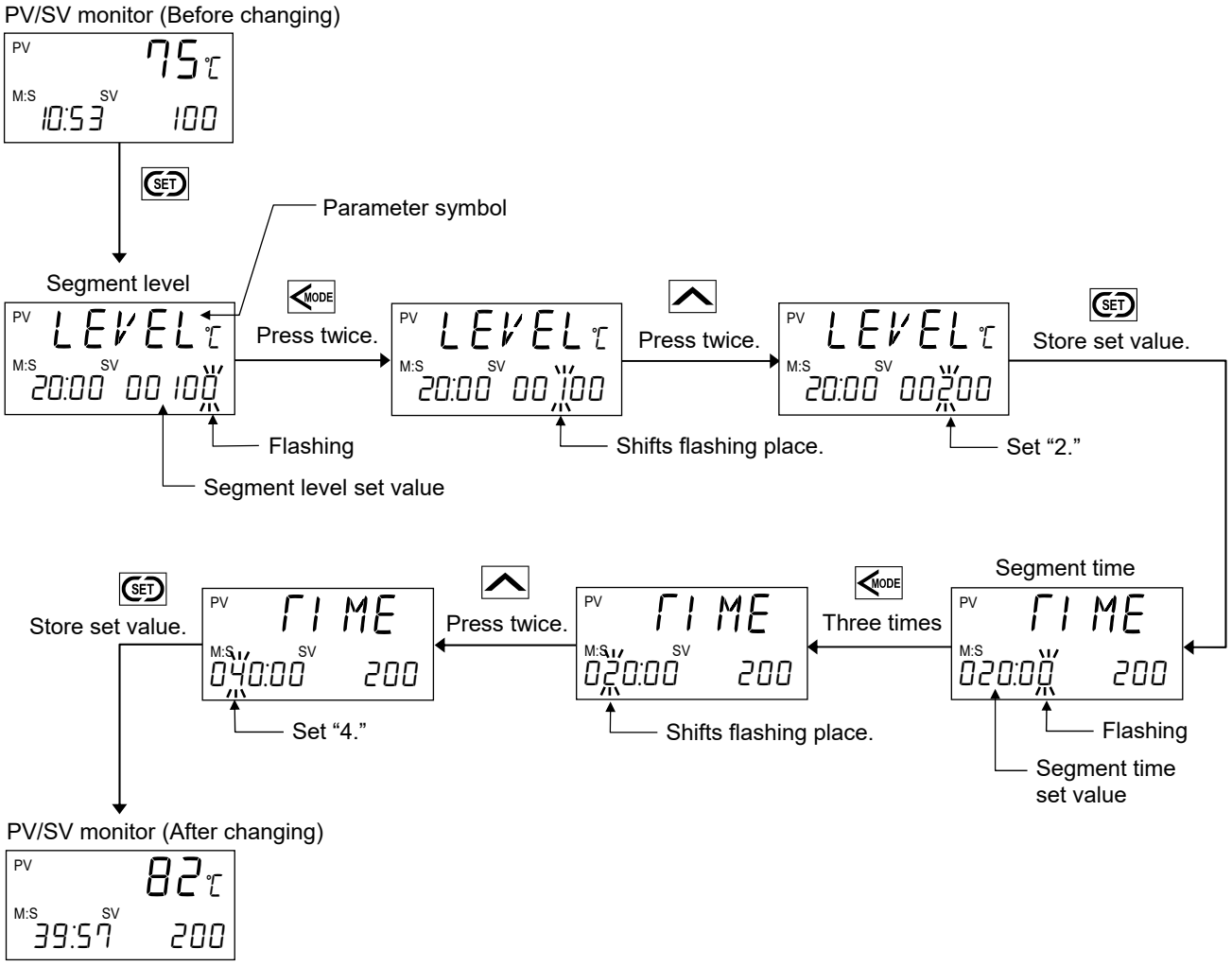
Once power is restored to the instrument the operation mode will return as it was before the power went OFF. The operation mode is displayed after the Input type and Input range.
[Factory set value: Reset mode (RESET)]
For the action at power ON, refer to **5.2 Operating Precautions (P. 5-7)**.

4.2 Changing Set Value

■ Numeric value setting

- 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.
- Set value (SV) may be changed by pressing the ^ key or the v key.
- 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.
- Press the STEP R.SET key to store the set value and return to the previous parameter setting display.

Example: Change the segment level (to 200 °C) and the segment time (to 40 minutes) in the Program control mode (RUN).

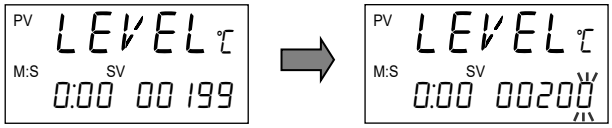


Display returns to the PV/SV monitor display without storing set value being changed if the SET key is not pressed within 1 minute. The new set values being set will not be stored when returning to the PV/SV monitor display if the MONI key is pressed before pressing the SET key.

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

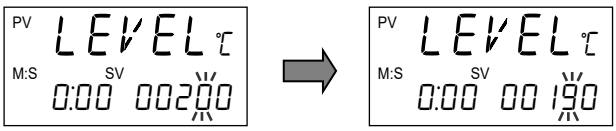
Increase SV from 199 °C to 200 °C:

1. Press the MODE key to flash the one place (first digit from the right).
2. Press the ∧ key to change to 0. The display changes to 200.



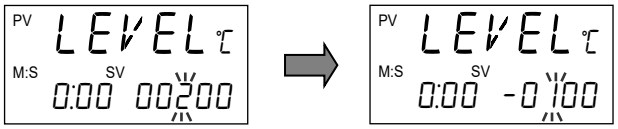
Decrease SV from 200 °C to 190 °C:

1. Press the MODE key to flash the tens place.
2. Press the ∨ key to change to 9. The display changes to 190.



Decrease SV from 200 °C to –100 °C:

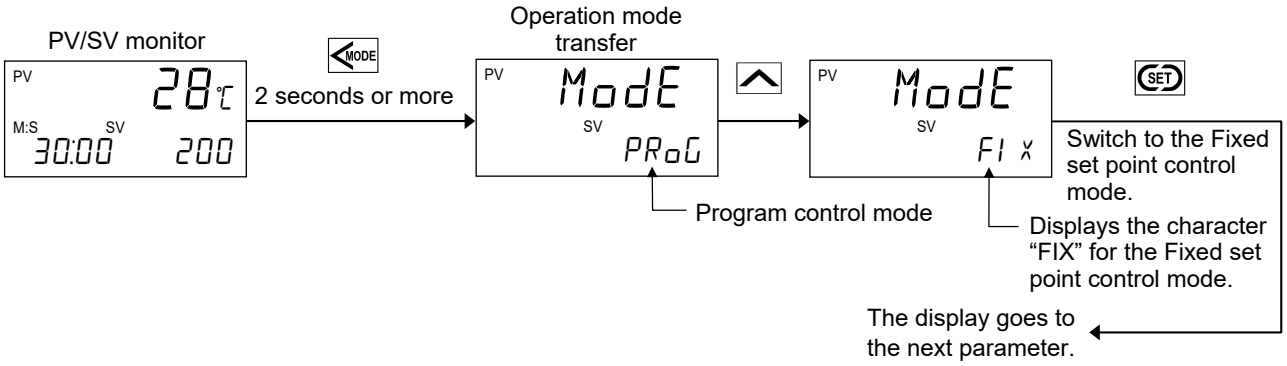
1. Press the MODE key to flash the hundreds place.
2. Press the ∨ key (three times) to change to –1. The display changes to –100.



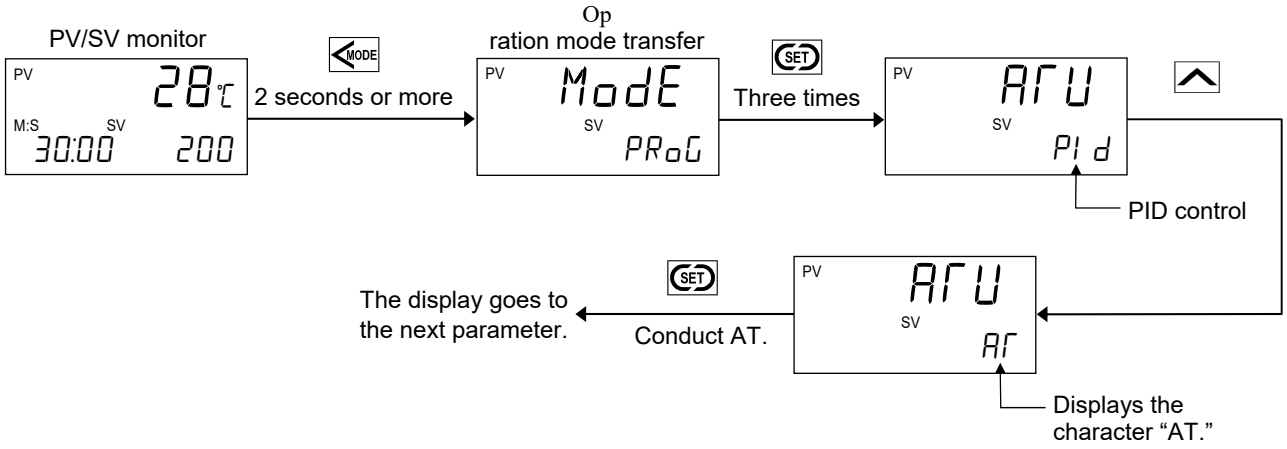
■ Setting item selection

- Press the ∧ key or the ∨ key to switch setting item.
- Press the SET key or the MODE key to store the set values being set and go to the next parameter setting display.

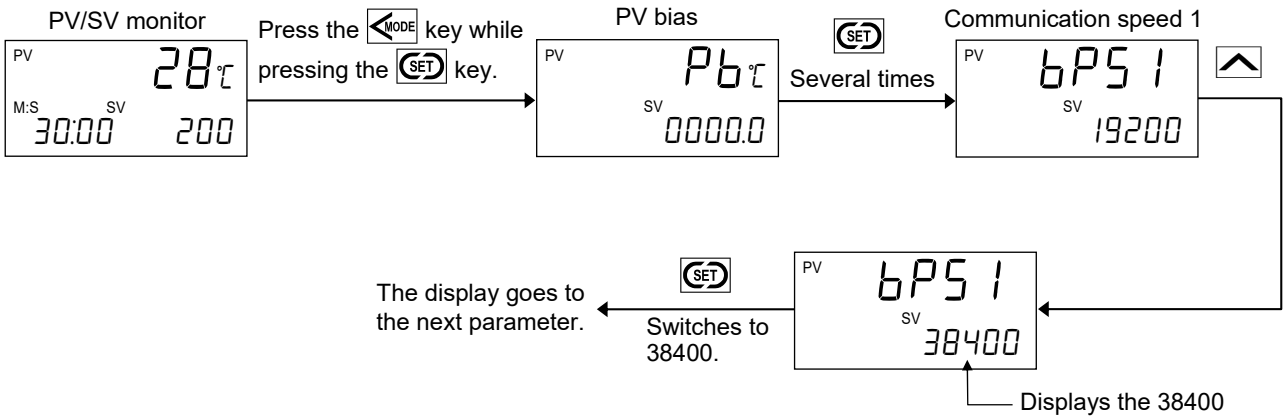
Example 1: Switch operation mode from the Program control mode to the Fixed set point control mode.



Example 2: Conduct Autotuning (AT).



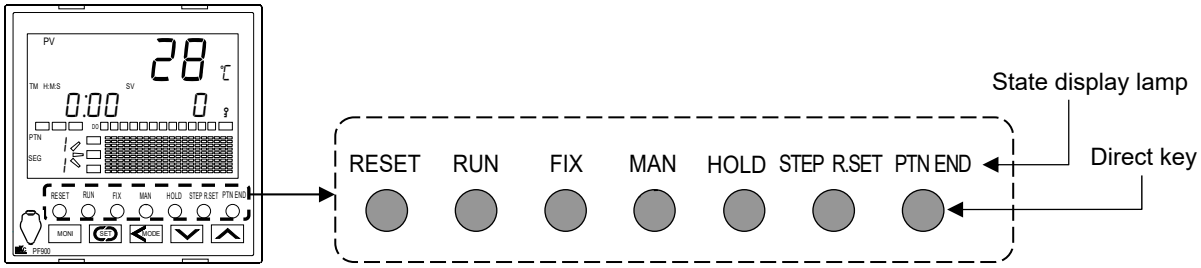
Example 3: Change communication speed 1 in the Setup setting mode.



4.3 Operation of the Direct Keys

■ Direct key menu

Use 7 direct keys to switch operation mode or to conduct simple key operation at program in progress.



● Operation mode switching

Switch operation mode by using the direct key and display the PV/SV screen of the operation mode in progress. State display lamp is orange when the operation mode is in progress. State display lamp turns off when Operation mode switching is not possible.

NOTE

The operation mode cannot be switched by using the direct keys when RESET or RUN of the Digital input (DI) is ON (contact closed).

Direct key	Operation mode	State display lamp	Display
RESET	Reset mode	RESET lamp lights [Orange]	PV/SV monitor of operation mode
RUN	Program control mode	RUN lamp lights [Orange]	
FIX	Fixed set point control mode	FIX lamp lights [Orange]	
MAN	Manual control mode	MAN lamp lights [Orange]	

● Key operation in the Program control mode (RUN)

HOLD key:

Press the HOLD key to stop progress of time in the Program control mode (RUN). To release the HOLD state, press the HOLD key again.

The HOLD key is not operative when conducting HOLD (contact closed) by using the Digital input (DI).

STEP R.SET key:

The STEP R.SET key offers 2 functions: the STEP function and the R.SET function. The STEP function is available for the PV/SV monitor state in the Program control mode. The R.SET function is validated in the Parameter setting mode.

- STEP function (STEP lamp lights):
  Forward the segment of the program pattern in process to the next.
- R.SET function (R.SET lamp lights):
  Go back to the previous parameter setting display (opposite action to the SET key). The set value of the parameter is stored when pressing the R.SET key.

PTN END key:

The PTN END key offers 2 functions: the PTN function and the END function. The END function is available for the program setting in the Parameter setting mode. The PTN function is available only in the Reset mode (RESET).

- END function (END lamp lights):
  Press the END key to display the program end screen when setting parameters related to segment at the Program setting block in the Parameter setting mode. Then press the SET key to go to the parameter setting display of pattern setting. Press the END key instead of the SET key to go back to the segment setting screen.
- PTN function (PTN lamp lights):
  Switch to the Execution pattern selection display.

■ Direct key type

To prevent error in key operation, select direct key type at the function block 11 in the Engineering mode (P. 4-33).

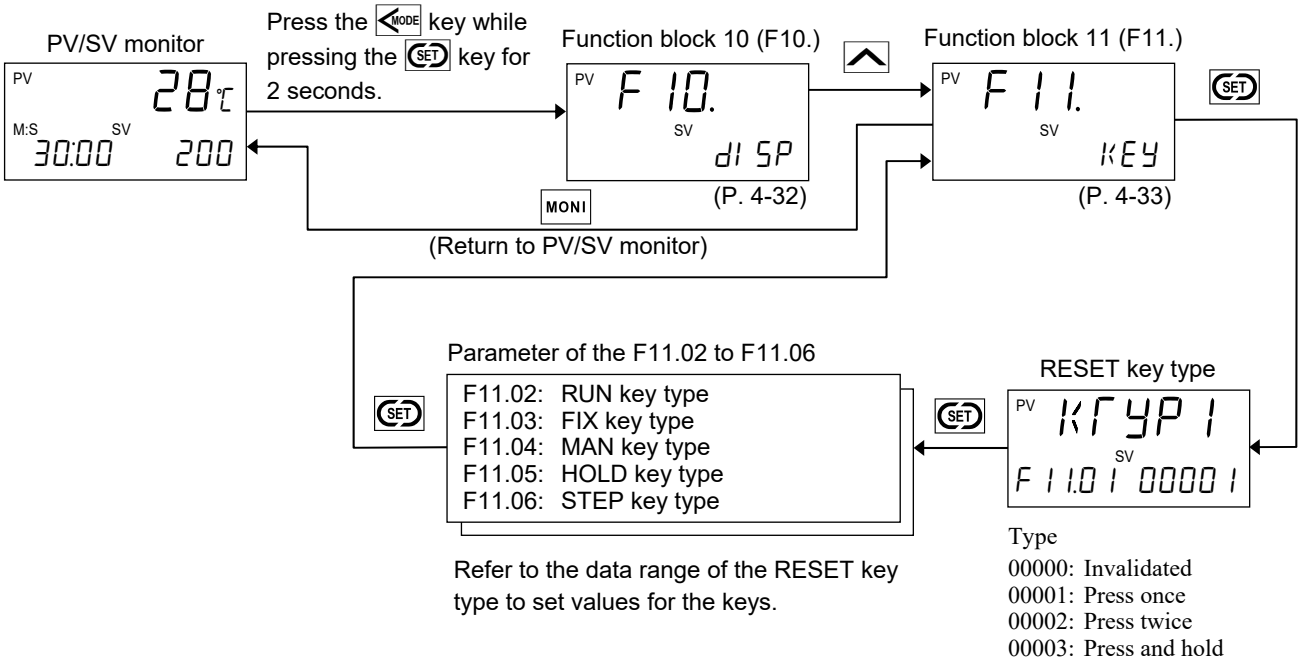
● Type:

- Invalidated: Direct key operation is invalidated
- Press once: Operate the direct key by pressing once.
- Press twice: Press the direct key once and confirm the state display lamp flashes in green. Then press again within 3 seconds to operate.
- Press and hold: Press and hold the direct key for 2 seconds to operate.

Direct key type is not available for the PTN END key (Press one type only).

The factory set value of the STEP R.SET key is "Press and hold" but the key type switches to "Press once" when the R.SET function is operative. The factory set value of the other direct keys is "Press once."

● Setting procedure



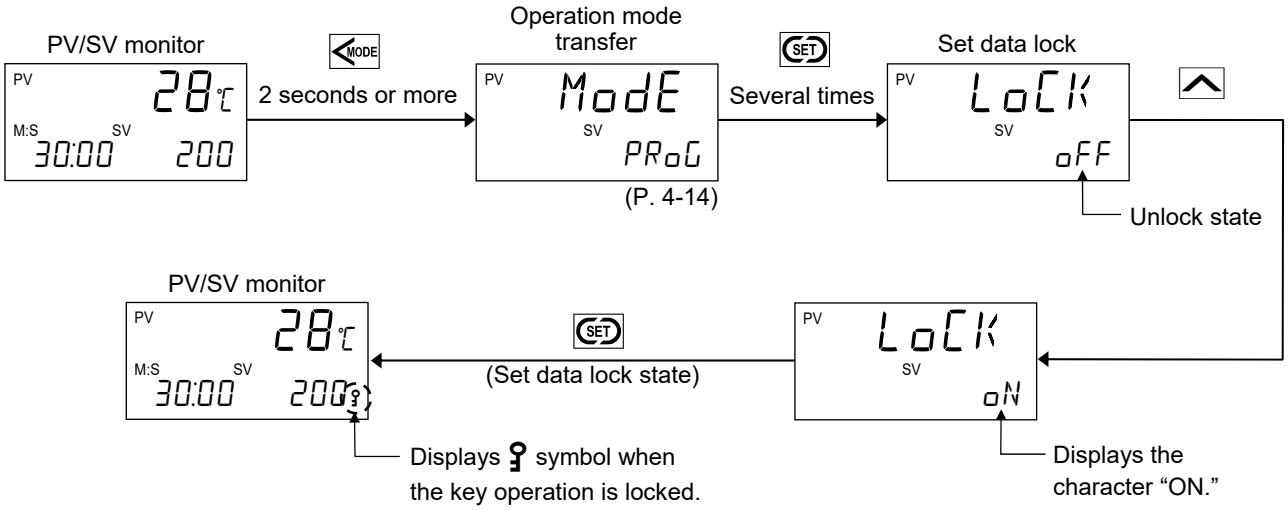
4.4 Protecting Setting Data

Prevent error in key operation by using the Set data lock function.

Parameter setting is prohibited when the Set data lock function is selected (except for the Operation mode transfer, the Set data lock and the Execution pattern selection).

● Setting procedure

Lock or unlock the key operation at the Set data lock setting display in the Operation mode.



It is possible to monitor set value of parameters.

Communication may be used to set parameters when the key operation is locked.

4.5 Parameter Description

Parameters are described by Mode type, Parameter list with Data range and Parameter switching diagram.

Reference page list

Mode type		Reference page	
		■ Parameter list	■ Parameter switching
4.5.1 SV setting & monitor mode	SV setting mode	P. 4-9	P. 4-10, P. 4-11
	Monitor mode	P. 4-12	P. 4-13
4.5.2 Operation mode		P. 4-14	P. 4-15
4.5.3 Parameter setting mode	Partial setting type *	P. 4-17 to P. 4-21	P. 4-22 to P. 4-25
	Batch setting type *	P. 4-26	P. 4-27, P. 4-28
4.5.4 Setup setting mode		P. 4-29, P. 4-30	P. 4-31
4.5.5 Engineering mode		P. 4-32 to P. 4-43	P. 4-44 to P. 4-49
Initial level engineering mode		Refer to the **PF900/PF901 Instruction manual (IMR02L03-E□)**.	

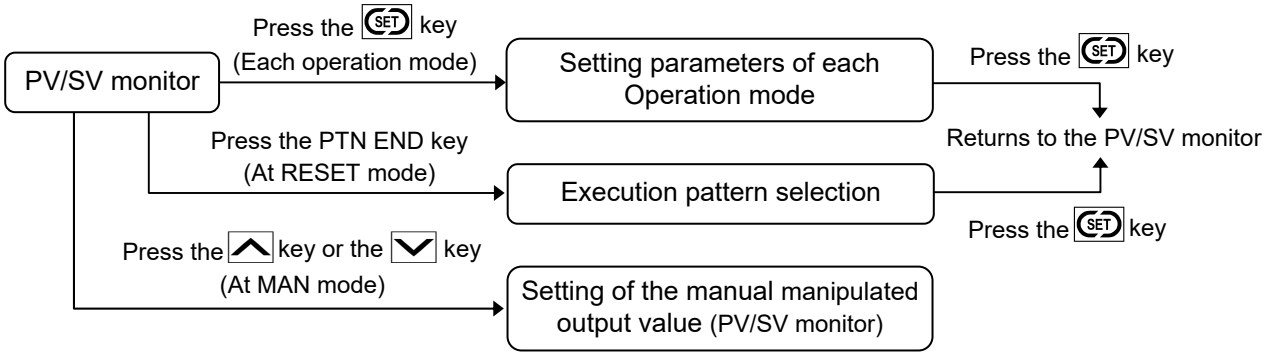
* For Partial setting type and Batch setting type, refer to ■ **Setting type for Program pattern (P. 4-16)**.

4.5.1 SV setting & monitor mode

Set the parameters such as the Segment level and Segment time in progress or switch the Execution pattern selection screen, monitor screen of the Pattern remaining time, Manipulated output value (MV) etc.

■ SV setting mode

Setting parameter varies with the operation mode (RESET, RUN, FIX, MAN) in the SV setting mode.



☞ Refer to P. 4-10 and P. 4-11 to switch parameter setting display.

● Parameter list

Name	Symbol	Data range	Factory set value
Reset mode (RESET)			
Set value (SV) in Reset mode	SV	Setting limiter low to Setting limiter high	0
Execution pattern selection	PTN	1 to 99 (Within the maximum pattern number)	1
Program control mode (RUN)			
Segment level	LEVEL	Setting limiter low to Setting limiter high	0
Segment time	TIME	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)
Fixed set point control mode (FIX)			
Set value (SV) in Fixed set point control mode	SV	Setting limiter low to Setting limiter high	0

Continued on the next page.

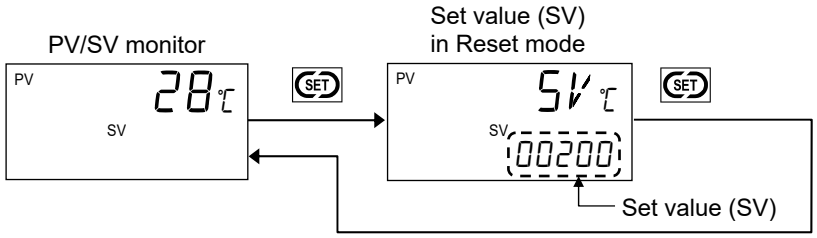
Continued from the previous page.

Name	Symbol	Data range	Factory set value
Manual control mode (MAN)			
Manual manipulated output value	MV	PID control or Position proportioning PID control (With FBR input): Output limiter low to Output limiter high Heat/Cool PID control: –(Cool-side output limiter (high)) to +(Heat-side output limiter (high)) For overlap: –105.0 to +105.0 % * * Actual output value is limited by the output limiter function.	–5.0
Set value (SV) in Manual control mode	SV	Setting limiter low to Setting limiter high	0

● Parameter switching

Reset mode (RESET)

Press the SET key to go to the Set value (SV) setting display in the Reset mode.



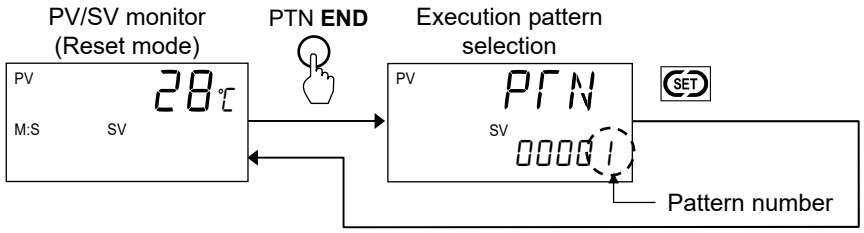
Execution pattern selection

Switch the PV/SV monitor display to the setting display of the Execution pattern selection by using the **PTN** END key (PTN lamp lights) in the Reset mode (RESET).

Select Execution pattern number by using the ∧ key or the ∨ key.

NOTE

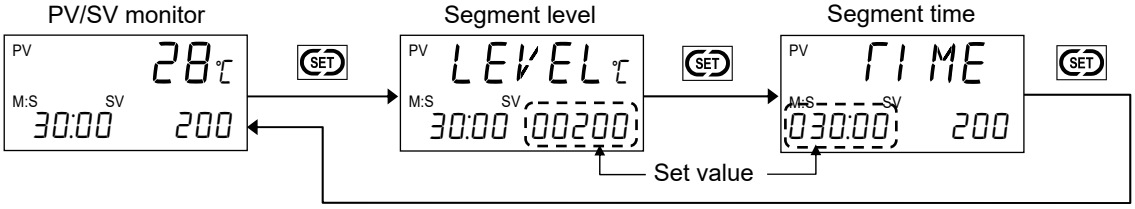
Execution pattern number can be selected only in the Reset mode (RESET).



Tag name setting will enable the display to show a tag name instead of the Pattern number. Refer to **6.12 Tag Function (P. 6-31)** for Tag name.

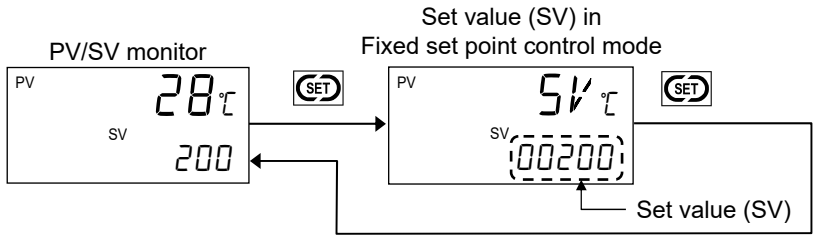
Program control mode (RUN)

Press the SET key in the Program control mode (RUN) to go to the setting display for the segment level and the segment time.



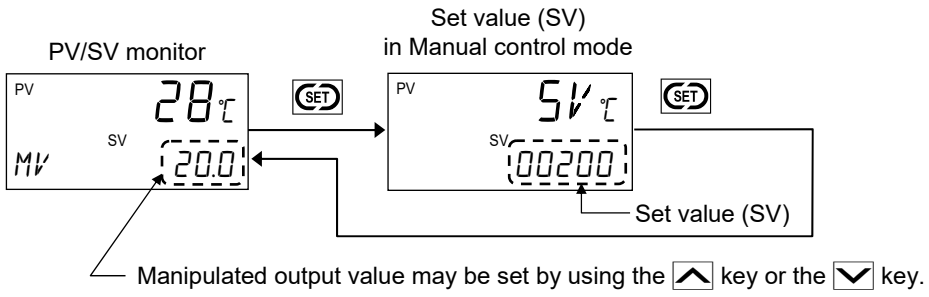
Fixed set point control mode (FIX)

Press the SET key in the Fixed set point control mode (FIX) to go to the Set value (SV) setting display.



Manual control mode (MAN)

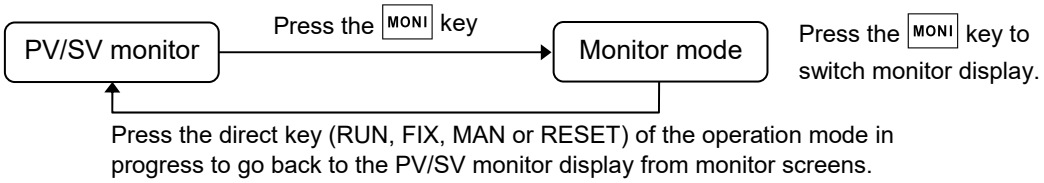
Set Manipulated output value by using the ∧ key or the ∨ key at the PV/SV monitor display in the Manual control mode (MAN). Press the SET key to go to the Set value (SV) setting display in the Manual control mode.



The Set value (SV) set in the previous mode is taken over when switching to the Manual control mode. However, the SV being changed in the Manual control mode is not affected when changing to the other modes.

■ Monitor mode

The contents of the monitor display are same in any operation mode (RESET, RUN, FIX, MAN).



☞ Refer to P. 4-13 to switch parameter setting display.

● Parameter list

Name	Symbol	Data range	Factory set value
Pattern remaining time monitor	PTNTM	From 0:00 to 999:59 (Hour: Minute), or from 0:00 to 999:59 (Minute: Second)	—
Segment repeat remaining time/ execution time monitor [1]	RPT.SG	0 to 9999 times	—
Pattern repeat remaining time/ execution time monitor [1]	RPT.PN	0 to 10000 times 10000: No limit	—
Total pattern remaining time/ execution time monitor [1]	RPT.PR	0 to 10000 times 10000: No limit	—
Wait condition monitor	WAIT	_ Display: Not in wait state □ Display: In wait state □□□ ← Value at SV display Zone wait of the controller Zone wait of the slave Zone wait of the DI	—
Event state monitor	EV	_ Display: OFF □ Display: ON □□□□□□□ ← Value at SV display Event 1 Event 2 Event 3 Event 4 HBA1 HBA2 LBA	—
Time signal state monitor	TS	_ Display: OFF □ Display: ON □□□□□□□□ ← Value at SV display Time signal 1 Time signal 2 Time signal 3 Time signal 4 Time signal 5 Time signal 6 Time signal 7 Time signal 8	—
Current transformer 1 (CT1) input value monitor [2]	CT1	0.0 to 100.0 A	—
Current transformer 2 (CT2) input value monitor [2]	CT2	0.0 to 100.0 A	—
Manipulated output value 1 (MV1) [heat-side] monitor	MV1	PID control, Heat/Cool PID control: −5.0 to +105.0 % Position proportioning PID control: 0.0 to 100.0 % (Displays the FBR input value)	—
Manipulated output value 2 (MV2) [cool-side] monitor [3]	MV2	−5.0 to +105.0 %	—

[1] Execution time monitor can be displayed by setting Repeat remaining process/program progression display at F10.12 in the Initial level engineering mode. For Initial level engineering mode, refer to the **PF900/PF901 Instruction manual (IMR02L03-E□)**.

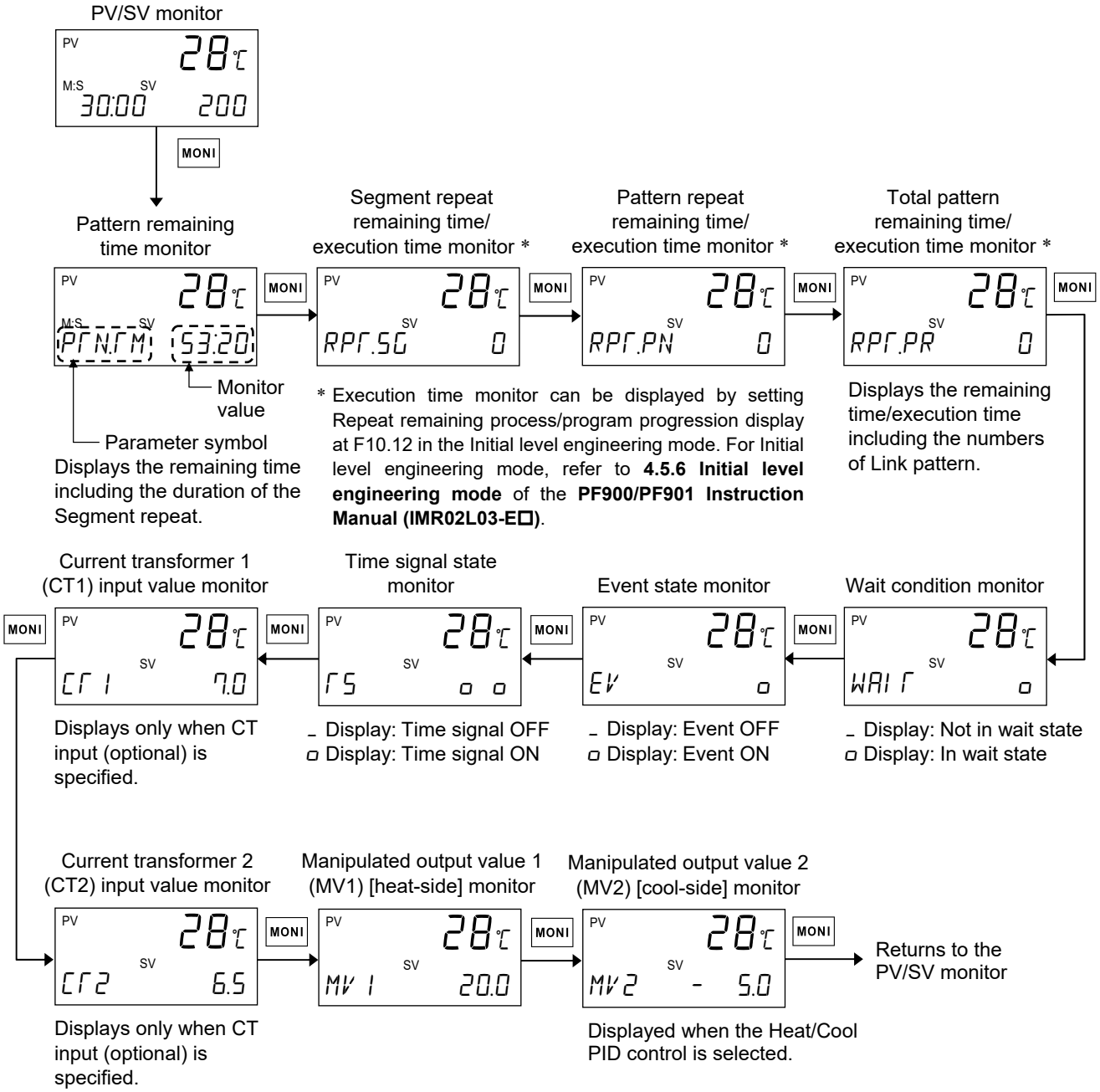
[2] Displays only when CT input (optional) is specified. CT input value monitor displays CT input value as 1.1 times the average current. CT input value is displayed for both Time proportional output and Current output. For Current output, the error of measurement between actual current value and monitor display value becomes large when load factor is other than 0 % or 100 %.

[3] Displayed when the Heat/Cool PID control is selected.

● Parameter switching

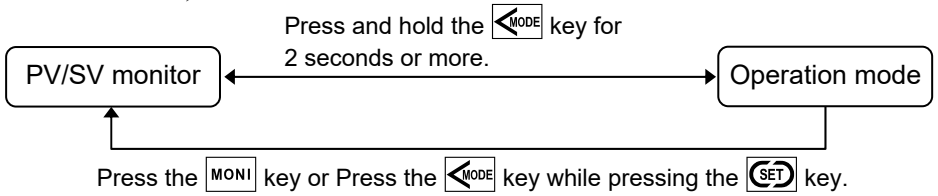
Press the MONI key to switch monitor screen.

- Press the SET key at the monitor screen to go to the SV setting mode of the operation mode in progress.
- The contents of the monitor display are same in any operation mode (RESET, RUN, FIX, MAN).
- Press the direct key (RUN, FIX, MAN or RESET) of the operation mode in progress to go back to the PV/SV monitor display from monitor screens.
- Parameters will not be displayed if the relevant function is not activated or no relevant specification is selected when ordering.



4.5.2 Operation mode

Set parameters such as PID/AT, and the operation mode (Program control, Fixed set point control, Manual control, or RESET).



- Press the SET key to switch operation screen.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first parameter setting display (Operation mode transfer).

☞ Refer to P. 4-15 to switch parameter setting display.

■ Parameter list

Name	Symbol	Data range	Factory set value
Operation mode transfer	ModE	RESET (Reset mode) PROG (Program control mode) FIX (Fixed set point control mode) MAN (Manual control mode)	RESET
Step function	STEP	ON: Forward to the next segment in progress. Turns OFF automatically when the Step function is completed.	OFF
Search function	SRCH	ON: Search start OFF: Search stop Turns OFF automatically when the Search function is completed.	OFF
PID/AT transfer	AT U	PID: PID control AT: Autotuning (AT) start When the AT is finished, the control will automatically returns to "PID control."	PID
Autotuning (AT) with learning function	AT T	ON: Autotuning (AT) with learning start OFF: Autotuning (AT) with learning stop Turns OFF automatically when the AT with learning function is completed.	OFF
Interlock release	I LR	ON: Interlock OFF: Interlock release	OFF
Set data lock	LoCK	ON: Set data lock OFF: Set data unlock	OFF

[1] Operative only in the Program control mode (RUN) [Not available when the operation is in HOLD state or RUN of the Digital input (DI) is ON (contact closed).]

[2] Operative when the operation is in the Program control mode (RUN) and in the HOLD state [Not available during Autotuning (AT).]

[3] Operative when the operation is in the Program control mode (RUN) or in the Fixed set point control mode (FIX).

[4] Operative only in the Reset mode (RESET)

■ Parameter switching

- Press and hold the MODE key for 2 seconds or more at PV/SV monitor screen until Operation mode is displayed.
- Press the SET key to switch operation screen.

It is possible to switch displays by using the MODE key instead of the SET key.

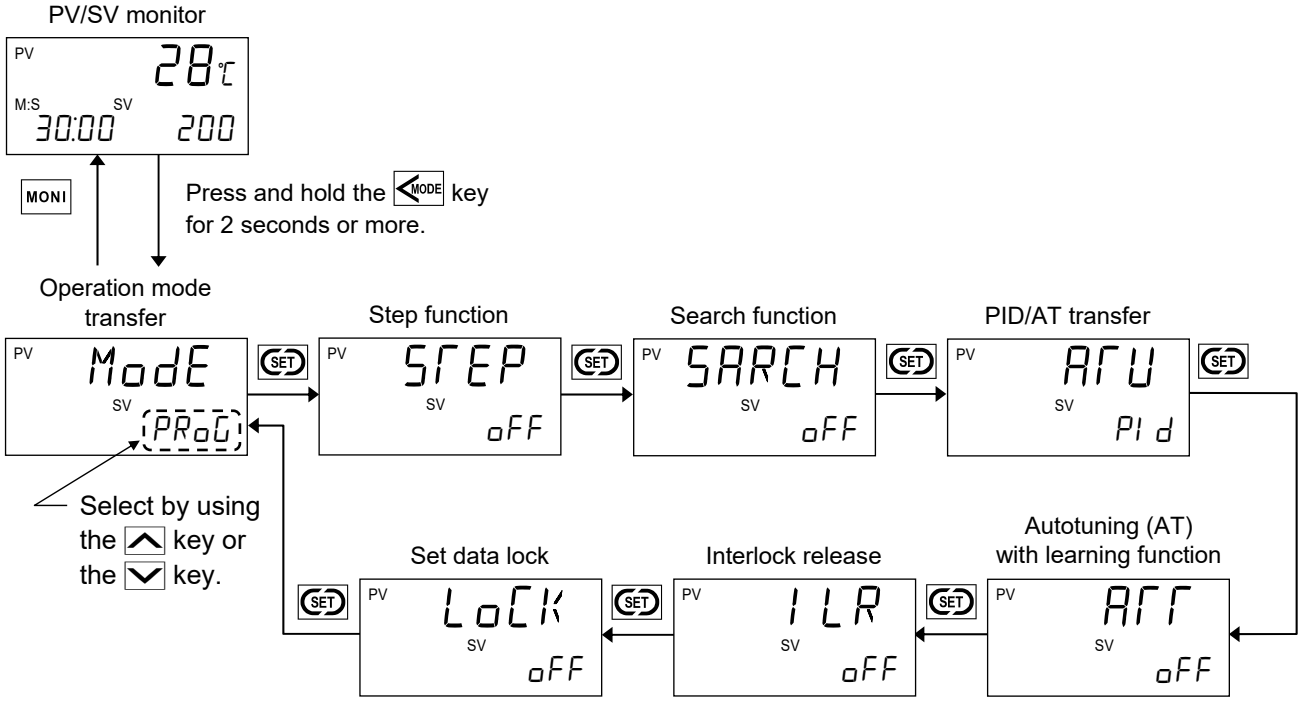
Press the MONI key to go back to the PV/SV monitor.

Press the STEP R.SET key to go back to the previous display.

Press the STEP R.SET key while pressing the SET key to go back to the Operation mode transfer display.

Display returns to the PV/SV monitor if no key operation is performed within 1 minute.

Parameters will not be displayed if the relevant function is not activated or no relevant specification is selected when ordering.



☞ For setting procedure of each function, refer to **6. FUNCTION AND SETTING PROCEDURE** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

4.5.3 Parameter setting mode

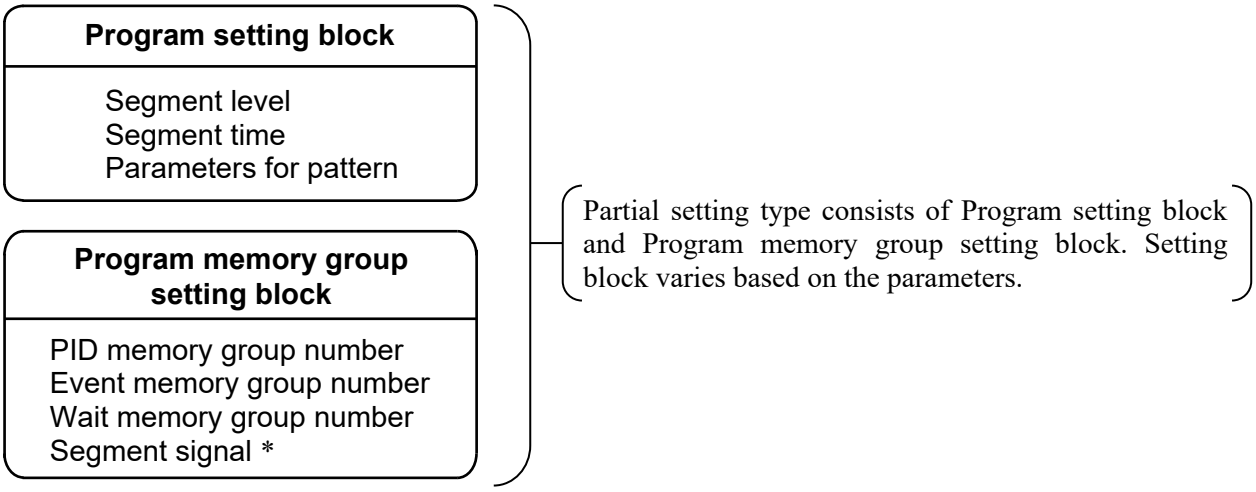
Parameters are classified into 12 setting blocks such as Program setting block, PID memory group setting block and Event memory group setting block in the Parameter setting mode. Setting block may be switched by using the ∧ key or the ∨ key.

■ Setting type for Program pattern

Partial setting or Batch setting is selectable for setting type of Program pattern in the Parameter setting mode. To select the type, go to F80.03 (P.4-43) in the Engineering mode.

☞ For parameter of the Engineering mode, refer to **4.5.5 Engineering mode (P. 4-32)**.

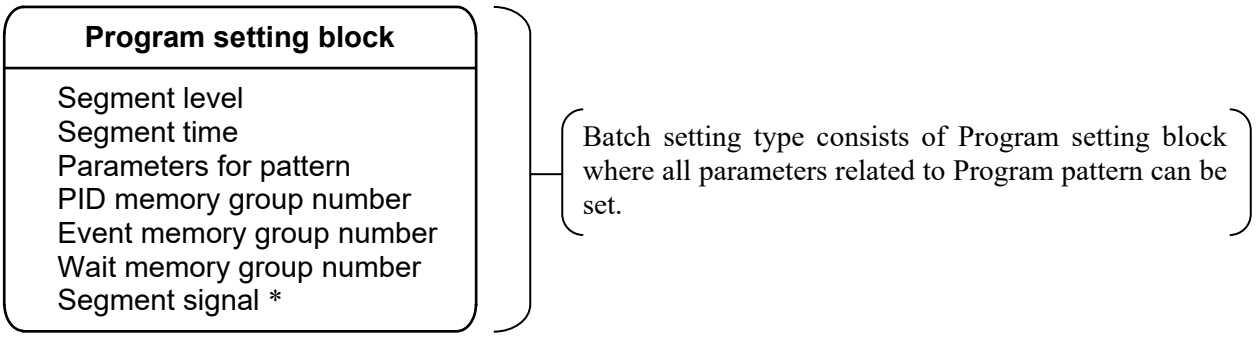
● Partial setting type (Factory set value)



* Settable only when Segment signal is specified.
Validates when specifying Segment signal function.

☞ Refer to P. 4-17 to 4-21 for Parameter list of the Partial setting type and P. 4-22 to 4-25 for parameter switching.

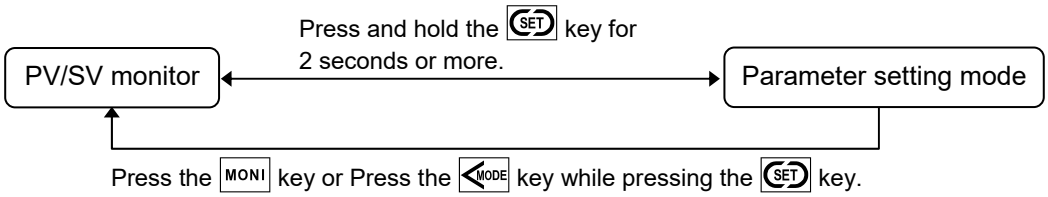
● Batch setting type



* Settable only when Segment signal is specified.
Validates when specifying Segment signal function.

☞ Refer to P. 4-26 for Parameter list of the Batch setting type and P. 4-27 to 4-28 for parameter switching.

■ Parameter list [Partial setting type]



- Press the SET key to switch setting screen.
- Setting block may be switched by using the ∧ key or the ∨ key.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.

☞ For parameter switching, refer to P. 4-22 to 4-25.

Name	Symbol	Data range	Factory set value
Program setting block (PRoG)			
Setting pattern number	PTN.No	1 to 99 (Within the maximum pattern number)	1
Segment level	LEVEL	Setting limiter low to Setting limiter high	0
Segment time	TIME	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)
Segment repeat start/end number	STrEd	Start number: 1 to 99 End number: 1 to 99 Within the maximum segment number	1
Segment repeat execution time	RPT.SG	1 to 9999 times 1: No segment repeat	1
Pattern repeat execution time	RPT.PN	1 to 10000 times 1: No pattern repeat 10000: No limit	1
Link pattern number	LNK.PN	0 to 99 (Within the maximum pattern number) 0: No pattern link	0
Pattern end output duration	END.TM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) Output remains ON at 0:00 (Hour: Minute or Minute: Second)	0:00 (0 hour 00 minutes)
Time signal memory group number	TS.GR	0 to 16 0: No assignment	1
Output program memory group number	P.MV.GR	0 to [128/Maximum number of segments] Up to 99 0: No assignment	0
Program memory group setting block (PR.MEM)			
Setting pattern number	PTN.No	1 to 99 (Within the maximum pattern number)	1
PID memory group number	PID.GR	0 to 8 0: Level PID	0
Event memory group number	EV.GR	0 to 8 0: Event OFF	1
Wait memory group number	WT.GR	0 to 8 0: Wait OFF	1

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Name	Symbol	Data range	Factory set value
Segment signal [1]	SI GNL	0: OFF 1: ON 00000000 ← Value at SV display Segment signal 1 Segment signal 2 Segment signal 3 Segment signal 4 Segment signal 5 Segment signal 6 Segment signal 7 Segment signal 8	00000000
PID memory group setting block (PI d)			
PID memory group number	PI d.GR	1 to 8	1
Proportional band [heat-side]	P	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD: 30 V/I: 3.0
Integral time [heat-side]	I	PID control or Heat/Cool PID control: 0 to 3600 seconds or 0.0 to 3600.0 seconds 0 (0.0): PD action Position proportioning PID control: 1 to 3600 seconds or 0.1 to 3600.0 seconds Varies with the setting of the Integral/Derivative time decimal point position selection.	240
Derivative time [heat-side]	d	0 to 3600 seconds or 0.0 to 3600.0 seconds 0 (0.0): PI action Varies with the setting of the Integral/Derivative time decimal point position selection.	60
Control response parameter	rPr	0: Slow 1: Medium 2: Fast P action and PD action, the control response is fixed at 2 (Fast).	2
Proportional band [cool-side] [2]	Pc	TC/RTD inputs: 1 (0.1, 0.01) to Input span (Unit: °C [°F]) Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input span	TC/RTD: 30 V/I: 3.0
Integral time [cool-side] [2]	Ic	0 to 3600 seconds or 0.0 to 3600.0 seconds 0 (0.0): PD action Varies with the setting of the Integral/Derivative time decimal point position selection.	240
Derivative time [cool-side] [2]	dc	0 to 3600 seconds or 0.0 to 3600.0 seconds 0 (0.0): PI action Varies with the setting of the Integral/Derivative time decimal point position selection.	60
Overlap/Deadband [2]	db	TC/RTD inputs: –Input span to +Input span (Unit: °C [°F]) Voltage (V)/Current (I) inputs: –100.0 to +100.0 % Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	0
Open/Close output neutral zone [3]	Ydb	0.1 to 20.0 %	2.0
Manual reset [4]	MR	–100.0 to +100.0 %	0.0
Output limiter high (MV1)	oLH	Output limiter low (MV1) to 105.0 %	105.0
Output limiter low (MV1)	oLL	–5.0 % to Output limiter high (MV1)	–5.0

[1] Displayed when the Segment signal type is selected.
[2] Displayed when the Heat/Cool PID control is selected.
[3] Displayed when the Position proportioning PID control is selected.
[4] Displayed when the P (Proportional) action is selected.

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Name	Symbol	Data range	Factory set value
Output limiter high (MV2) [1]	oLH2	Output limiter low (MV2) to 105.0 %	105.0
Output limiter low (MV2) [1]	oLL2	–5.0 % to Output limiter high (MV2)	–5.0
ON/OFF action differential gap (upper) [2]	oHH	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input span	TC/RTD: 1 V/I: 0.1
ON/OFF action differential gap (lower) [2]	oHL		TC/RTD: 1 V/I: 0.1
Control loop break alarm (LBA) time [3]	LbA	0 to 7200 seconds 0: Unused	480
LBA deadband (LBD) [3]	Lbd	0 to Input span	0
Event memory group setting block (EVENT)			
Event memory group number	EV.GR	1 to 8	1
Event 1 set value (EV1)	EV 1	Deviation: –Input span to +Input span Process and set value: Input range low to Input range high Manipulated output value (MV1 or MV2): –5.0 to +105.0 %	50
Event 1 set value (EV1) [high] [4]		–Input span to +Input span	50
Event 1 set value (EV1') [low] [4]	EV 1'		–50
Event 2 set value (EV2)	EV 2	The data range is same as Event 1 set value (EV1).	50
Event 2 set value (EV2) [high] [4]		The data range is same as Event 1 set value (EV1) [high].	50
Event 2 set value (EV2') [low] [4]	EV 2'	The data range is same as Event 1 set value (EV1') [low].	–50
Event 3 set value (EV3)	EV 3	The data range is same as Event 1 set value (EV1).	50
Event 3 set value (EV3) [high] [4]		The data range is same as Event 1 set value (EV1) [high].	50
Event 3 set value (EV3') [low] [4]	EV 3'	The data range is same as Event 1 set value (EV1') [low].	–50
Event 4 set value (EV4)	EV 4	The data range is same as Event 1 set value (EV1).	50
Event 4 set value (EV4) [high] [4]		The data range is same as Event 1 set value (EV1) [high].	50
Event 4 set value (EV4') [low] [4]	EV 4'	The data range is same as Event 1 set value (EV1') [low].	–50
Wait memory group setting block (WAIT)			
Wait memory group number	WT.GR	1 to 8	1
Wait zone high	ZONE.H	TC/RTD inputs: 0 (0.0, 0.00) to 200 (200.0, 200.00) (Unit: °C [°F]) Voltage (V)/Current (I) inputs: 0.0 to 20.0 % of Input span 0 (0.0, 0.00): Wait zone high becomes OFF	0
Wait zone low	ZONE.L	TC/RTD inputs: –200 (–200.0, –199.99) to 0 (0.0, 0.00) (Unit: °C [°F]) Voltage (V)/Current (I) inputs: –20.0 to 0.0 % of Input span 0 (0.0, 0.00): Wait zone low becomes OFF	0
Wait release trigger selection	RELRG	0: Invalidate 1: Validate 00000 ← Value at SV display Zone wait 1 (the controller) Zone wait 2 (all slave controllers) Wait release by digital input (DI) Unused	00001

[1] Displayed when the Heat/Cool PID control is selected.
[2] Displays when Proportional band [heat-side] is set to "0."
[3] Displays when LBA is specified.
[4] This parameter displays when the event type is the Deviation High/Low (Individual high and low setting) or the Band (Individual high and low setting).

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Name	Symbol	Data range	Factory set value
Wait time-out set value	rM.oUt	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) 0:00 (Hour: Minute or Minute: Second): Unused	0:00 (0 hour 00 minutes)
Time signal memory group setting block (rM.SI G)			
Time signal memory group number	rS.GR	1 to 16	1
Time signal output assignment	O1.oUt	1 to 8: Time signal 1 to 8 0: No assignment	0
Start segment of time signal	O1.SSN	1 to 99 Within the maximum segment number.	1
Time signal start time	O1.SrM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)
End segment of time signal	O1.ESN	1 to 99 Within the maximum segment number.	1
Time signal end time	O1.ErM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)
Output program memory group setting block (PRG.MV)			
Output program memory group number [a]	P.MV.GR	1 to [128/Maximum number of segments] Up to 99	1
Output program value 1 [a]	P.MV 1	−5.0 to +105.0 %	−5.0
Output program value 2 [b]	P.MV2	−5.0 to +105.0 %	−5.0
Output program value 3 [c]	P.MV3	−5.0 to +105.0 %	−5.0
Level PID setting block (LV.PId)			
Level PID setting 1	LEVL.1	Input range low to Level PID setting 2	Input range high
Level PID setting 2	LEVL.2	Level PID setting 1 to Level PID setting 3	Input range high
Level PID setting 3	LEVL.3	Level PID setting 2 to Level PID setting 4	Input range high
Level PID setting 4	LEVL.4	Level PID setting 3 to Level PID setting 5	Input range high
Level PID setting 5	LEVL.5	Level PID setting 4 to Level PID setting 6	Input range high
Level PID setting 6	LEVL.6	Level PID setting 5 to Level PID setting 7	Input range high
Level PID setting 7	LEVL.7	Level PID setting 6 to Input range high	Input range high
Reset mode setting block (RESEr)			
Set value (SV) in Reset mode	SV	Setting limiter low to Setting limiter high	0
Manipulated output value 1 (MV1) in Reset mode	MV 1	−5.0 to +105.0 %	−5.0
Manipulated output value 2 (MV2) in Reset mode	MV2	−5.0 to +105.0 %	−5.0
Event memory group number in Reset mode	EV.GR	0 to 8 0: Event OFF	1
Fixed set point control mode setting block (Fix)			
Set value (SV) in Fixed set point control mode	SV	Setting limiter low to Setting limiter high	0
PID memory group number in Fixed set point control mode	PId.GR	0 to 8 0: Level PID	0
Event memory group number in Fixed set point control mode	EV.GR	0 to 8 0: Event OFF	1

[a] Displays when Output program value 1 is assigned to OUT1.
[b] Displays when Output program value 2 is assigned to OUT2.
[c] Displays when Output program value 3 is assigned to OUT3.

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Name	Symbol	Data range	Factory set value
Manual control mode setting block (MAN)			
PID memory group number in Manual control mode	PI d.GR	0 to 8 0: Level PID	0
Event memory group number in Manual control mode	EV.GR	0 to 8 0: Event OFF	1
Editing block (EdIT)			
Pattern copy *	CoPY	Copy source number: 0 to 99 Copy destination number: 0 to 99 Within the maximum pattern number.	0
Data clear *	CLR	All set values in the Parameter setting mode will be initialized after setting 9999 and switching from NO to YES.	0

* Settable only in the Reset mode (RESET)

■ Parameter switching [Partial setting type]

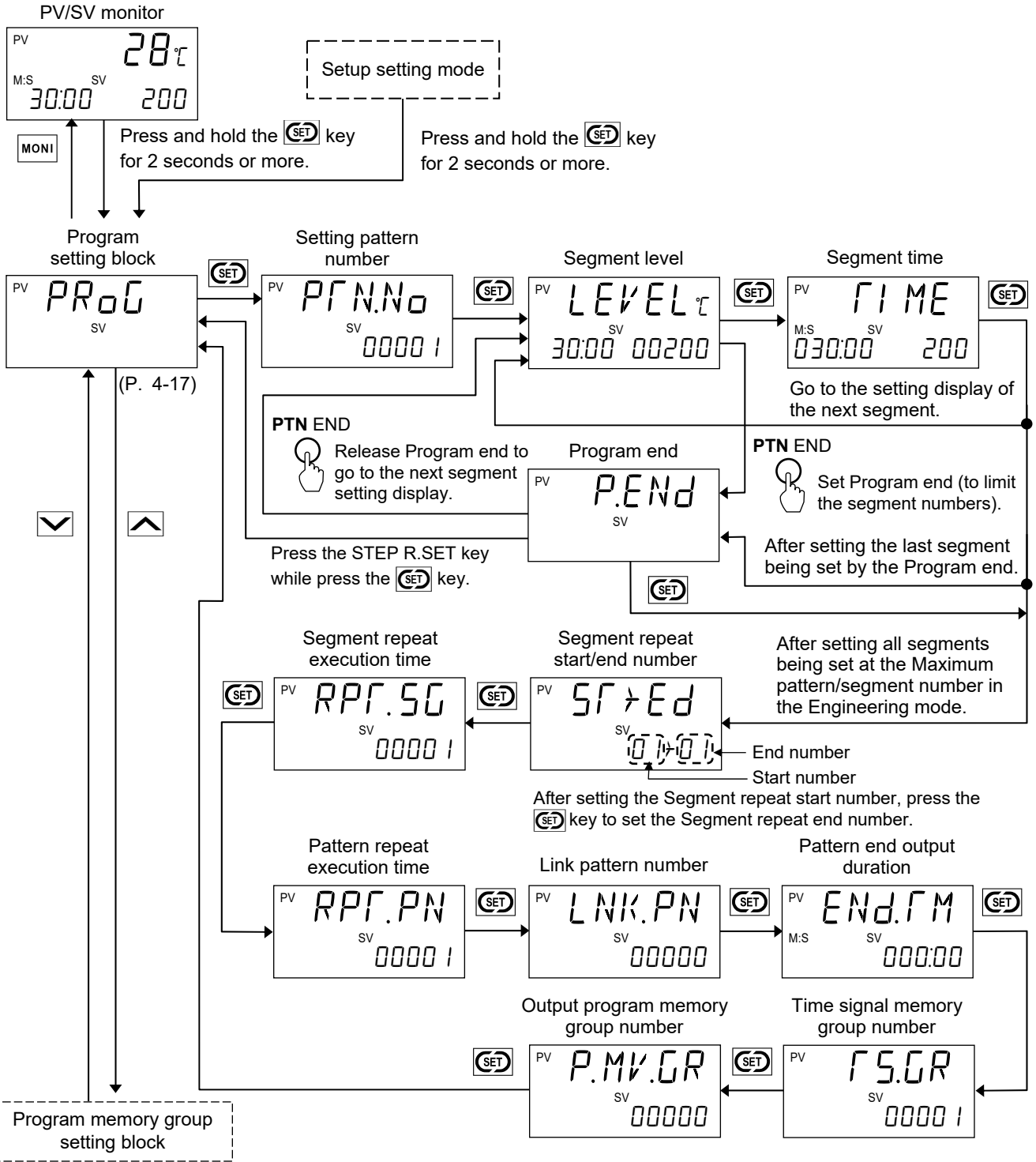
- Press and hold the SET key for 2 seconds or more at PV/SV monitor screen until Parameter setting mode is displayed.
- Press the SET key to switch operation screen.
- Switch setting block by using the ^ key or the v key.

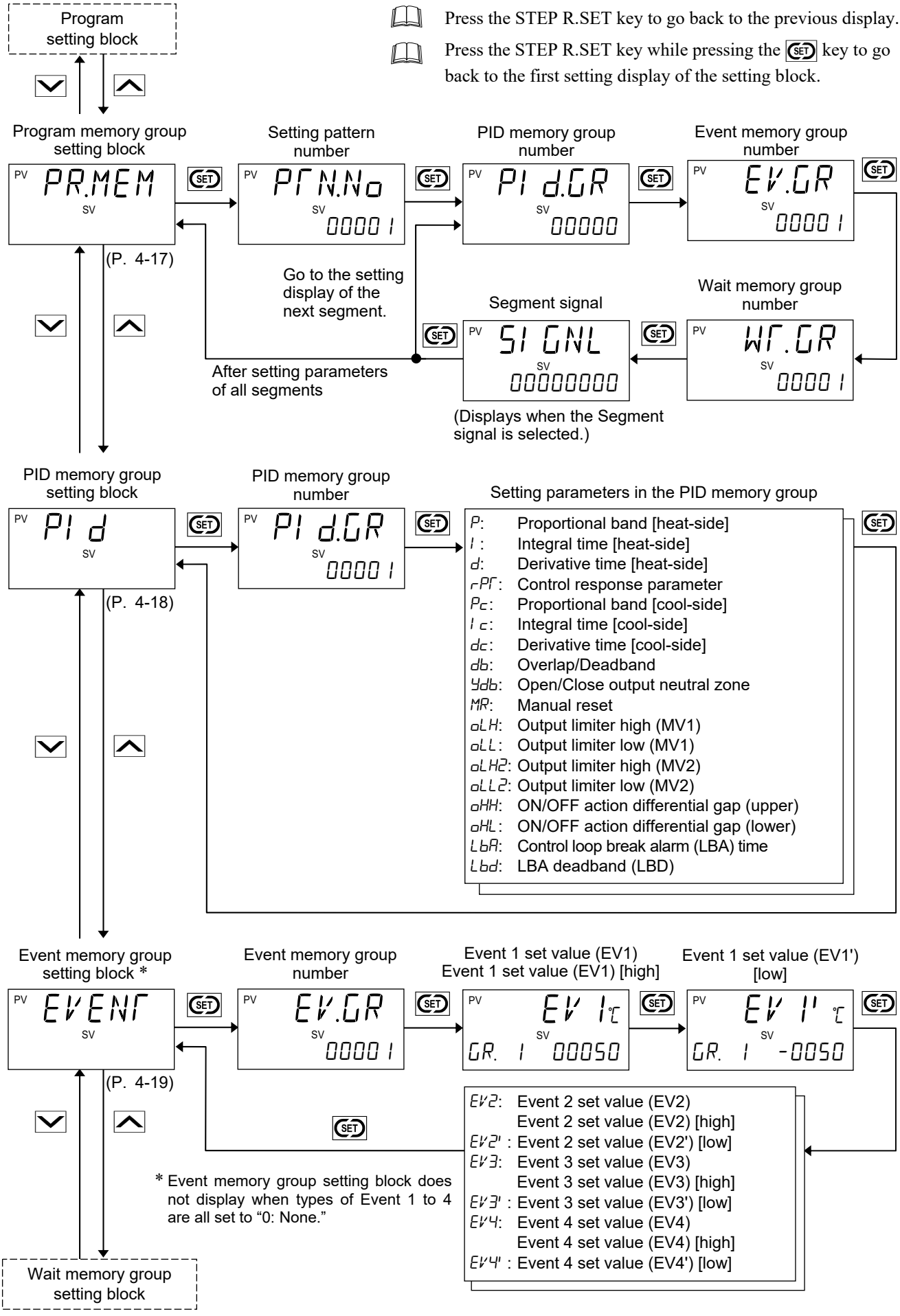
Press the MONI key to go back to the PV/SV monitor.

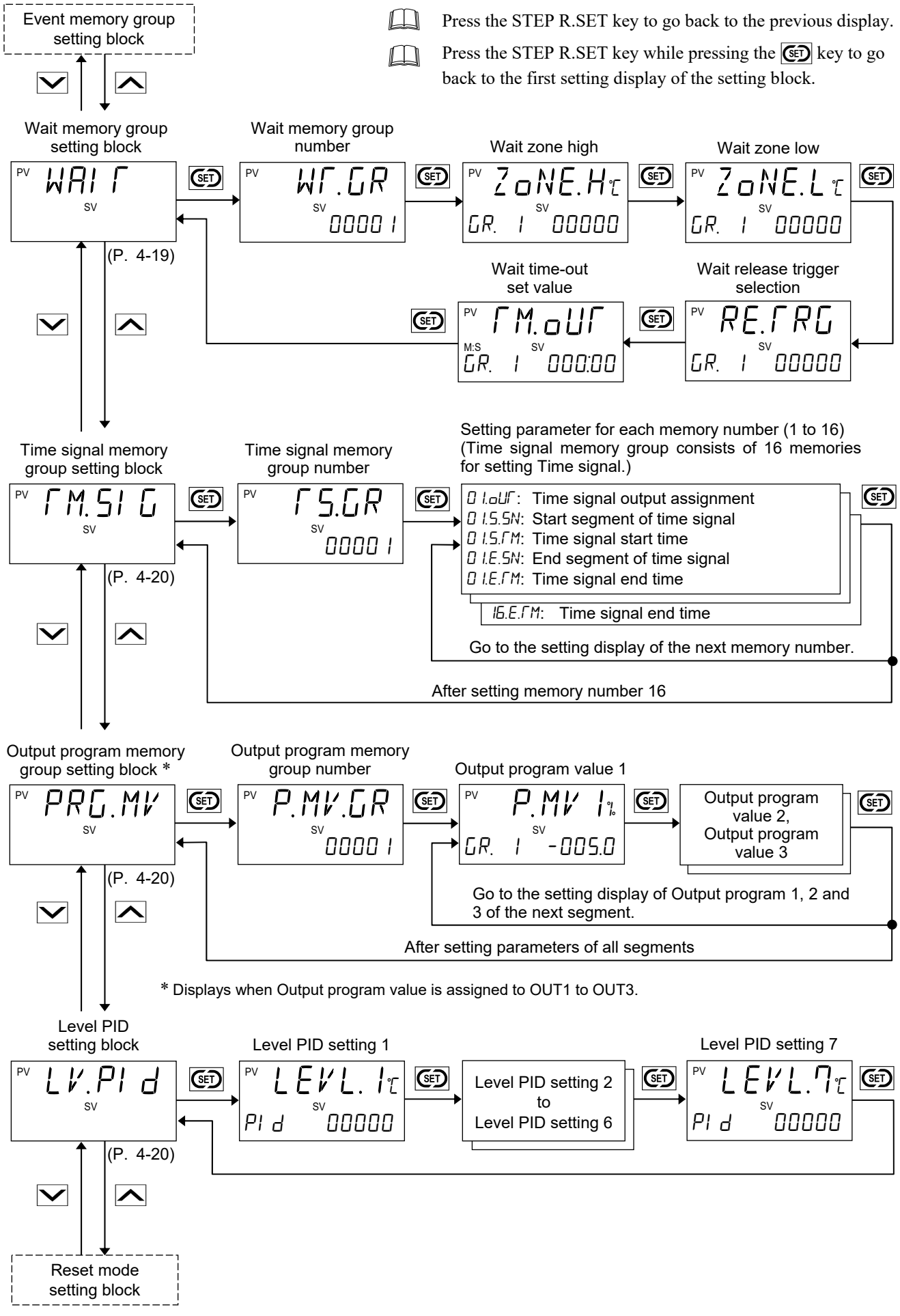
Press the STEP R.SET key to go back to the previous display.

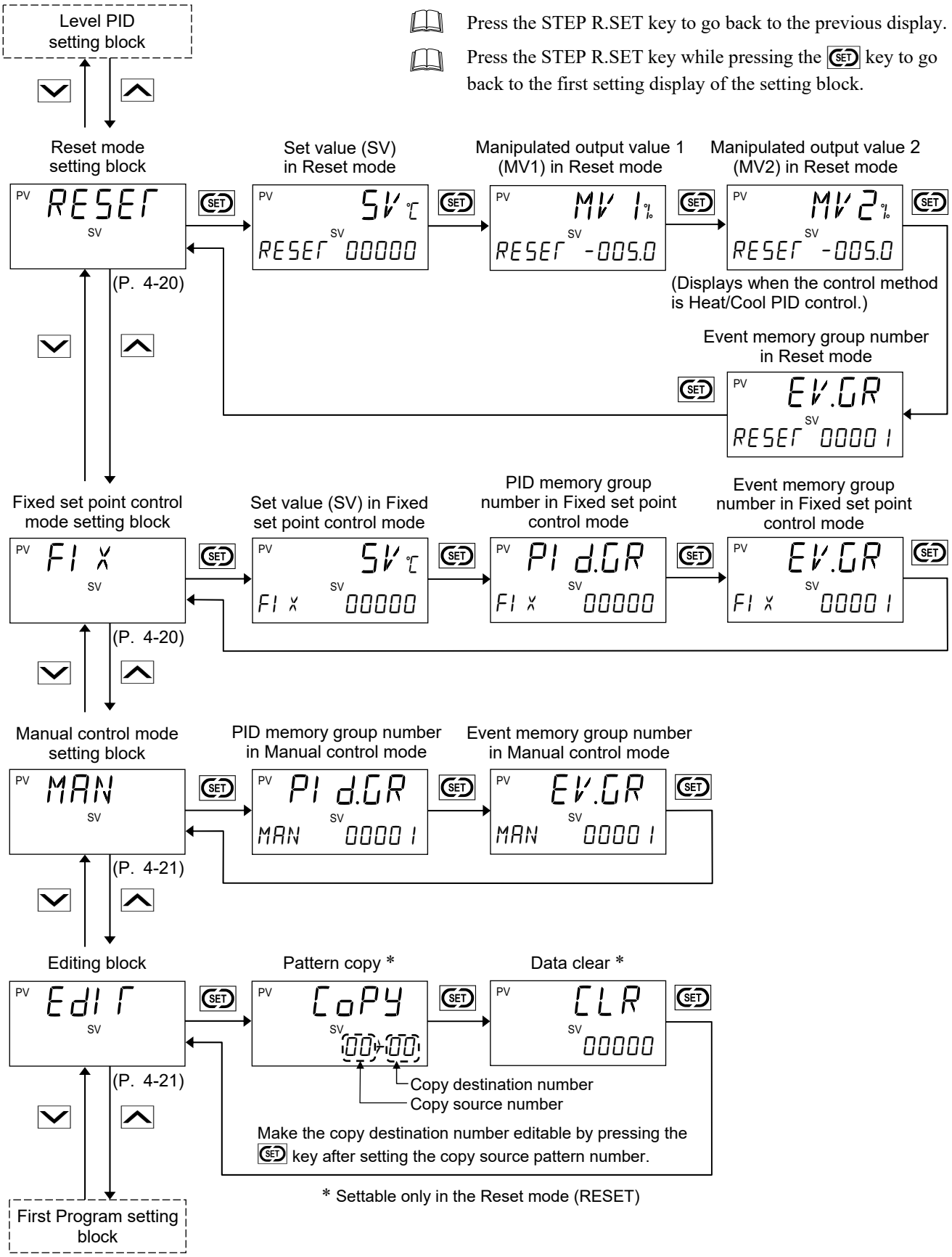
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.

Display returns to the PV/SV monitor if no key operation is performed within 1 minute.



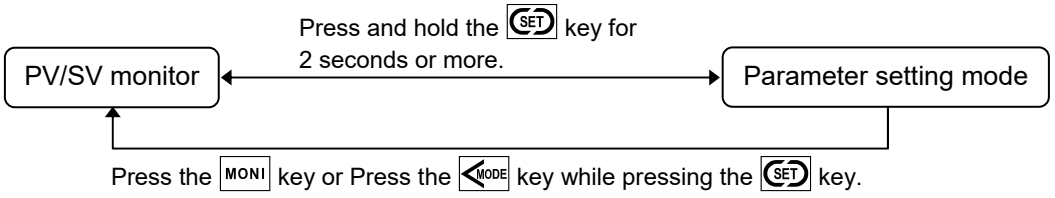

Program setting block
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.
Program memory group setting block
PV PR.MEM SV
Setting pattern number
PV PTN.No SV 00001
PID memory group number
PV PID.GR SV 00000
Event memory group number
PV EV.GR SV 00001
(P. 4-17)
Go to the setting display of the next segment.
Segment signal
PV SIGNL SV 00000000
Wait memory group number
PV WT.GR SV 00001
After setting parameters of all segments
(Displays when the Segment signal is selected.)
PID memory group setting block
PV PID SV
PID memory group number
PV PID.GR SV 00001
(P. 4-18)
Setting parameters in the PID memory group
P: Proportional band [heat-side]
I: Integral time [heat-side]
d: Derivative time [heat-side]
rPT: Control response parameter
Pc: Proportional band [cool-side]
Ic: Integral time [cool-side]
dc: Derivative time [cool-side]
db: Overlap/Deadband
Ydb: Open/Close output neutral zone
MR: Manual reset
oLH: Output limiter high (MV1)
oLL: Output limiter low (MV1)
oLH2: Output limiter high (MV2)
oLL2: Output limiter low (MV2)
oHH: ON/OFF action differential gap (upper)
oHL: ON/OFF action differential gap (lower)
LbA: Control loop break alarm (LBA) time
Lbd: LBA deadband (LBD)
Event memory group setting block *
PV EVENT SV
Event memory group number
PV EV.GR SV 00001
Event 1 set value (EV1)
Event 1 set value (EV1) [high]
PV EV 1 SV GR. 1 00050
Event 1 set value (EV1') [low]
PV EV 1' SV GR. 1 -0050
(P. 4-19)
EV2: Event 2 set value (EV2)
Event 2 set value (EV2) [high]
EV2': Event 2 set value (EV2') [low]
EV3: Event 3 set value (EV3)
Event 3 set value (EV3) [high]
EV3': Event 3 set value (EV3') [low]
EV4: Event 4 set value (EV4)
Event 4 set value (EV4) [high]
EV4': Event 4 set value (EV4') [low]
* Event memory group setting block does not display when types of Event 1 to 4 are all set to "0: None."
Wait memory group setting block


Event memory group setting block
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.
Wait memory group setting block
Wait memory group number
Wait zone high
Wait zone low
Wait time-out set value
Wait release trigger selection
(P. 4-19)
Time signal memory group setting block
Time signal memory group number
Setting parameter for each memory number (1 to 16)
(Time signal memory group consists of 16 memories for setting Time signal.)
01.oUT: Time signal output assignment
01.S.SN: Start segment of time signal
01.S.TM: Time signal start time
01.E.SN: End segment of time signal
01.E.TM: Time signal end time
16.E.TM: Time signal end time
Go to the setting display of the next memory number.
After setting memory number 16
(P. 4-20)
Output program memory group setting block *
Output program memory group number
Output program value 1
Output program value 2, Output program value 3
Go to the setting display of Output program 1, 2 and 3 of the next segment.
After setting parameters of all segments
(P. 4-20)
* Displays when Output program value is assigned to OUT1 to OUT3.
Level PID setting block
Level PID setting 1
Level PID setting 2 to Level PID setting 6
Level PID setting 7
(P. 4-20)
Reset mode setting block



☞ For setting procedure of each function, refer to **6. FUNCTION AND SETTING PROCEDURE** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Parameter list [Batch setting type]



- Press the SET key to switch setting screen.
- Setting block may be switched by using the ∧ key or the ∨ key.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.

☞ Refer to P. 4-27 and P. 4-28 to switch parameter setting display.

Name	Symbol	Data range	Factory set value
Program setting block (PRoG)			
Setting pattern number	PTN.No	1 to 99 (Within the maximum pattern number)	1
Segment level	LEVEL	Setting limiter low to Setting limiter high	0
Segment time	TIME	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)
PID memory group number	PID.GR	0 to 8 0: Level PID	0
Event memory group number	EV.GR	0 to 8 0: Event OFF	1
Wait memory group number	WT.GR	0 to 8 0: Wait OFF	1
Segment signal *	SIGNL	0: OFF 1: ON 00000000 ← Value at SV display Segment signal 1 Segment signal 2 Segment signal 3 Segment signal 4 Segment signal 5 Segment signal 6 Segment signal 7 Segment signal 8	00000000
Segment repeat start/end number	STrEd	Start number: 1 to 99 End number: 1 to 99 Within the maximum segment number.	1
Segment repeat execution time	RPT.SG	1 to 9999 times 1: No segment repeat	1
Pattern repeat execution time	RPT.PN	1 to 10000 times 1: No pattern repeat 10000: No limit	1
Link pattern number	LNK.PN	0 to 99 (Within the maximum pattern number) 0: No pattern link	0
Pattern end output duration	END.TM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) Output remains ON at 0:00 (Hour: Minute or Minute: Second)	0:00 (0 hour 00 minutes)
Time signal memory group number	TS.GR	0 to 16 0: No assignment	1
Output program memory group number	PMV.GR	0 to [128/Maximum number of segments] Up to 99 0: No assignment	0
PID memory group setting block (PID)			
Refer to the parameter list of Partial setting type for the PID memory group setting block or the latter setting blocks of Batch setting type (P. 4-18).			

* Displayed when the Segment signal type is selected.

■ Parameter switching [Batch setting type]

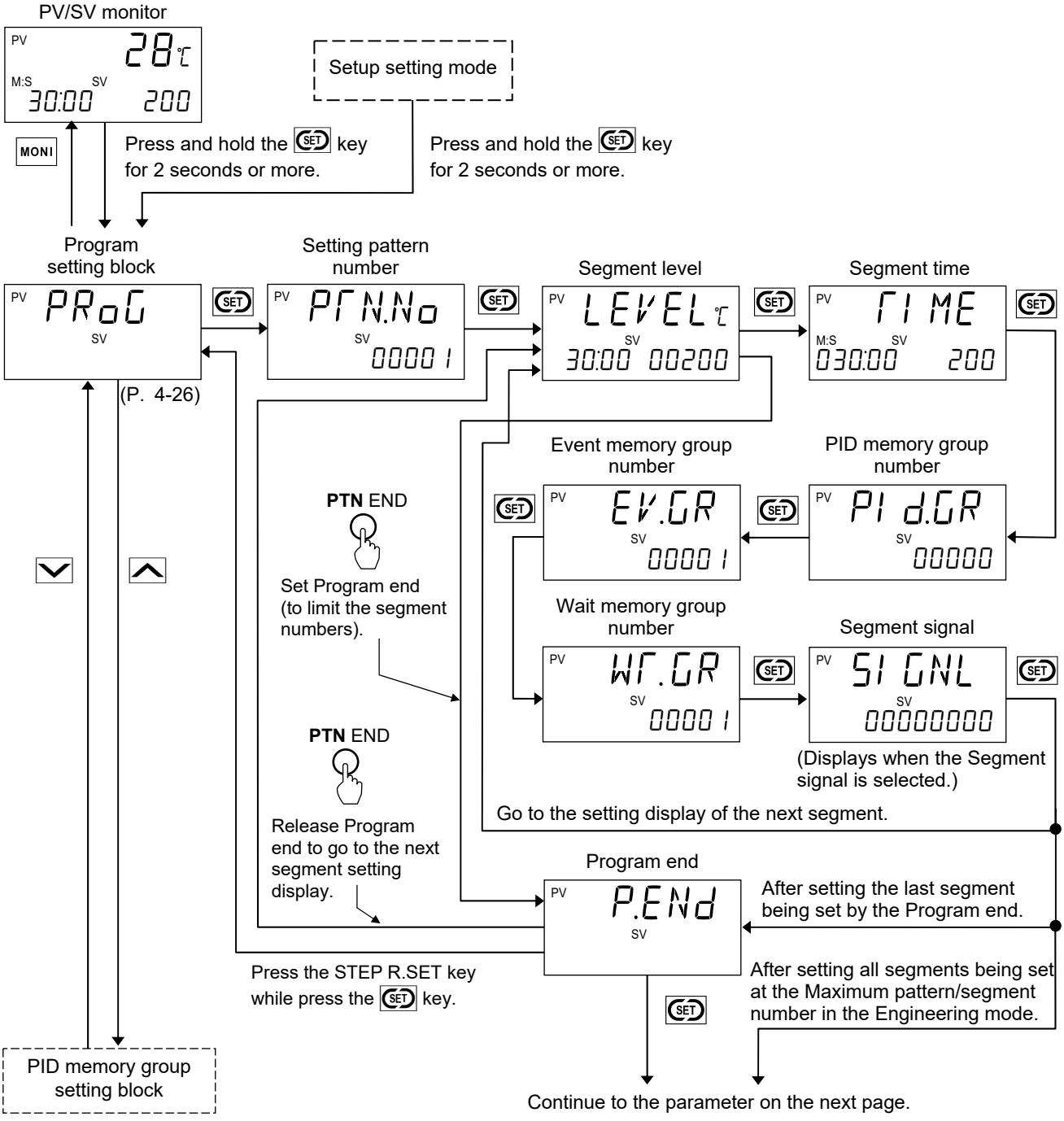
- To go to the Parameter setting mode, press and hold the SET key for 2 seconds or more at PV/SV monitor display.
- Press the SET key to switch operation screen.
- Switch setting block by using the ∧ key or the ∨ key.

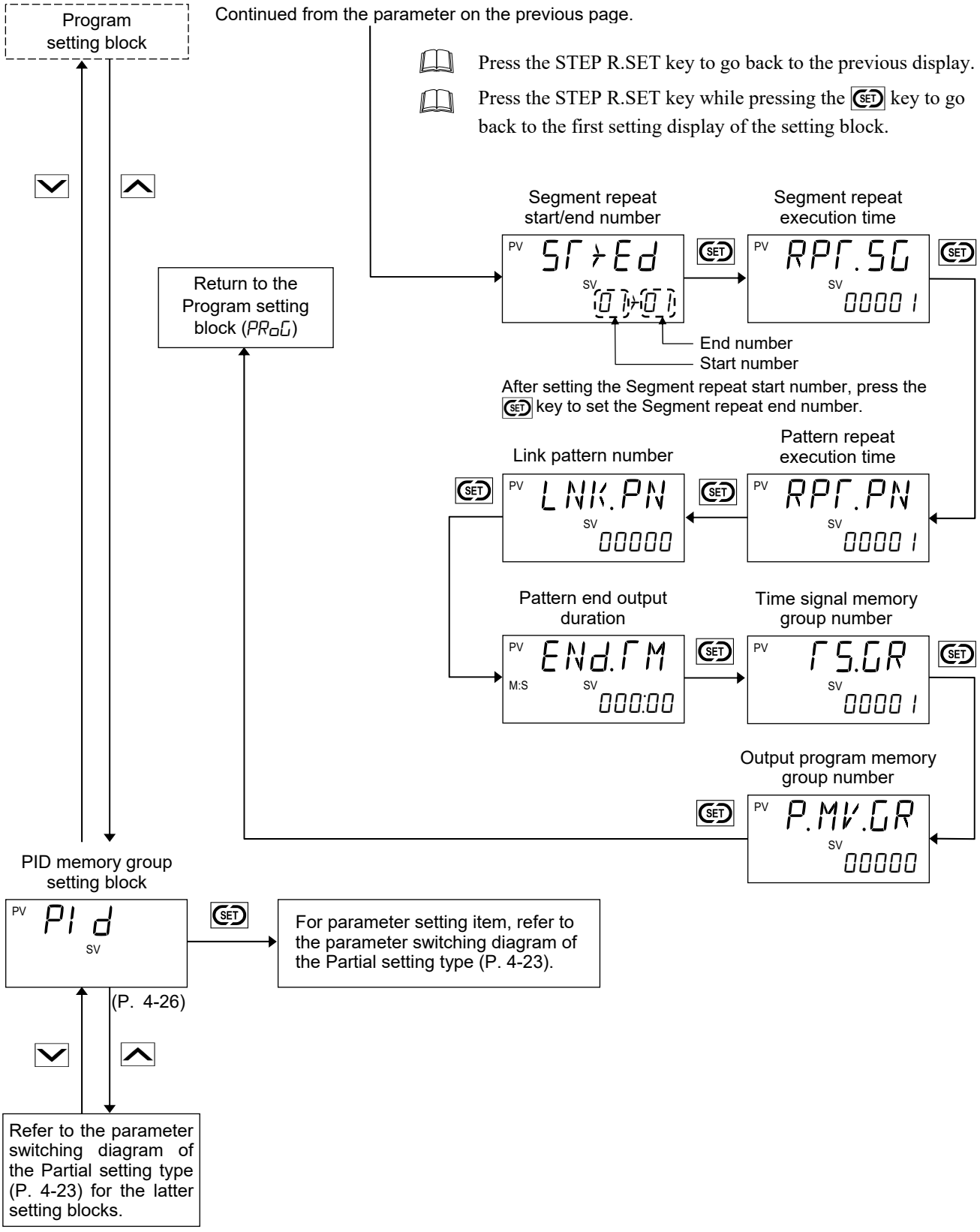
Press the MONI key to go back to the PV/SV monitor.

Press the STEP R.SET key to go back to the previous display.

Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.

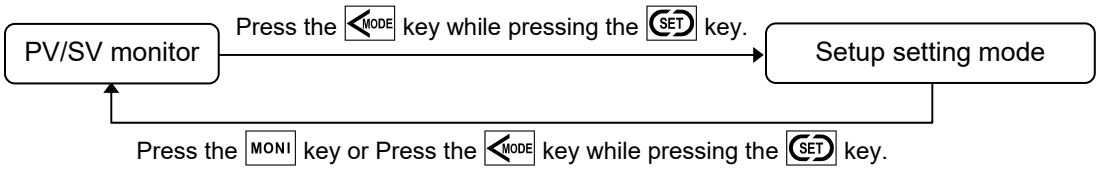
Display returns to the PV/SV monitor if no key operation is performed within 1 minute.




Program setting block
Continued from the parameter on the previous page.
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the setting block.
Segment repeat start/end number
Segment repeat execution time
Return to the Program setting block (PRoG)
End number
Start number
After setting the Segment repeat start number, press the SET key to set the Segment repeat end number.
Link pattern number
Pattern repeat execution time
Pattern end output duration
Time signal memory group number
Output program memory group number
PID memory group setting block
For parameter setting item, refer to the parameter switching diagram of the Partial setting type (P. 4-23).
(P. 4-26)
Refer to the parameter switching diagram of the Partial setting type (P. 4-23) for the latter setting blocks.

4.5.4 Setup setting mode

Set parameters such as PV bias, Time proportional cycle time, Heater break alarm (HBA) set value and communication (optional).



- Press the SET key to switch setting screen.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first parameter setting display (PV bias).

☞ Refer to P. 4-31 to switch parameter setting display.

📖 Some parameters in the Engineering mode may be set in the Engineering mode.

■ Parameter list

Name	Symbol	Data range	Factory set value
PV bias	Pb	–Input span to +Input span	0
PV digital filter	dF	0.0 to 100.0 seconds 0.0: Unused	0.0
PV ratio	PR	0.001 to 9.999	1.000
PV low input cut-off [1]	L-CUT	0.00 to 25.00 % of Input span	0.00
OUT1 proportional cycle time [2]	cY1	0.1 to 100.0 seconds M: Relay contact output T: Triac output V: Voltage pulse output D: Open collector output Relay contact output and Triac output cannot be selected for OUT3.	M: 20.0 V/T/D: 2.0
OUT2 proportional cycle time [2]	cY2		M: 20.0 V/T/D: 2.0 Factory set value No output: 2.0
OUT3 proportional cycle time [2]	cY3		V/D: 2.0 Factory set value No output: 2.0
Heater break alarm 1 (HBA1) set value [3]	HbA1	CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A 0.0: Unused (Current value monitoring still available)	0.0
Heater break alarm 2 (HBA2) set value [3]	HbA2		0.0
SV selection at Program start	SrSV	0: Start with the Set value (SV) in the Reset mode. 1: PV start 1 [Time fixed type] 2: PV start 2 [Time saving & ramp holding type] 3: PV start 3 [Time saving & level searching type/with HOLD function at start] 4: PV start 4 [Time saving & level searching type/without HOLD function at start]	2

[1] Displayed when the Square root extraction is selected.

[2] Displayed when the time-proportional control output (relay, voltage pulse, triac or open collector output) is selected.

[3] Displays only when CT input (optional) is specified.

Continued on the next page.

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Name	Symbol	Data range	Factory set value
Control action at Pattern end	END.P	PID control, Heat/Cool PID control or Position proportioning PID control (With FBR input): 0: Control continued 1: Control stop Setting is still effective when using Output program function. Position proportioning PID control (When there is no FBR input or the FBR input is break): 0: Control continued 1: Open-side output OFF, Close-side output OFF 2: Open-side output OFF, Close-side output ON 3: Open-side output ON, Close-side output OFF	0
Device address 1 [a]	Add1	0 to 99	RKC communication: 0 Modbus: 1
Communication speed 1 [a]	bPS1	2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19200 bps 38400: 38400 bps 57600: 57600 bps	19200
Data bit configuration 1 [a]	bIT1	Symbol / Data bit / Parity bit / Stop bit 8N1 * / 8 bit / None / 1 bit 8N2 * / 8 bit / None / 2 bit 8E1 * / 8 bit / Even / 1 bit 8E2 * / 8 bit / Even / 2 bit 8o1 / 8 bit / Odd / 1 bit 8o2 / 8 bit / Odd / 2 bit 7N1 / 7 bit / None / 1 bit 7N2 / 7 bit / None / 2 bit 7E1 / 7 bit / Even / 1 bit 7E2 / 7 bit / Even / 2 bit 7o1 / 7 bit / Odd / 1 bit 7o2 / 7 bit / Odd / 2 bit * Available for only Modbus	8N1
Interval time 1 [a]	INT1	0 to 250 ms	10
Device address 2 [b]	Add2	0 to 99	0
Communication speed 2 [b]	bPS2	9600: 9600 bps 19200: 19200 bps 38400: 38400 bps	19200

[a] Displays only when Communication 1 (optional) is specified.
[b] Displays only when Communication 2 (optional) is specified.

■ Parameter switching

- Press the MODE key while pressing the SET key at PV/SV monitor screen until Setup setting mode is displayed.
- Press the SET key to switch operation screen.

Some parameters in the Setup setting mode may be set in the Engineering mode.

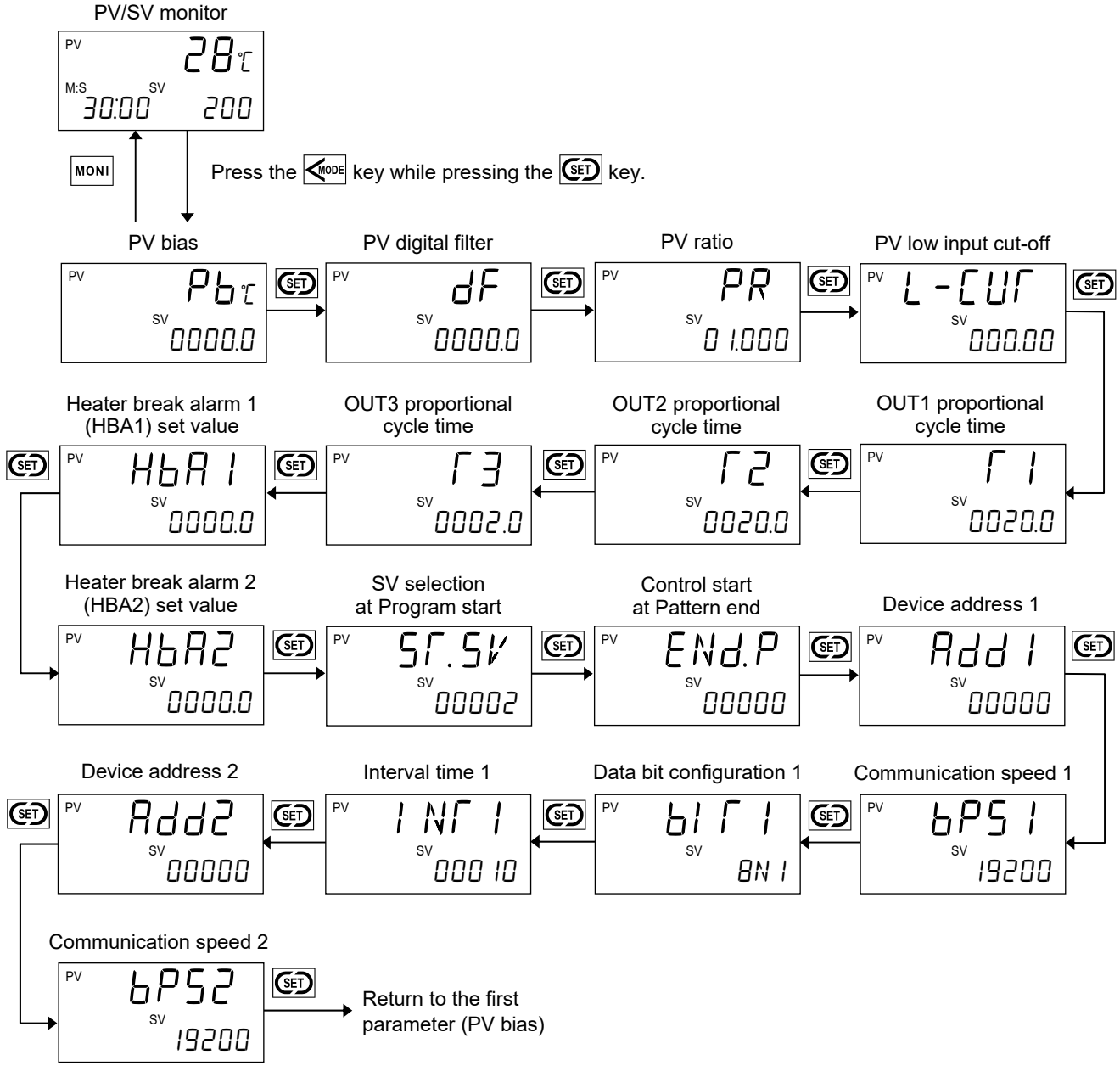
Press the MONI key to go back to the PV/SV monitor.

Press the STEP R.SET key to go back to the previous display.

Press the STEP R.SET key while pressing the SET key to go back to the first parameter setting display (PV bias).

Display returns to the PV/SV monitor if no key operation is performed within 1 minute.

Parameters will not be displayed if the relevant function is not activated or no relevant specification is selected when ordering.



For setting procedure of each function, refer to **6. FUNCTION AND SETTING PROCEDURE** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

4.5.5 Engineering mode

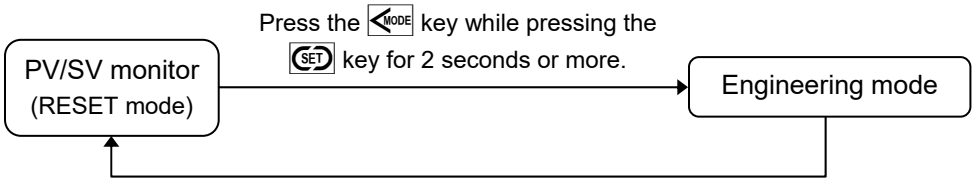
Parameters are classified into 23 function blocks. Initialize the parameters related to input, output, control, the Event type etc.

⚠ WARNING

Parameters in the Engineering mode (F10 to F80) 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 the Engineering mode are only available for monitoring in the RUN mode, the FIX mode and the MAN mode. Switch to the RESET mode to set the parameters. It is possible to set parameters in the function block 10 (F10) and the function block 11 (F11) in the RUN mode, the FIX mode and the MAN mode.



- Press the SET key to switch setting screen.
- Function blocks may be switched by using the ∧ key or the ∨ key.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.

☞ For parameter switching, refer to P. 4-44 to 4-49.

■ Parameter list

Name	Symbol	Data range	Factory set value
Function block 10 (F10.01 to F10.11)			
PV flashing display at input error	dSoP	0: Flashing at input error 1: No flashing at input error	0
Dot monitor type	ddTP	0: Program pattern type 1: Output bar graph type	0
Dot monitor scale high	dSCH	Dot monitor low to Maximum value of the selected input range Validate the Dot monitor type for the Program pattern type.	Input range high
Dot monitor scale low	dSCL	Minimum value of the selected input range to Dot monitor high Validate the Dot monitor type for the Program pattern type.	Input range low
ALM lamp light condition 1	ALC1	0: No lighting 1: Lighting 00000 ← Value at SV display Event 1 Event 2 Event 3 Event 4 Unused	1111

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Name	Symbol	Data range	Factory set value
ALM lamp light condition 2	ALC2	0: No lighting 1: Lighting 00000 ← Value at SV display └ HBA1 └ HBA2 └ LBA └ Self-diagnostic error └ Unused	0011
ALM lamp light condition 3	ALC3	0: No lighting 1: Lighting 00000 ← Value at SV display └ FAIL └ Host communication error └ Intercontroller communication error └ Unused	000
Dot monitor at ALM lamp light	ddEV	0: Normal display 1: Red flashing display	0
TS lamp light condition 1	TSC1	0: No lighting 1: Lighting 00000 ← Value at SV display └ TS1 └ TS2 └ TS3 └ TS4 └ Unused	1111
TS lamp light condition 2	TSC2	0: No lighting 1: Lighting 00000 ← Value at SV display └ TS5 └ TS6 └ TS7 └ TS8 └ Unused	1111
Power saving mode duration	oFFM	0 to 60 minutes (0: Lights at all times)	0
Function block 11 (F11.01 to F11.06)			
RESET key type	KTYP1	0: Invalid 1: Press once 2: Press twice 3: Press and hold Key type is not available for the PTN END key.	1
RUN key type	KTYP2		1
FIX key type	KTYP3		1
MAN key type	KTYP4		1
HOLD key type	KTYP5		1
STEP key type	KTYP6		3
Function block 21 (F21.01 to F21.15)			
Input type	INP	Voltage (low) input group 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 22: Voltage (low) 0 to 10 mV DC 23: Voltage (low) 0 to 100 mV DC	Based on model code. When not specifying: 0

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Name	Symbol	Data range	Factory set value
Input type (A continuance)	INP	24: Voltage (low) 0 to 1 V DC 25: Voltage (low) −10 to +10 mV DC 26: Voltage (low) −100 to +100 mV DC 27: Voltage (low) −1 to +1 V DC Voltage (high) input group 17: Voltage (high) 0 to 10 V DC 18: Voltage (high) 0 to 5 V DC 19: Voltage (high) 1 to 5 V DC 20: Voltage (high) −5 to +5 V DC 21: Voltage (high) −10 to +10 V DC Current input group 15: Current 0 to 20 mA DC 16: Current 4 to 20 mA DC To switch Input group, refer to **How to switch Input group (P. 3-8)**.	Based on model code. When not specifying: 0
Display unit	UNIT	0: °C 1: °F	0
Decimal point position	PGdP	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: Only 0 or 1 can be set. RTD input: From 0 to 2 can be set. Voltage (V)/Current (I) input: From 0 to 4 can be set.	Based on model code. When not specifying: 1
Input range high	PGSH	TC/RTD inputs: Input range low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: −19999 to +32000 Varies with the setting of the Decimal point position.	TC/RTD: Maximum value of the selected input range V/I: 100.0
Input range low	PGSL	TC/RTD inputs: Minimum value of the selected input range to Input range high Voltage (V)/Current (I) inputs: −19999 to +32000 Varies with the setting of the Decimal point position.	TC/RTD: Minimum value of the selected input range V/I: 0.0
Input error determination point (high)	PoV	Input range low − (5 % of Input span) to Input range high + (5 % of Input span) Maximum setting value of Input error determination point (high): 32767 (excluding decimal point) Minimum setting value of Input error determination point (low): −19999 (excluding decimal point)	Input range high + (5 % of Input span)
Input error determination point (low)	PUN		Input range low − (5 % of Input span)
Burnout direction	boS	0: Upscale 1: Downscale Valid only when the Voltage (low) input group selected.	0
Square root extraction	SQR	0: Unused 1: Used	0
Power supply frequency	PFRQ	0: 50 Hz 1: 60 Hz	0
Sampling cycle	SMP	0: 50 ms 1: 100 ms 2: 250 ms	1
PV bias *	Pb	−Input span to +Input span	0
PV digital filter *	dF	0.0 to 100.0 seconds 0.0: Unused	0.0
PV ratio *	PR	0.001 to 9.999	1.000
PV low input cut-off *	L-CUT	0.00 to 25.00 % of Input span	0.00

* It is not necessary to change the operation mode to the Reset mode (RESET) when setting the parameters. The parameters may also be set in the Setup setting mode.

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<table>
<tr><th>Name</th><th>Symbol</th><th>Data range</th><th>Factory set value</th></tr>
<tr><td colspan="4">Function block 23 (F23.01, F23.02)</td></tr>
<tr><td>Digital input (DI) assignment</td><td>dI SL</td><td>0 to 5
DI1 to DI6 (Optional)
<table>
<tr><th></th><th>DI1</th><th>DI2</th><th>DI3</th><th>DI4</th><th>DI5</th><th>DI6</th></tr>
<tr><td>0</td><td>PTN1</td><td>PTN2</td><td>PTN4</td><td>PTN8</td><td>PTN16</td><td>P.SET</td></tr>
<tr><td>1</td><td>PTN1</td><td>PTN2</td><td>PTN4</td><td>PTN8</td><td>PTN16</td><td>P.SET</td></tr>
<tr><td>2</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td></tr>
<tr><td>3</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td></tr>
<tr><td>4</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td></tr>
<tr><td>5</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td><td>WAIT</td></tr>
</table>
DI7 to DI11 (Standard)
<table>
<tr><th></th><th>DI7</th><th>DI8</th><th>DI9</th><th>DI10</th><th>DI11</th></tr>
<tr><td>0</td><td>RESET</td><td>RUN</td><td>STEP</td><td>HOLD</td><td>PTN32</td></tr>
<tr><td>1</td><td>RESET</td><td>RUN</td><td>STEP</td><td>PTN32</td><td>PTN64</td></tr>
<tr><td>2</td><td>PTN1</td><td>PTN2</td><td>PTN4</td><td>PTN8</td><td>P.SET</td></tr>
<tr><td>3</td><td>PTN1</td><td>PTN2</td><td>PTN4</td><td>PTN8</td><td>PTN16</td></tr>
<tr><td>4</td><td>RESET</td><td>RUN</td><td>STEP</td><td>HOLD</td><td>D/R</td></tr>
<tr><td>5</td><td>RESET</td><td>RUN</td><td>STEP</td><td>HOLD</td><td>PTN_INC</td></tr>
</table>
PTN1 to PTN64: Pattern number switch
P.SET: Pattern set
WAIT: Wait state release
RESET: Reset mode setting
RUN: Program control mode setting
HOLD: Hold function
STEP: Step function
D/R: Direct/Reverse action switching
PTN_INC Pattern increment</td><td>Based on model code.
When not specifying: 0</td></tr>
<tr><td>Pattern input method of Digital input (DI)</td><td>dI PTN</td><td>0: Set Pattern number by using the Pattern set input.
Pattern number = Binary number of DI + 1
1: Set Pattern number by switching the contact input.
Pattern number = Binary number of DI + 1
2: Set Pattern number by using the Pattern set input.
Pattern number = Binary number of DI
3: Set Pattern number by switching the contact input.
Pattern number = Binary number of DI
To change Pattern number, refer to ■ Pattern number switch of the PF900/PF901 Instruction Manual (IMR02L03-E□).</td><td>0</td></tr>
<tr><td colspan="4">Function block 30 (F30.01 to F30.08)</td></tr>
<tr><td>OUT2, OUT3
Energized/De-energized</td><td>ExoUT</td><td>0: Energized 1: De-energized
00000 ← Value at SV display
OUT2
OUT3
Unused</td><td>00</td></tr>
<tr><td>DO1 to DO4
Energized/De-energized</td><td>Exdo1</td><td>0: Energized 1: De-energized
00000 ← Value at SV display
DO1
DO2
DO3
DO4
Unused</td><td>0000</td></tr>
<tr><td>DO5 to DO8
Energized/De-energized</td><td>Exdo2</td><td>0: Energized 1: De-energized
00000 ← Value at SV display
DO5
DO6
DO7
DO8
Unused</td><td>0000</td></tr>
</table>

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Name	Symbol	Data range	Factory set value
DO9 to DO12 Energized/De-energized	Ex do3	0: Energized 1: De-energized 00000 ← Value at SV display └ DO9 └ DO10 └ DO11 └ DO12 └ Unused	0000
Transmission output action in Reset mode	R.Ao	0: Action stop 1: Action continued 00000 ← Value at SV display └ OUT2 └ OUT3 └ Unused	00
Event action in Reset mode	R.EV	0: Action stop 1: Action continued 00000 ← Value at SV display └ Event 1 └ Event 2 └ Event 3 └ Event 4 └ HBA1 or HBA2	00000
Transmission output action at Pattern end	P.Ed.Ao	0: Action stop 1: Action continued 00000 ← Value at SV display └ OUT2 └ OUT3 └ Unused Action of OUT1 stops or continues based on the setting of Control action selection at Pattern end.	00
Event action at Pattern end	P.Ed.EV	0: Action stop 1: Action continued 00000 ← Value at SV display └ Event 1 └ Event 2 └ Event 3 └ Event 4 └ HBA1 or HBA2	00000
Function block 31 (F31.01)			
OUT1 assignment	Lo0C 1	0: Manipulated output value 1 (MV1) [For Control output] [PID control or Heat/Cool PID control: Heat-side output Position proportioning PID control: Open-side output] 1: Output program value 1 [For Control output or Transmission output (Voltage/Current output)]	0
Function block 32 (F32.01 to F32.03)			
OUT2 assignment	Lo0C2	Voltage output or Current output Control output: 1, 2, 7 Transmission output: 3 to 7 0: None 1: Manipulated output value 1 (MV1) [Feedback resistance (FBR) input value when FBR input is specified with the Position proportioning PID control.] 2: Manipulated output value 2 (MV2) [Cool-side output at Heat/Cool PID control] 3: Measured value (PV) 4: Deviation value (DEV) 5: Set value (SV) monitor 6: Segment time (percentage basis) 7: Output program value 2 Manipulated output value (MV1 or MV2) may be used as a transmission output. Relay contact output, Voltage pulse output, Triac output or Open collector output Control output: 21, 22, 23 Event output: 24 to 53 20: None	Heat/Cool PID control: 22 or 2 (varies with output type) Position proportioning PID control: 22 Other control method: 0 or 20 (varies with output type) When the OUT2 is not provided: 0

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Name	Symbol	Data range	Factory set value
OUT2 assignment (A continuance)	LoC2	21: Manipulated output value 1 (MV1) PID control or Heat/Cool PID control: Heat-side output [Feedback resistance (FBR) input value when FBR input is specified with the Position proportioning PID control.] 22: Manipulated output value 2 (MV2) Heat/Cool PID control: Cool-side output Position proportioning PID control: Close-side output 23: Output program value 2 24 to 31: Time signal 1 to Time signal 8 32 to 35: Event 1to Event 4 36: HBA1 37: HBA2 38: Logical *OR* of HBA1 and HBA2 39: LBA 40: Input error state 41: Program control mode (RUN) state 42: Fixed set point control mode (FIX) state 43: Manual control mode (MAN) state 44: Ramp state 45: Soak state 46: Hold state 47: Wait state 48: Pattern end signal 49: Autotuning (AT) state 50: FAIL state 51: Host communication error 52: Intercontroller communication error 53: Feedback resistance (FBR) input error	Heat/Cool PID control: 22 or 2 (varies with output type) Position proportioning PID control: 22 Other control method: 0 or 20 (varies with output type) When the OUT2 is not provided: 0
OUT2 transmission output scale high	AH52	Varies with OUT2 assignment. Measured value (PV), Set value (SV) monitor: Input range low to Input range high Deviation value (DEV): −Input span to +Input span (Within −19999 to +32000 [excluding decimal point]) Output program value 2: Fixed at 100.0 % (scaling is not available) Segment time (percentage basis): Fixed at 100.0 % (scaling is not available) When using Manipulated output value (MV1 or MV2) as a transmission output: Fixed at 100.0 % (scaling is not available)	Measured value (PV), Set value (SV) monitor: Input range high Deviation value (DEV): + Input span Other: 100.0
OUT2 transmission output scale low	AL52	Varies with OUT2 assignment. Measured value (PV), Set value (SV) monitor: Input range low to Input range high Deviation value (DEV): −Input span to +Input span (Within −19999 to +32000 [excluding decimal point]) Output program value 2: Fixed at 0.0 % (scaling is not available) Segment time (percentage basis): Fixed at 0.0 % (scaling is not available) When using Manipulated output value (MV1 or MV2) as a transmission output: Fixed at 0.0 % (scaling is not available)	Measured value (PV), Set value (SV) monitor: Input range low Deviation value (DEV): − Input span Other: 0.0
Function block 33 (F33.01 to F33.03)			
OUT3 assignment	LoC3	The data range is same as OUT2 assignment. However, No. 7 or 23 becomes output program value 3. There are no relay contact output and triac output in OUT3 No control output when No. 21 or 22 is selected at Position proportioning PID control.	0 or 20 (varies with output type) When the OUT3 is not provided: 0
OUT3 transmission output scale high	AH53	Varies with OUT3 assignment. The data range is the same as the OUT2 transmission output scale high.	

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Name	Symbol	Data range	Factory set value
OUT3 transmission output scale low	AL53	Varies with OUT3 assignment. The data range is the same as the OUT2 transmission output scale low.	
Function block 34 (F34.01 to F34.12)			
DO1 assignment	Ldo1	0: None 1 to 8: Time signal 1 to Time signal 8 9 to 12: Event 1 to Event 4 13: HBA1 14: HBA2 15: Logical *OR* of HBA1 and HBA2 16: LBA 17: Input error state 18: Program control mode (RUN) state 19: Fixed set point control mode (FIX) state 20: Manual control mode (MAN) state 21: Ramp state 22: Soak state 23: Hold state 24: Wait state 25: Pattern end signal 26: Autotuning (AT) state 27: FAIL state 28: Host communication error 29: Intercontroller communication error 30: Feedback resistance (FBR) input error	Based on model code. When not specifying: DO1: 9 DO2: 10 DO3: 1 DO4: 25
DO2 assignment	Ldo2		
DO3 assignment	Ldo3		
DO4 assignment	Ldo4		
DO5 assignment	Ldo5		When specifying 12 points of DO at ordering: DO5 to DO12: 1 to 8 When specifying 4 points of DO at ordering: DO5 to DO12: 0
DO6 assignment	Ldo6		
DO7 assignment	Ldo7		
DO8 assignment	Ldo8		
DO9 assignment	Ldo9		
DO10 assignment	Ldo10		
DO11 assignment	Ldo11		
DO12 assignment	Ldo12		
Function block 41 (F41.01 to F41.08)			
Event 1 type	ES1	0: None 1: Deviation high [1] 2: Deviation low [1] 3: Deviation high/low [1] 4: Deviation high/low (Individual high and low setting) [1] 5: Band [1] 6: Band (Individual high and low setting) [1] 7: Process high [1] 8: Process low [1] 9: SV high 10: SV low 11: MV1 high [heat-side] [1, 2] 12: MV1 low [heat-side] [1, 2] 13: MV2 high [cool-side] [1] 14: MV2 low [cool-side] [1] [1] Event hold action is available. [2] If there is Feedback resistance (FBR) input in Position proportioning PID control, set to the FBR input value.	Based on model code. When not specifying: 1
Event 1 hold action	EHo1	0: OFF 1: Hold action ON [when power turned on; when Event start (SV changed)]	Based on model code. When not specifying: 0
Event 1 differential gap	EH1	Deviation, process or set value: 0 to Input span (Unit: °C [°F]) MV: 0.0 to 110.0 %	TC/RTD: 2 V/I: 0.2 MV: 0.2
Event 1 output action at input error	Ebo1	0 to 4	0
Event 1 timer	EVT1	0.0 to 600.0 seconds	0.0

	When PV reaches Input error determination point (high) or higher temperature:	When PV reaches Input error determination point (low) or lower temperature:
0	Conforms to Event action	Conforms to Event action
1	ON	Conforms to Event action
2	Conforms to Event action	ON
3	ON	ON
4	OFF	OFF

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Name	Symbol	Data range	Factory set value
Event 1 interlock	EIL1	0: Unused 1: Used 2: Activate Interlock and switch to the Manual control mode to produce Manipulated output at Input error.	0
Event 1 minimum ON time	E1on	0.0 to 600.0 seconds	0.0
Event 1 minimum OFF time	E1oFF	0.0 to 600.0 seconds	0.0
Function block 42 (F42.01 to F42.08)			
Event 2 type	ES2	The data range is same as Event 1.	Based on model code. When not specifying: 2
Event 2 hold action	EHo2	The data range is same as Event 1.	Based on model code. When not specifying: 1
Event 2 differential gap	EH2	The data range is same as Event 1.	
Event 2 output action at input error	Eo2		
Event 2 timer	EVT2		
Event 2 interlock	EIL2		
Event 2 minimum ON time	E2on		
Event 2 minimum OFF time	E2oFF		
Function block 43 (F43.01 to F43.08)			
Event 3 type	ES3	The data range is same as Event 1.	Based on model code. When not specifying: 0
Event 3 hold action	EHo3	The data range is same as Event 1.	Based on model code. When not specifying: 0
Event 3 differential gap	EH3	The data range is same as Event 1.	
Event 3 output action at input error	Eo3		
Event 3 timer	EVT3		
Event 3 interlock	EIL3		
Event 3 minimum ON time	E3on		
Event 3 minimum OFF time	E3oFF		
Function block 44 (F44.01 to F44.08)			
Event 4 type	ES4	The data range is same as Event 1.	Based on model code. When not specifying: 0
Event 4 hold action	EHo4	The data range is same as Event 1.	Based on model code. When not specifying: 0
Event 4 differential gap	EH4	The data range is same as Event 1.	
Event 4 output action at input error	Eo4		
Event 4 timer	EVT4		
Event 4 interlock	EIL4		
Event 4 minimum ON time	E4on		
Event 4 minimum OFF time	E4oFF		

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Name	Symbol	Data range	Factory set value
Function block 45 (F45.01 to F45.05)			
CT1 ratio	CTR1	0 to 9999	CTL-6-P-N: 800 CTL-12-S56: 1000 When not specifying: 800
CT1 assignment	CTA1	0: None 1: OUT1 2: OUT2 3: OUT3	When specifying CT at ordering: 1 When not specifying: 0
Number of heater break alarm 1 (HBA1) delay times	HBC1	0 to 255 times	5
Heater break alarm 1 (HBA1) set value *	HBA1	CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A 0.0: Unused (Current value monitoring still available.)	0.0
Heater break alarm 1 (HBA1) interlock	HBIL1	0: Unused 1: Used 2: Activate Interlock and switch to the Manual control mode to produce Manipulated output at Input error.	0
Function block 46 (F46.01 to F46.05)			
CT2 ratio	CTR2	The data range is same as Function block 45 (F45.)	CTL-6-P-N: 800 CTL-12-S56: 1000 When not specifying: 800
CT2 assignment	CTA2		When specifying CT at ordering: 2 When not specifying: 0
Number of heater break alarm 2 (HBA2) delay times	HBC2		5
Heater break alarm 2 (HBA2) set value *	HBA2		0.0
Heater break alarm 2 (HBA2) interlock	HBIL2		0
Function block 47 (F47.01, F47.02)			
Control loop break alarm (LBA) selection	LBASL	0: Without LBA 1: With LBA	0
Control loop break alarm (LBA) interlock	LBIL	0: Unused 1: Used 2: Activate Interlock and switch to the Manual control mode to produce Manipulated output at input error.	0

* It is not necessary to change the operation mode to the Reset mode (RESET) when setting the parameters. The parameters may also be set in the Setup setting mode.

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Name	Symbol	Data range	Factory set value
Function block 50 (F50.01 to F50.14)			
Control action	oS	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 gain linear type) 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action)	Based on model code. When specifying FBR input or Z action ordering: 5 When initial setting is not specifying: 1
Hot/Cold start	Pd	0: Hot start 1 2: Cold start 1: Hot start 2 3: Reset start	0
Start determination point	PdA	0 to Input span (The unit is the same as input value.)	3 % of Input span
Action (high) at input error	AoVE	0: Normal control 1: Manipulated output value at input error	0
Action (low) at input error	AUNE		0
Manipulated output value at input error	PSM	PID contorl: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 % Actual output values become those restricted by the Output limiter.	0.0
Control action at Pattern end *	END.P	PID control or Heat/Cool PID control, Position proportioning PID control (with FBR input): 0: Control continued 1: Control stop Control action at Pattern end can be operative when using Output program function. Position proportioning PID control (When there is no FBR input or the FBR input is break): 0: Control continued 1: Open-side output OFF, Close-side output OFF 2: Open-side output OFF, Close-side output ON 3: Open-side output ON, Close-side output OFF	0
Intensity factor of Ramp/Soak stabilizer	RSS.AJ	0.0 to 1.0 0.0: Unused	0.5
OUT1 proportional cycle time *	r 1	0.1 to 100.0 seconds M: Relay contact output T: Triac output V: Voltage pulse output D: Open collector output	M: 20.0 V/T/D: 2.0
OUT1 minimum ON/OFF time of proportioning cycle	o 1.rM	0 to 1000 ms	0
OUT2 proportional cycle time *	r2	0.1 to 100.0 seconds M: Relay contact output T: Triac output V: Voltage pulse output D: Open collector output	M: 20.0 V/T/D: 2.0 When the OUT2 is not provided: 2.0
OUT2 minimum ON/OFF time of proportioning cycle	o2.rM	0 to 1000 ms	0
OUT3 proportional cycle time *	r3	0.1 to 100.0 seconds V: Voltage pulse output D: Open collector output	V/D: 2.0 When the OUT3 is not provided: 2.0
OUT3 minimum ON/OFF time of proportioning cycle	o3.rM	0 to 1000 ms	0
Function block 52 (F52.01 to F52.07)			
AT bias	ArB	−Input span to +Input span (The unit is the same as input value)	0
AT differential gap time	ArHS	0.0 to 100.0 seconds	10.0
AT time signal action	ArrS	0: Time signal OFF 1: Time signal ON	0

* It is not necessary to change the operation mode to the Reset mode (RESET) when setting the parameters. The parameters may also be set in the Setup setting mode.

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Name	Symbol	Data range	Factory set value
AT cycles	ATC	0: 1.5 cycles 2: 2.5 cycles 1: 2.0 cycles 3: 3.0 cycles	0
Output value with AT turned on	ATon	Output value with AT turned off to +105.0 % Actual output values become those restricted by the Output limiter. Position proportioning PID control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break (high limit of Feedback resistance input at AT).	105.0
Output value with AT turned off	ATof	−105.0 % to Output value with AT turned on Actual output values become those restricted by the Output limiter. Position proportioning PID control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break (low limit of Feedback resistance input at AT).	−105.0
AT with learning function at ramp segment	ATr.R	0: No AT with learning function at ramp segment 1: Conduct AT with learning function at ramp segment	0
Function block 53 (F53.01 to F53.05)			
Action at feedback resistance (FBR) input error	ybR	0: Action depending on the Valve action at Reset mode 1: Control action continued	0
Feedback adjustment	PoS	AdJ: Adjustment end oPEN: During adjustment on the open-side CLoSE: During adjustment on the close-side To start Feedback adjustment, press and hold the MODE key for 5 seconds or more at AdJ display. Err display: Adjustment error When FBR input is not specified, only AdJ displays.	AdJ
Control motor time	Mot	5 to 1000 seconds	10
Integrated output limiter	oLA	0.0 to 200.0 % of Control motor time 0.0: OFF Invalidate when Feedback resistance (FBR) input is selected.	150.0
Valve action in Reset mode	VAL	0: Open-side output OFF, Close-side output OFF 1: Open-side output OFF, Close-side output ON 2: Open-side output ON, Close-side output OFF Invalidate when Feedback resistance (FBR) input is selected.	0
Function block 60 (F60.01 to F60.05)			
Communication 1 protocol	CMP1	0: RKC communication 1: Modbus	Based on model code.
Device address 1 *	Add1	RKC communication: 0 to 99 Modbus: 1 to 99	RKC communication: 0 Modbus: 1
Communication speed 1 *	bPS1	2400: 2400 bps 19200: 19200 bps 4800: 4800 bps 38400: 38400 bps 9600: 9600 bps 57600: 57600 bps	19200
Data bit configuration 1 *	bit1	Symbol / Data bit / Parity bit / Stop bit 8N1 [a] / 8 bit / None / 1 bit 8N2 [a] / 8 bit / None / 2 bit 8E1 [a] / 8 bit / Even / 1 bit 8E2 [a] / 8 bit / Even / 2 bit 8o1 / 8 bit / Odd / 1 bit 8o2 / 8 bit / Odd / 2 bit 7N1 / 7 bit / None / 1 bit 7N2 / 7 bit / None / 2 bit 7E1 / 7 bit / Even / 1 bit 7E2 / 7 bit / Even / 2 bit 7o1 / 7 bit / Odd / 1 bit 7o2 / 7 bit / Odd / 2 bit [a] Available for only Modbus	8N1
Interval time 1 *	int1	0 to 250 ms	10

* It is not necessary to change the operation mode to the Reset mode (RESET) when setting the parameters. The parameters may also be set in the Setup setting mode.

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Name	Symbol	Data range	Factory set value
Function block 61 (F61.01 to F61.06)			
Slave controller	SLV.SL	0: FB series: FB100/400/900 1: RB series: RB100/400/500/700/900 2: PF900/901	0
Number of slave unit	SLV.No	0 to 4	0
Device address 2 *	Add2	0 to 99	0
Communication speed 2 *	bPS2	9600: 9600 bps 19200: 19200 bps 38400: 38400 bps	19200
Host communication error judgment time	H.ERTM	0 to 600 seconds 0: Unused	10
Intercontroller communication error judgment time	C.ERTM	0 to 600 seconds 0: Real-time error	10
Function block 71 (F71.01, F71.02)			
Setting limiter high	SLH	Setting limiter low to Input range high (The unit is the same as input value)	Input range high
Setting limiter low	SLL	Input range low to Setting limiter high (The unit is the same as input value)	Input range low
Function block 80 (F80.01 to F80.07)			
SV selection at Program start *	ST.SV	0: Start with the Set value (SV) in the Reset mode. 1: PV start 1 [Time fixed type] 2: PV start 2 [Time saving & ramp holding type] 3: PV start 3 [Time saving & level searching type/ With HOLD function at start] 4: PV start 4 [Time saving & level searching type/ Without HOLD function at start]	2
Wait memory group number at Program start	ST.WT	0: Wait OFF 1 to 8: Wait memory 1 to Wait memory 8	0
Program setting type	PRTYP	0: Batch setting type 1: Partial setting type	1
Signal type	TS.TYP	0: Time signal type 1: Segment signal type	0
Set time unit	TM.SL	0: Hour : Minute 1: Minute : Second	0
Maximum pattern/segment number	PN*SN	Maximum pattern number: 1 to 99 Maximum segment number: 1 to 99 Maximum pattern number × Maximum segment number = 1024 at maximum	Maximum pattern number: 32 Maximum segment number: 32

* It is not necessary to change the operation mode to the Reset mode (RESET) when setting the parameters. The parameters may also be set in the Setup setting mode.

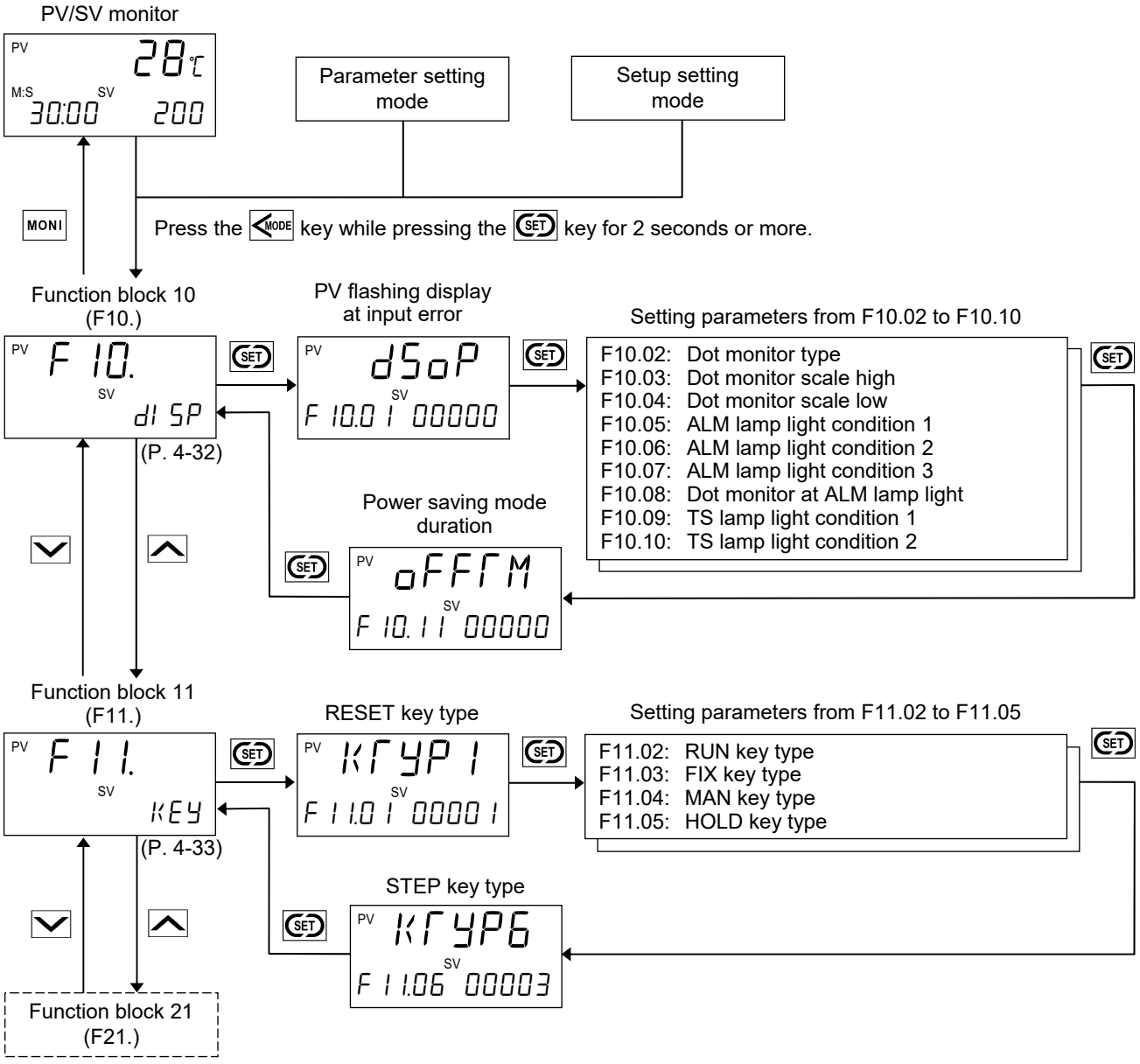
■ Parameter switching

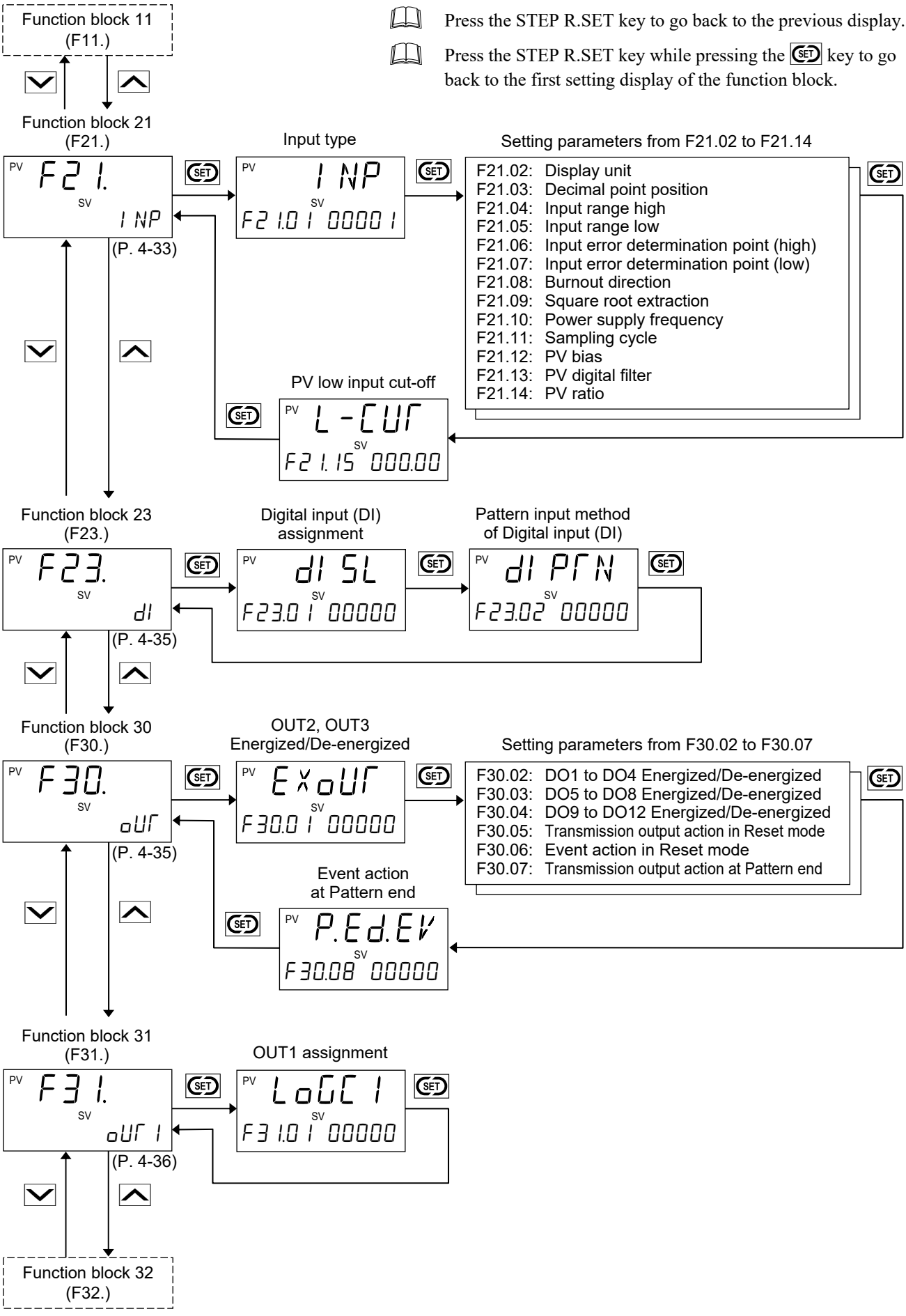
- To go to the Parameter setting mode, press the MODE key while pressing the SET key for 2 seconds or more at PV/SV monitor display.
- Press the SET key to switch operation screen.
- Function blocks may be switched by using the ∧ key or the ∨ key.

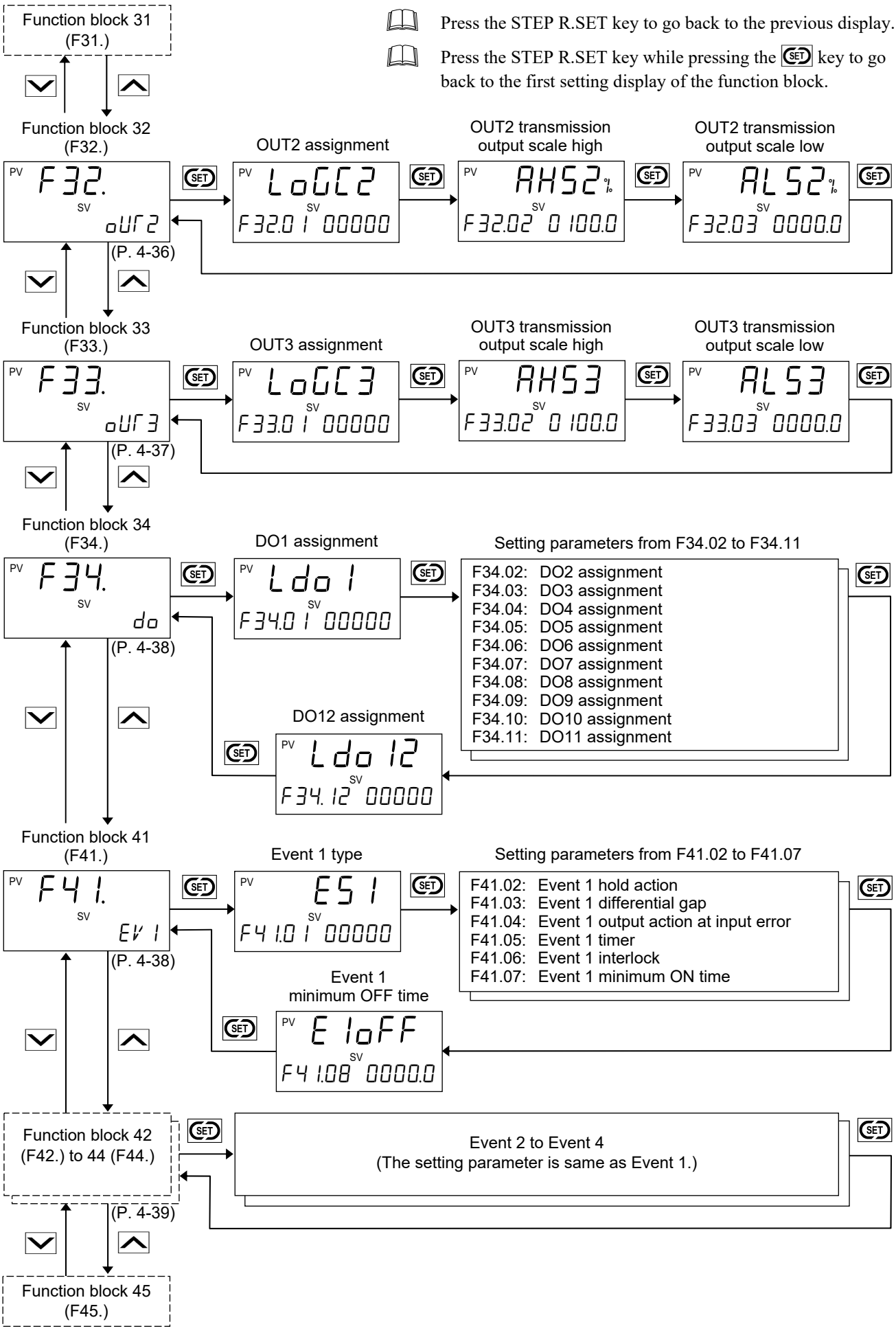
NOTE

Parameters in the Engineering mode are only available for monitoring in the RUN mode, the FIX mode and the MAN mode. Switch to the RESET mode to set the parameters. It is possible to set parameters in the function block 10 (F10) and the function block 11 (F11) in the RUN mode, the FIX mode and the MAN mode.

- Press the MONI key to go back to the PV/SV monitor.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.
- Display returns to the PV/SV monitor if no key operation is performed within 1 minute.

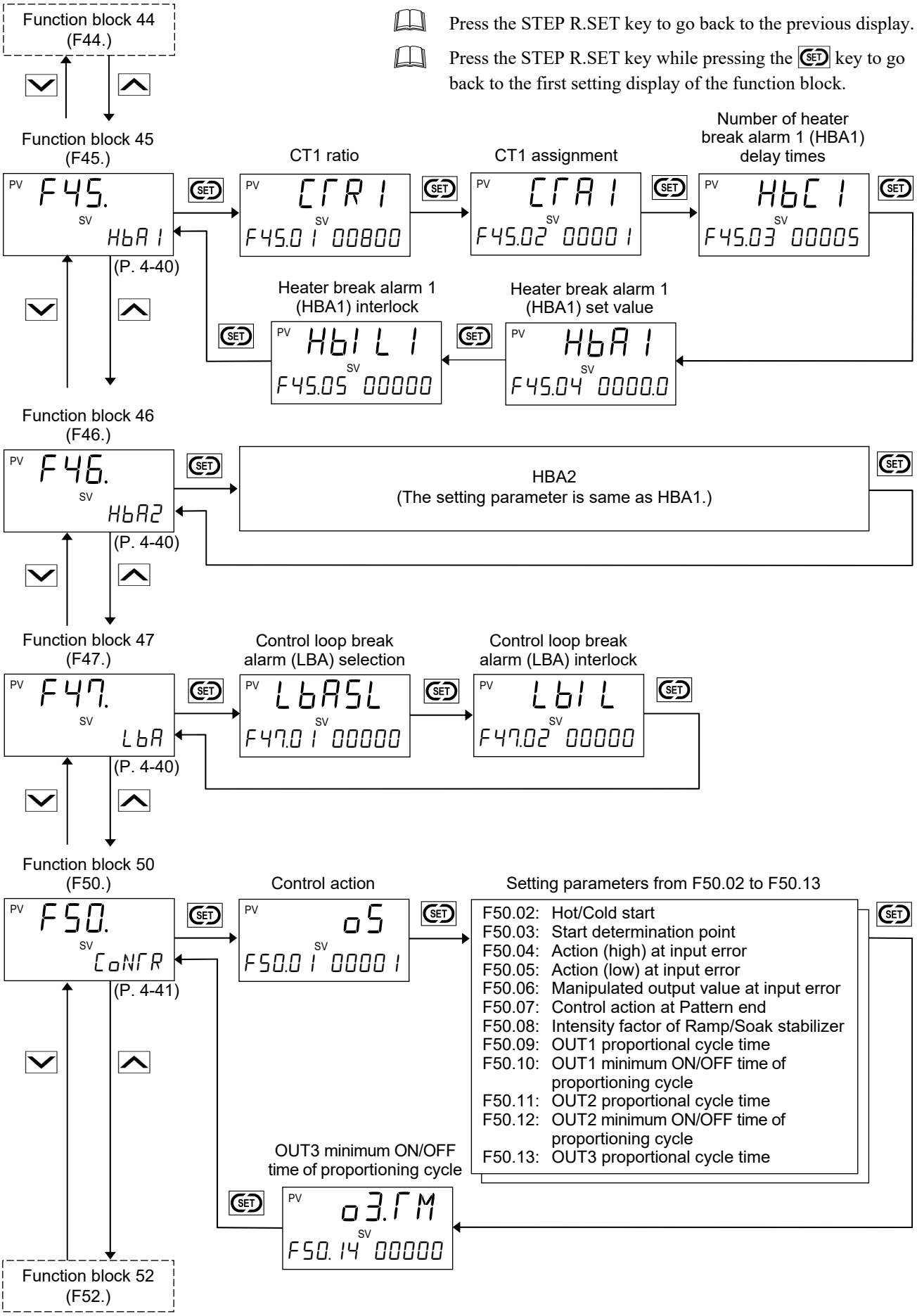


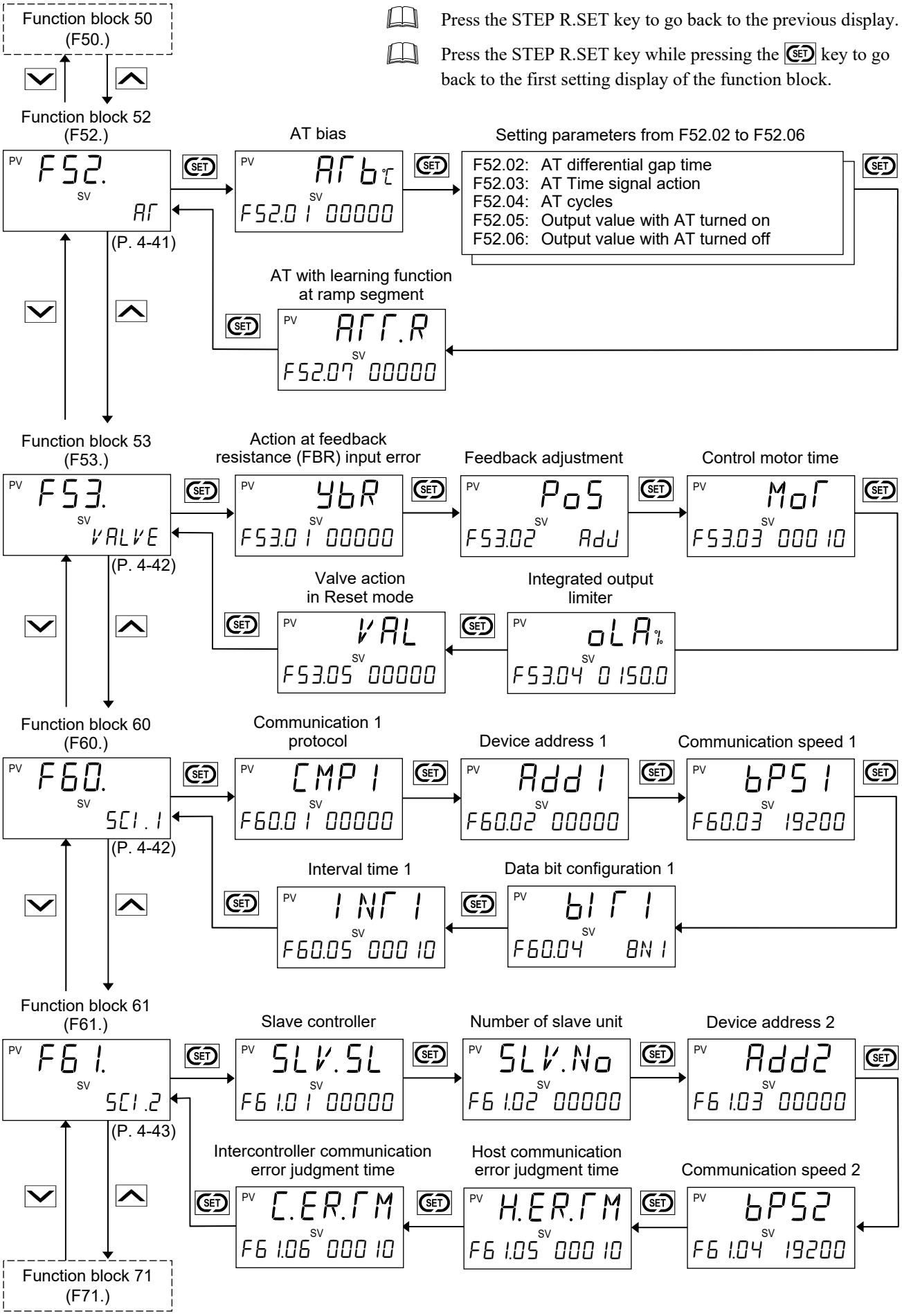

Function block 11
(F11.)
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.
Function block 21
(F21.)
Input type
Setting parameters from F21.02 to F21.14
F21.02: Display unit
F21.03: Decimal point position
F21.04: Input range high
F21.05: Input range low
F21.06: Input error determination point (high)
F21.07: Input error determination point (low)
F21.08: Burnout direction
F21.09: Square root extraction
F21.10: Power supply frequency
F21.11: Sampling cycle
F21.12: PV bias
F21.13: PV digital filter
F21.14: PV ratio
(P. 4-33)
PV low input cut-off
Function block 23
(F23.)
Digital input (DI) assignment
Pattern input method of Digital input (DI)
(P. 4-35)
Function block 30
(F30.)
OUT2, OUT3 Energized/De-energized
Setting parameters from F30.02 to F30.07
F30.02: DO1 to DO4 Energized/De-energized
F30.03: DO5 to DO8 Energized/De-energized
F30.04: DO9 to DO12 Energized/De-energized
F30.05: Transmission output action in Reset mode
F30.06: Event action in Reset mode
F30.07: Transmission output action at Pattern end
(P. 4-35)
Event action at Pattern end
Function block 31
(F31.)
OUT1 assignment
(P. 4-36)
Function block 32
(F32.)

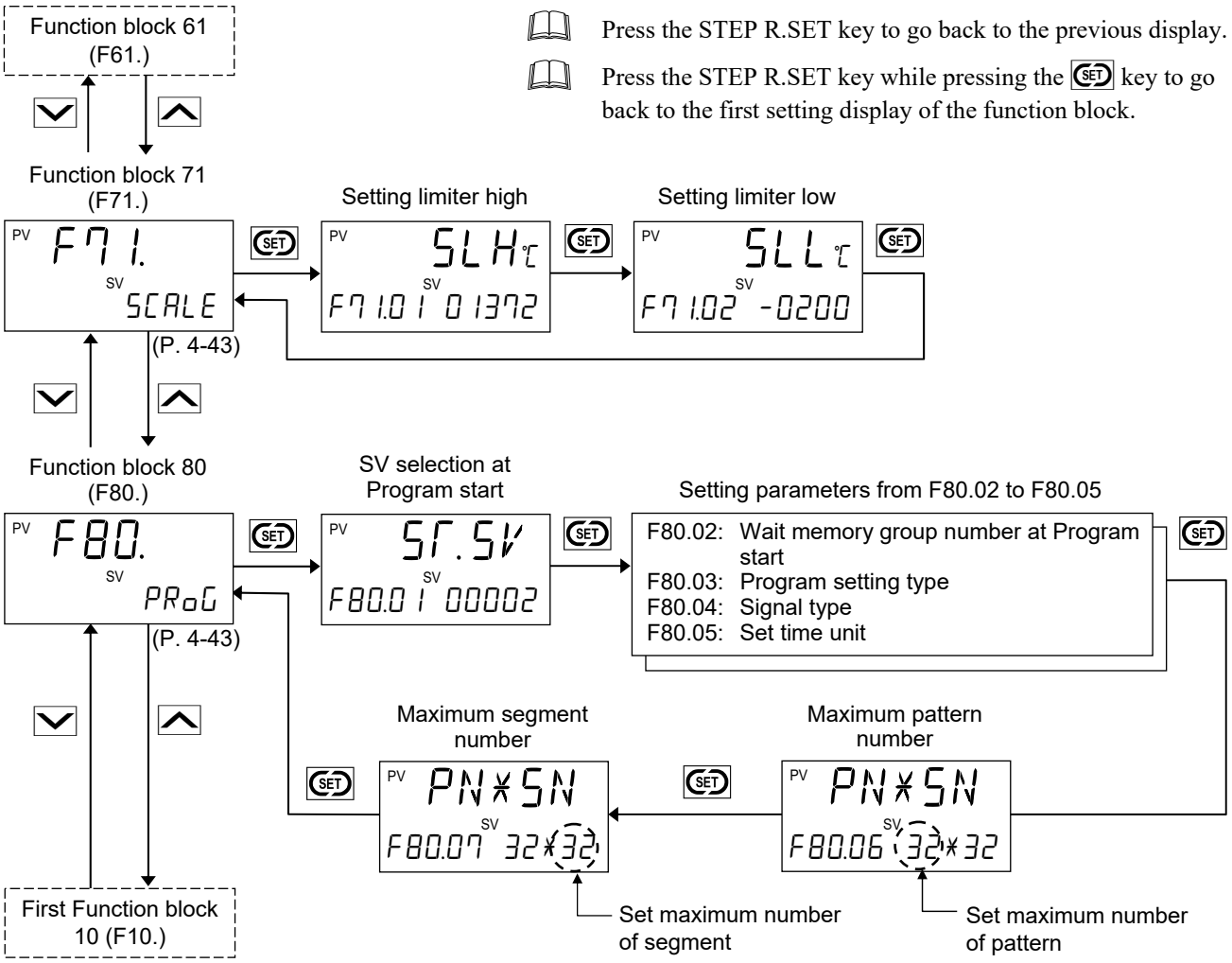


Press the STEP R.SET key to go back to the previous display.

Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.


Function block 44
(F44.)
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.
Function block 45
(F45.)
CT1 ratio
CT1 assignment
Number of heater break alarm 1 (HBA1) delay times
PV F45. SV HbA1
PV CTR1 SV F45.01 00800
PV CTA1 SV F45.02 00001
PV HbC1 SV F45.03 00005
(P. 4-40)
Heater break alarm 1 (HBA1) interlock
Heater break alarm 1 (HBA1) set value
PV HbIL1 SV F45.05 00000
PV HbA1 SV F45.04 0000.0
Function block 46
(F46.)
PV F46. SV HbA2
(P. 4-40)
HBA2
(The setting parameter is same as HBA1.)
Function block 47
(F47.)
Control loop break alarm (LBA) selection
Control loop break alarm (LBA) interlock
PV F47. SV LbA
PV LbASL SV F47.01 00000
PV LbIL SV F47.02 00000
(P. 4-40)
Function block 50
(F50.)
Control action
Setting parameters from F50.02 to F50.13
PV F50. SV CoNTR
PV oS SV F50.01 00001
F50.02: Hot/Cold start
F50.03: Start determination point
F50.04: Action (high) at input error
F50.05: Action (low) at input error
F50.06: Manipulated output value at input error
F50.07: Control action at Pattern end
F50.08: Intensity factor of Ramp/Soak stabilizer
F50.09: OUT1 proportional cycle time
F50.10: OUT1 minimum ON/OFF time of proportioning cycle
F50.11: OUT2 proportional cycle time
F50.12: OUT2 minimum ON/OFF time of proportioning cycle
F50.13: OUT3 proportional cycle time
(P. 4-41)
OUT3 minimum ON/OFF time of proportioning cycle
PV o3TM SV F50.14 00000
Function block 52
(F52.)


Function block 50
(F50.)
Press the STEP R.SET key to go back to the previous display.
Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.
Function block 52
(F52.)
AT bias
Setting parameters from F52.02 to F52.06
F52.02: AT differential gap time
F52.03: AT Time signal action
F52.04: AT cycles
F52.05: Output value with AT turned on
F52.06: Output value with AT turned off
(P. 4-41)
AT with learning function at ramp segment
Function block 53
(F53.)
Action at feedback resistance (FBR) input error
Feedback adjustment
Control motor time
(P. 4-42)
Valve action in Reset mode
Integrated output limiter
Function block 60
(F60.)
Communication 1 protocol
Device address 1
Communication speed 1
(P. 4-42)
Interval time 1
Data bit configuration 1
Function block 61
(F61.)
Slave controller
Number of slave unit
Device address 2
(P. 4-43)
Intercontroller communication error judgment time
Host communication error judgment time
Communication speed 2
Function block 71
(F71.)



Press the STEP R.SET key to go back to the previous display.

Press the STEP R.SET key while pressing the SET key to go back to the first setting display of the function block.

NOTE

When changing a Maximum pattern number or Maximum segment number, all parameters related to Program setting such as Segment level and Segment time will be initialized automatically.

Parameters to be initialized

Parameter setting mode:

- Parameters at the Program setting block
- Wait zone high and Wait zone low at the Wait memory group setting block
- Output program value from 1 to 3 at the Output program memory group setting block
- Parameters at the Time signal memory group setting block

SV setting mode:

- Execution pattern selection

Setting by RKC communication:

- Pattern tag name

It takes approximately 1 second to initialize the related parameters when a Maximum pattern number of Maximum segment number is changed.

MEMO

5. OPERATION

5.1 Initial Setting

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

⚠ WARNING

Parameters in the Engineering mode (F10 to F80) 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 Reset mode (RESET).

Setup the controller prior to operating the instrument. Refer to the following setup example.

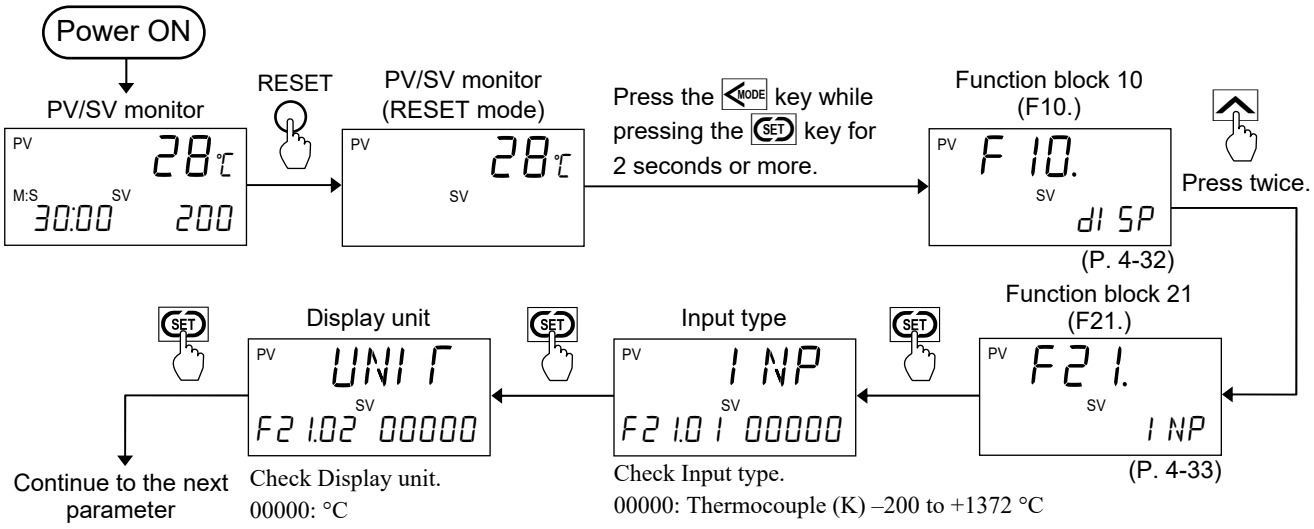
Setup example:
Input specification: Thermocouple K 0 to 400 °C
Control action: PID control (reverse action)
Control output: OUT1, Relay contact output,
Proportional cycle time: 20 seconds
Event specification (Event 1):
Deviation high/low with hold action
(Uses Interlock function)
Event output: Assigned to DO1
Program pattern/segment number:
Pattern/segment number: 32/32 (Factory set value)

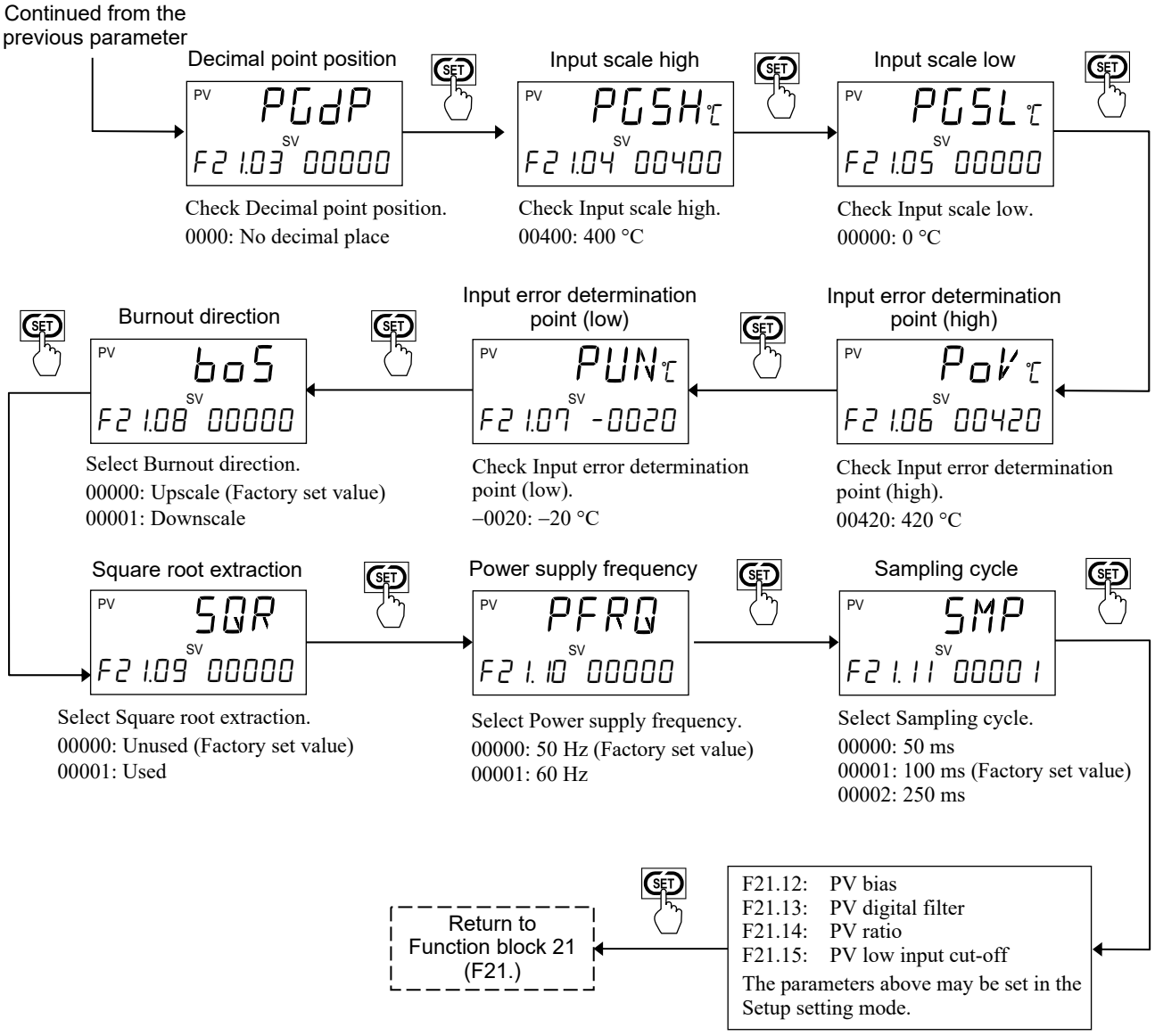
Set value change and registration
- The blinking digit indicates which digit can be set. The blinking digit can be moved by pressing the MODE key.
- However, the changed data is not stored by the operation of the ∧ and ∨ keys alone. In order for the new parameter value to be stored, the SET key must be pressed within 1 minute after the new value is displayed. The new value will then be saved and the display will move to the next parameter.

5.1.1 Check the parameter related to the input

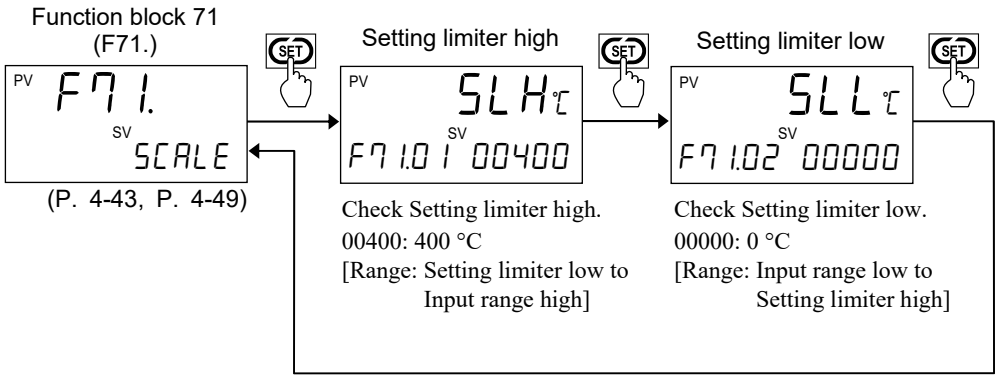
Check the set value of the parameter for input specification (such as the input type at F21 in the Engineering mode). Parameters which are not specified when ordering must be set before use.

Setup example:
Input specification: Thermocouple (K) 0 to 400 °C [Input range code: K02]





Check the set value of the Setting limiter at the Function block 71 (F71.).



5.1.2 Check the parameter related to the event action

Parameter settings related to event action can be checked at F41 in Engineering mode.
Parameters which are not specified when ordering must be set before use.

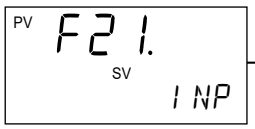
Setup example:
Event specification (Event 1):
Deviation high/low with hold action [Quick start code: G]
Uses Interlock function
Event output: Assigned to DO1

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

After setting input related parameters, check and set parameters related to event actions.

DO1 Energized/De-energized can be selected at function block 30 [F30.02 (Exdo 1)] (P.4-35). (Factory set value: Energized)

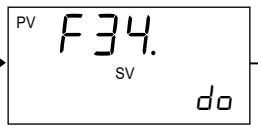
Function block 21 (F21.)



(P. 4-33)

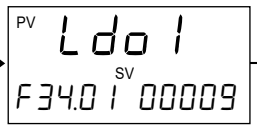
Press the ^ key until F34 displays.

Function block 34 (F34.)



(P. 4-38)

DO1 assignment



Set DO1 assignment to Event 1.
00009: Event 1

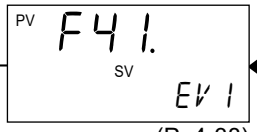
The display goes to the next parameter (DO2 type)

STEP **R.SET**

Press twice.

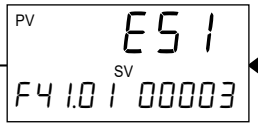
Return to Function block 34 (F34.)

Function block 41 (F41.)



(P. 4-38)

Event 1 type

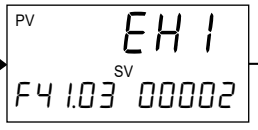


Check Event 1 type.
00003: Deviation high/low

Event 1 hold action

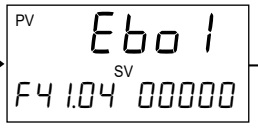
Check Event 1 hold action.
00001: Hold action ON

Event 1 differential gap



Set Event 1 differential gap.
00002: 2 °C (Factory set value)
[Range: 0 to Input span]

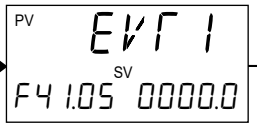
Event 1 output action at input error



Select Event 1 output action at input error.

	When PV reaches Input error determination point (high) or higher temperature:	When PV reaches Input error determination point (low) or lower temperature:
00000	Conforms to Event action	Conforms to Event action
00001	ON	Conforms to Event action
00002	Conforms to Event action	ON
00003	ON	ON
00004	OFF	OFF

Event 1 timer

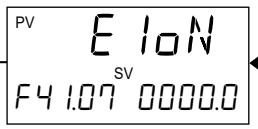


Set Event 1 timer.
0000.0: 0.0 second
(Factory set value)
[Range: 0.0 to 600.0 seconds]

Event 1 Interlock

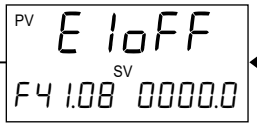
Set Event 1 Interlock to "Used."
00000: Unused
00001: Used

Event 1 Minimum ON time



Set Event 1 Minimum ON time.
0000.0: 0.0 second
(Factory set value)
[Range: 0.0 to 600.0 seconds]

Event 1 Minimum OFF time



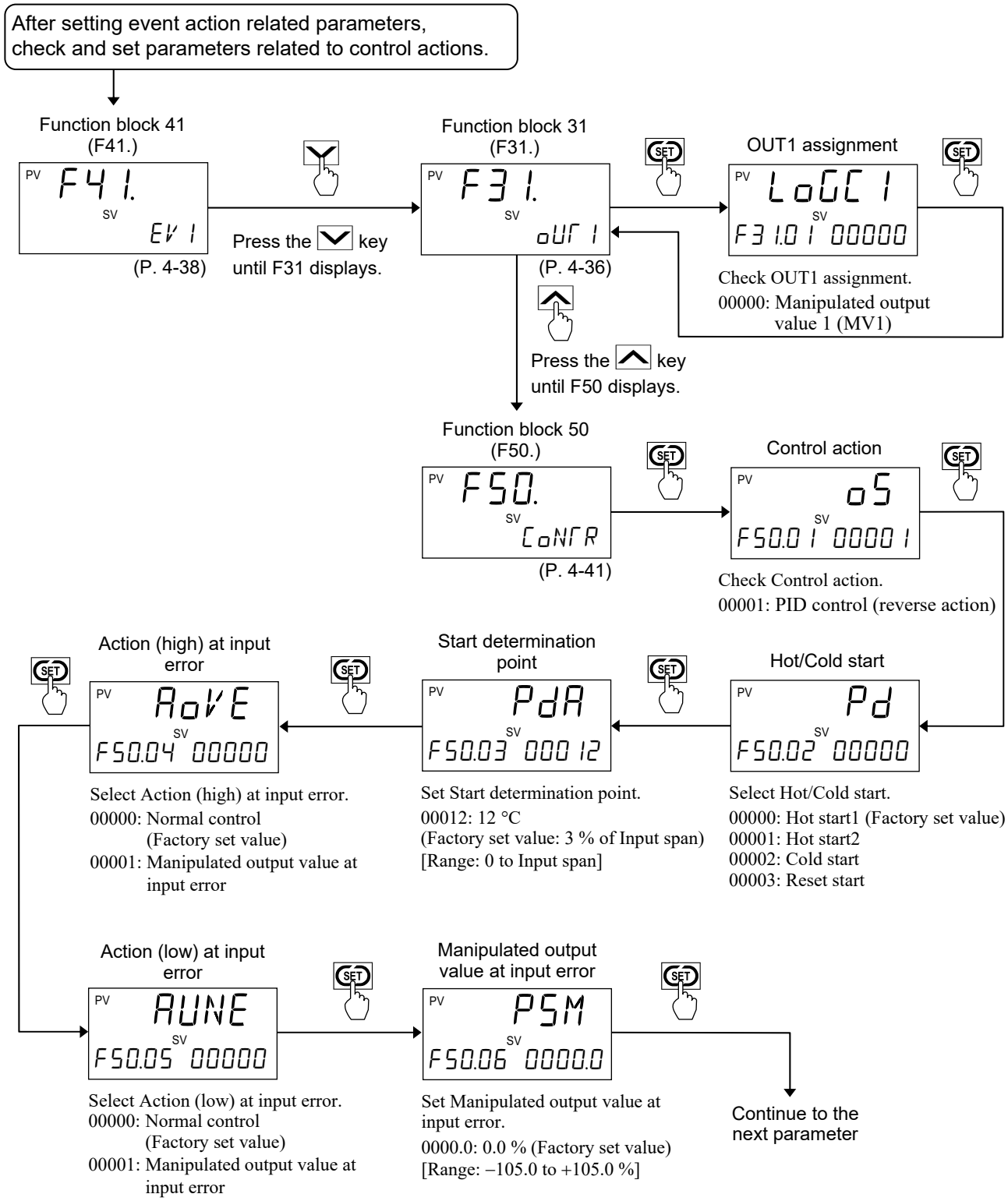
Set Event 1 Minimum OFF time.
0000.0: 0.0 second
(Factory set value)
[Range: 0.0 to 600.0 seconds]

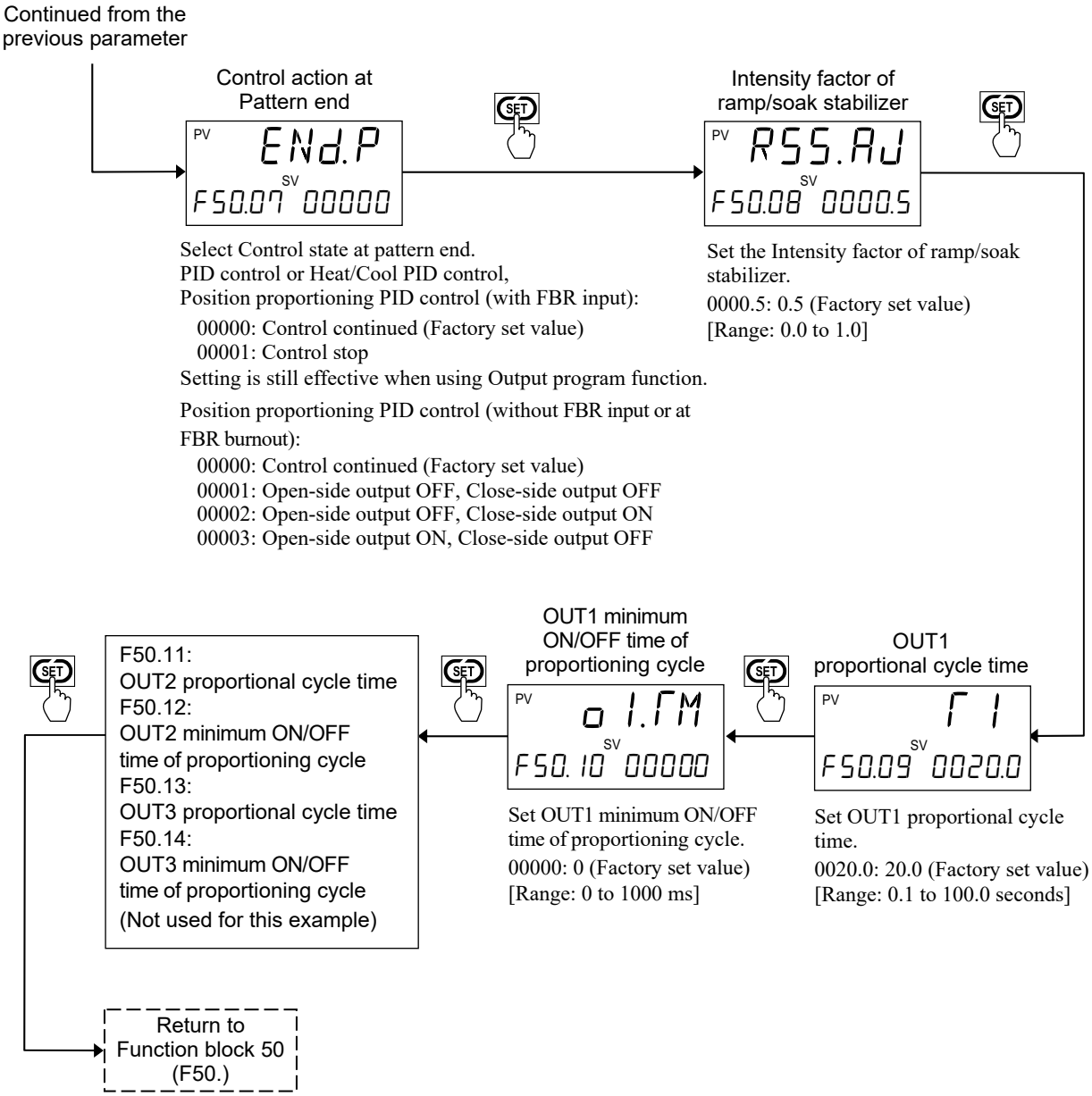
Return to Function block 41 (F41.)

5.1.3 Check the parameter related to the control

Parameter settings related to control action can be checked at F50 in Engineering mode.
Parameters which are not specified when ordering must be set before use.

Setup example:
Control action: PID control (reverse action) [Suffix code: F]
Control output: OUT1, Relay contact output, Proportional cycle time: 20 seconds





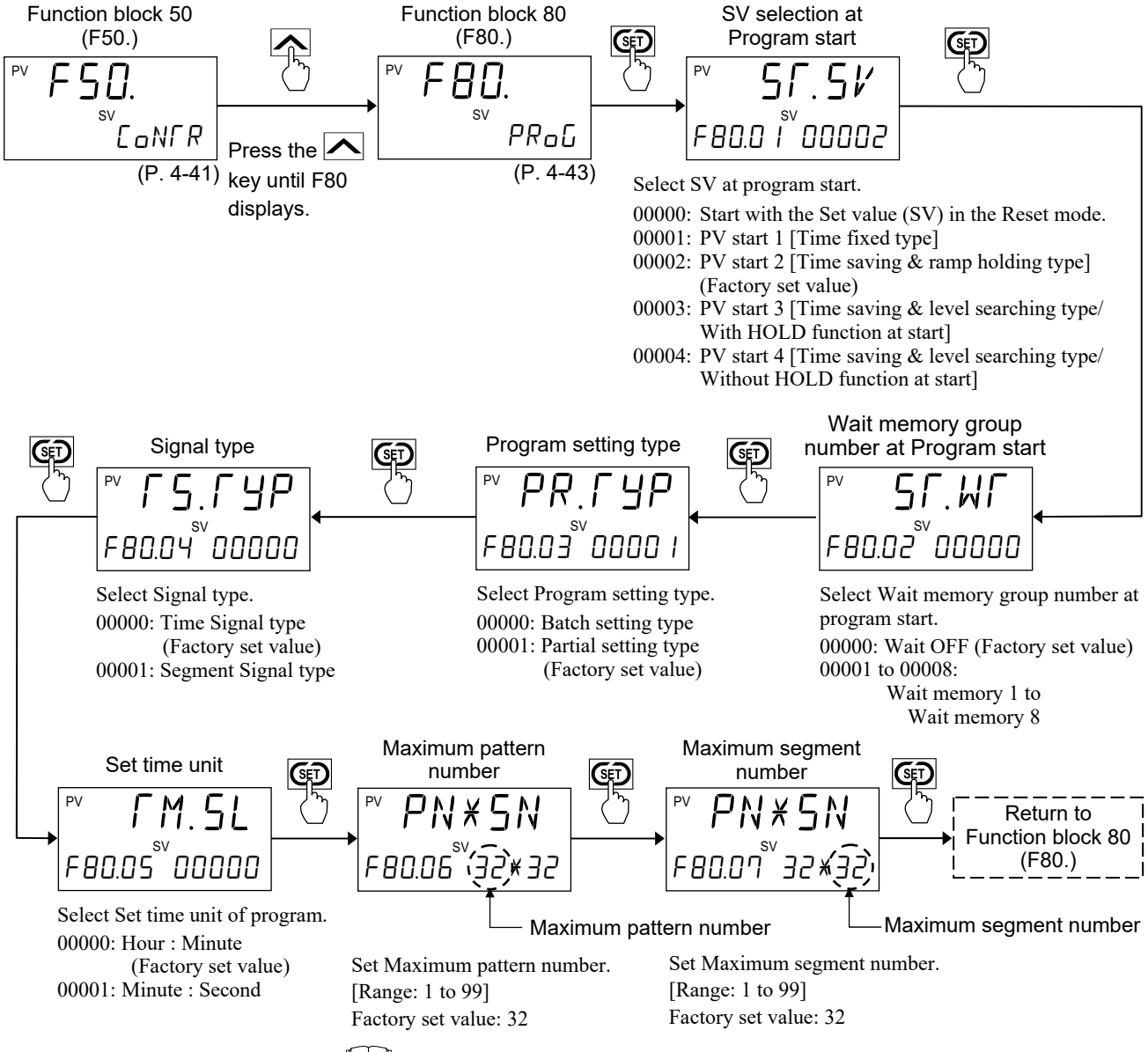
Control action at Pattern end and Proportional cycle time may be set in the Setup setting mode.

5.1.4 Check set value of parameter for program control operation

Parameter settings related to Program control operation can be checked at F80 in Engineering mode.

Setup example:
Number of program pattern: 32
Number of segment: 32

Set parameters for Program operation after confirming parameter of control action.



Maximum pattern number x Maximum segment number = 1024 maximum

NOTE

When changing a Maximum pattern number or Maximum segment number, all parameters related to Program setting such as Segment level and Segment time will be initialized automatically.

Parameter to be initialized

Parameter setting mode:
- Parameter at Program setting block
- Wait zone high and Wait zone low at the Wait memory group setting block
- Output program value from 1 to 3 at the Output program memory group setting block
- Parameter at the Time signal memory group setting block

SV setting mode:
- Execution pattern number

Setting by RKC communication:
- Pattern tag name

5.2 Operating Precautions

Check the following precautions before starting operation.

■ Power ON

Once power is restored to the instrument the operation mode will return as it was before the power went OFF. The operation mode is displayed after the Input type and Input range.
[Factory set value: Reset mode (RESET)]

📖 Action at power ON can be selected at Hot/Cold start of F50.02 in the Engineering mode (P. 4-41).
📖 The digital input (DI) becomes valid approximately nine seconds after power on.
☞ For Hot/Cold start, refer to **6.5.5 Start action at recovering power failure** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Action at input error

If the input signal wiring is disconnected or short-circuited (RTD input only), the instrument determines that burnout has occurred.

● Burnout direction

Thermocouple input, RTD input, Voltage (low) input:
Conforms to the setting of Burnout direction in the Engineering mode F21.08 (P. 4-34).
0: Upscale (Factory set value) 1: Downscale
Voltage (high) input, Current input:
Downscale or indicate the value near 0

● Output at input error

Control output: Conforms to the setting of Action (high) at input error [F50.04 (P. 4-41)] or Action (low) at input error [F50.05 (P. 4-41)] in the Engineering mode F50.
0: Normal control (Factory set value) 1: Manipulated output value at input error
Event output: Conforms to the setting of Event output action at input error in the Engineering mode F41. to F44.

	When PV reaches Input error determination point (high) or higher temperature:	When PV reaches Input error determination point (low) or lower temperature:
0	Conforms to Event action	Conforms to Event action
1	ON	Conforms to Event action
2	Conforms to Event action	ON
3	ON	ON
4	OFF	OFF

Factory set value: 0 (Conforms to Event action)

■ Check each parameter

Control target value and parameters should be appropriate for the application when setting Segment level, Set value (SV) or parameters. There are parameters in Engineering mode which can not be changed when the controller is in the RUN mode, the FIX mode and the MAN mode. Switch to the RESET mode to set the parameters in Engineering mode.

☞ For mode switching or parameter, refer to **4. BASIC OPERATION (P. 4-1)** in this manual or **4. BASIC OPERATION** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Event hold action

Event hold action becomes active when turning on the instrument or starting Event (only for event with hold action).

■ Operation when power failure

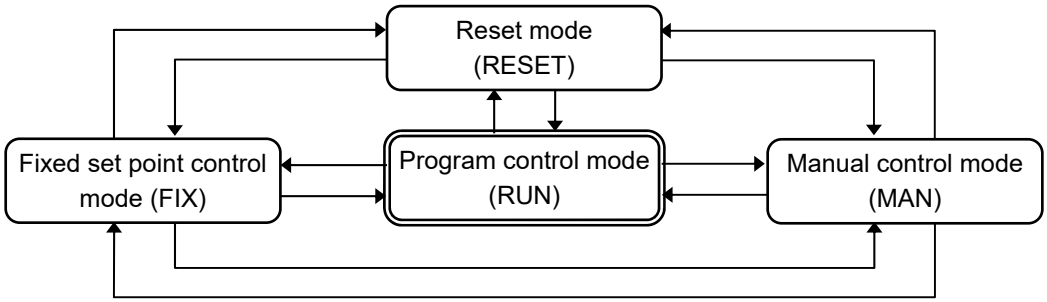
A power failure of 20 ms or less will not affect the control action. When a power failure of more than 20 ms occurs the instrument assumes that the power has been turned off. When restarting following a power failure, the instrument will restore to the Hot/Cold start setting.

☞ For Hot/Cold start, refer to **6.5.5 Start action at recovering power failure** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

5.3 Type and Switching Procedures of Operation Mode

5.3.1 Type of Operation mode

PF900/901 offers 4 type of Operation mode. It is possible to switch any type within the Operation mode.



● Reset mode (RESET)

Initializes the program operation and produces the Manipulated output value set at the Reset mode.
Action stop or Action continued for Event or Transmission output may be selected at the Reset mode.

● Program control mode (RUN)

Controls based on the program pattern being set.

● Fixed set point control mode (FIX)

Controls with the Set value (SV) being set at the Fixed set point control mode.

● Manual control mode (MAN)

Set Manipulated output value manually.

5.3.2 Operation mode switching

■ Action at Operation mode switching

Refer to the table below for the action at Operation mode switching.

<table>
<tr><th></th><th colspan="4">Operation mode before switching</th></tr>
<tr><th>Operation mode after switching</th><th>Reset mode (RESET)</th><th>Program control mode (RUN) [1]</th><th>Fixed set point control mode (FIX)</th><th>Manual control mode (MAN)</th></tr>
<tr><td>Reset mode (RESET)</td><td></td><td colspan="3">Produces the Manipulated output value set at the Reset mode.</td></tr>
<tr><td>Program control mode (RUN)</td><td rowspan="2">Action starts based on the Control computation result.</td><td></td><td>Action continues with the SV in the Program control mode. [1]</td><td rowspan="2">Action continues with Manual manipulated output value. (Bumpless transfer [2])</td></tr>
<tr><td>Fixed set point control mode (FIX)</td><td>Action continues with the SV in the Fixed set point control mode.</td><td></td></tr>
<tr><td>Manual control mode (MAN)</td><td>Action starts with Manual manipulated output value (the output value in the Reset mode).</td><td>Action continues with Manual manipulated output value (the last output value in the Program control mode).</td><td>Action continues with Manual manipulated output value (the last output value in the Fixed set point control mode).</td><td></td></tr>
</table>

[1] Once Program control mode is restarted, the program state will return as it was before switched to the Fixed set point control mode (FIX) or the Manual control mode (MAN). If the Program control mode is switched to the RESET mode, program state will be reset and the operation restarts from the beginning of the program when switching to the Program control mode.

[2] When changing to the operation mode with the control action P, PD or ON/OFF, output may bump when using Bumpless switch (control output does not change rapidly).

■ Switching procedure of Operation mode

4 types of mode switching procedure:

- Parameter for Operation mode switching
- Direct key for Operation mode switching
- Digital input (DI) for Operation mode switching
- Host communication for Operation mode switching

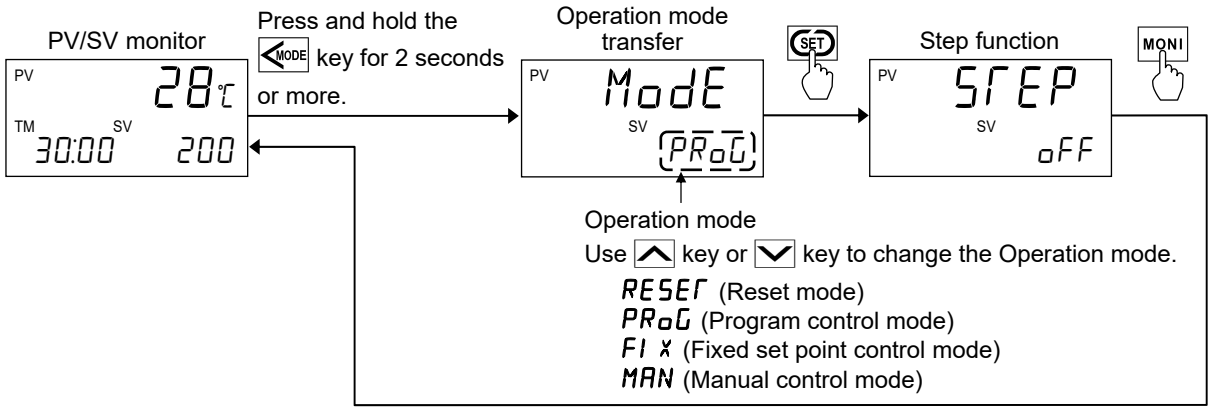
NOTE

Switching procedure does not affect the Operation mode. The Operation mode being selected last is validated. Operation mode cannot be changed by the Operation mode switching parameter, the Direct key or the Host communication when RESET or RUN of Digital input (DI) is ON (contact closed).

● When switching by the Operation mode switching parameter

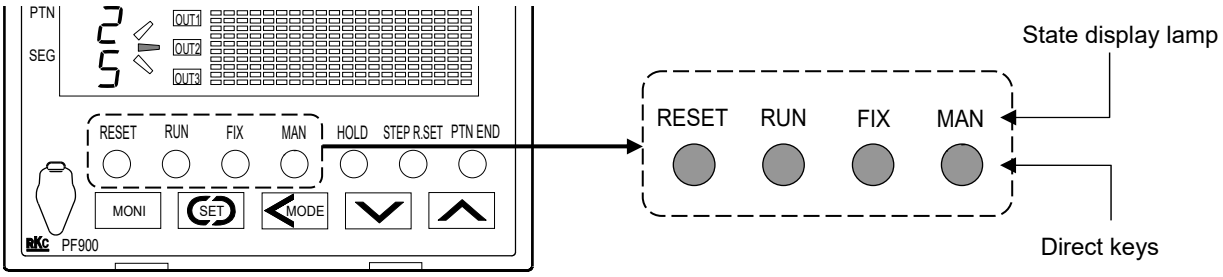
Switch the Operation mode by using ∧ key or ∨ key at the Operation mode transfer screen.

Release the Set data lock before changing the Operation mode.



● When switching by the Direct key

Use the front direct key.



Switch the Operation mode by using the direct key. The State display lamp turns from green to orange (State display lamp turns OFF when switching operation is not possible.) Displays the PV/SV monitor screen of the Operation mode last selected.

Direct key	Operation mode	State display lamp		Display
RESET	Reset	RESET lights	[Orange]	PV/SV monitor screen of each Operation mode
RUN	Program control	RUN lights	[Orange]	
FIX	Fixed set point control	FIX lights	[Orange]	
MAN	Manual control	MAN lights	[Orange]	

It is possible to invalidate the operation by using the direct keys. For direct key usage, refer to ■ **Direct key type (P. 4-7)**.

● When switching by the Digital input (DI)

DI switching by using DI7 and DI8 is only available when switching to the Reset mode (RESET) or the Program control mode (RUN).

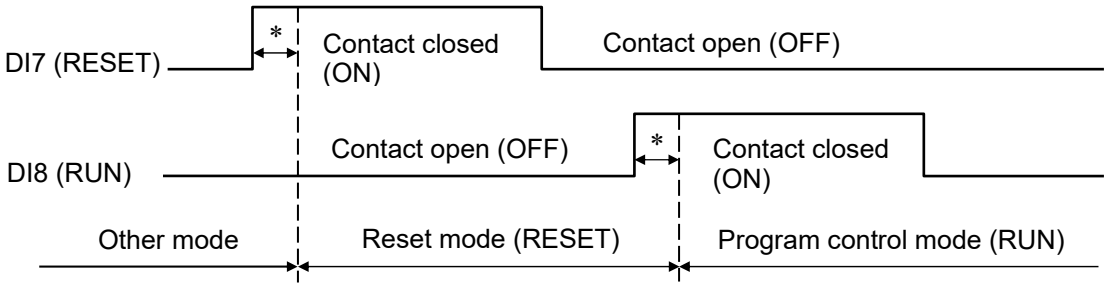
- Set 0, 1, 4 or 5 at the Digital input (DI) assignment of the Engineering mode F23.01 before switching mode by using DI.

DI assignment from DI7 to DI11 (DI7: RESET mode, DI8: RUN mode)

	DI7	DI8	DI9	DI10	DI11
0	RESET	RUN	STEP	HOLD	PTN32
1	RESET	RUN	STEP	PTN32	PTN64
2	PTN1	PTN2	PTN4	PTN8	P.SET
3	PTN1	PTN2	PTN4	PTN8	PTN16
4	RESET	RUN	STEP	HOLD	Direct/Reverse
5	RESET	RUN	STEP	HOLD	PTN_INC

☞ For Engineering mode parameters, refer to **4.5.5 Engineering mode (P. 4-32)**.

- Close (ON*) the contact of DI7 to switch to the Reset mode (RESET). To switch to the Program control mode (RUN), open (OFF) the contact of DI7 and close (ON*) the contact of DI8.



* Detects edge at start-up and judges that DI is validated when the contact is in ON state for at least 200 ms + 1 sampling cycle.

☞ For terminal configuration and switching procedure of DI switching, refer to **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

● When switching by the Host communication

Refer to the communication data below when switching the Operation mode by the Host communication (RKC communication or Modbus).

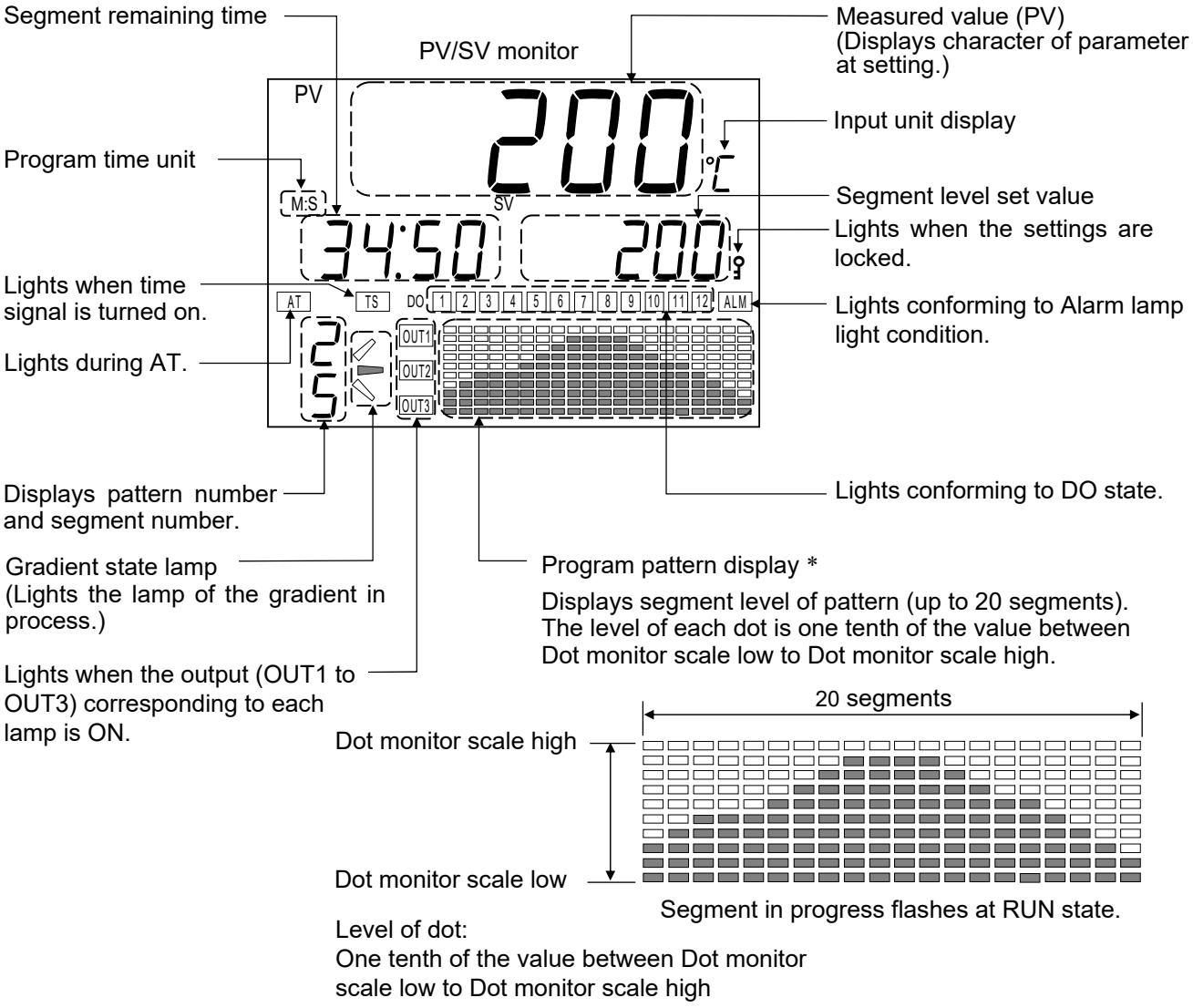
- Communication data

Name	RKC communication		Modbus		Attribute	Data range	Factory set value
	Identifier	Digits	Register address				
			DEC	HEX			
Operation mode transfer	XM	7	43	002B	R/W	0 to 3 0: Reset mode (RESET) 1: Program control mode (RUN) 2: Fixed set point value control mode (FIX) 3: Manual control mode (MAN)	0

☞ For Host communication, refer to **7. HOST COMMUNICATION [OPTIONAL]** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

5.4 Program Control Operation

5.4.1 Program control mode display



* To display Program pattern, select Program pattern type at Dot monitor type (ddtP) of F10.02 in the Engineering mode (P. 4-32).
(Factory set value: Program pattern type)

📖 Set Alarm lamp light condition at F10 in the Engineering mode (P. 4-32).

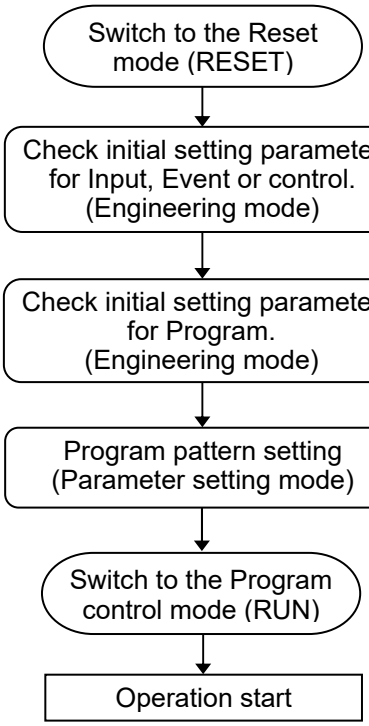
📖 Set DO type at F34 in the Engineering mode (P. 4-38).

📖 Set parameter for Program pattern display at F10 in the Engineering mode.

☞ For Program pattern display, refer to **6.3.1 Graph display selection of** the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

☞ Refer to **6.8 Pattern End (P. 6-17)** for the display of Segment remaining time monitor at Pattern end.

5.4.2 Program control operation procedures



Go to the Reset mode (RESET) to set parameters in the Engineering mode.
☞ Refer to **5.3.2 Operation mode switching (P. 5-8)**.

Before starting operation, confirm that the setting of parameters for Input, Event or control matches the model code as specified when ordered.
Comply with the working conditions when setting other parameters.
☞ Refer to **5.1 Initial Setting (P. 5-1)**.

Set number of pattern or segment to be used, or unit for program time.
☞ Refer to **5.1.4 Check set value of parameter for program control operation (P. 5-6)**.

Set parameter for pattern or segment of program.
☞ Refer to **5.4.3 Set up program patterns (P. 5-12)**.

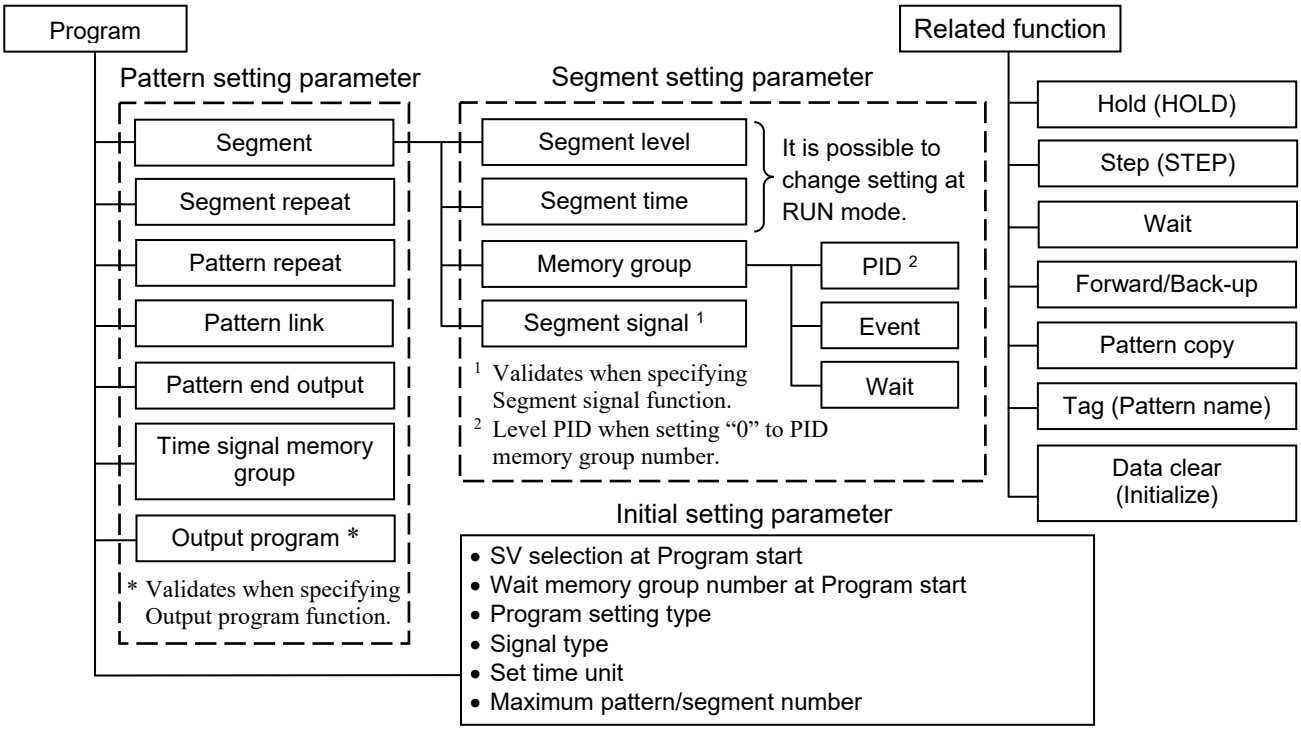
Go to the Program control mode (RUN) to start program operation.
☞ Refer to **5.4.4 Start/End Program control (P. 5-20)**.

5.4.3 Set up program patterns

■ Configuration parameter for program

Program consists of parameters for pattern setting, segment setting, initial setting and function setting of program operation. It is possible to set 99 patterns and 1024 segments at the maximum. (Up to 99 segments for each pattern)

☞ For the parameter, refer to **6. PROGRAM CONTROL (P. 6-1)**.



■ Setting example of program pattern

• Setting example of the program pattern is described by using the following data:

Pattern number	1				
Segment number	SEG1	SEG2	SEG3	SEG4	SEG5
Segment level	150 °C	150 °C	250 °C	250 °C	100 °C
Segment time	30 min.	45 min.	45 min.	70 min.	40 min.
PID memory group number	1	1	2	2	1
Event memory group number	1	1	1	1	1
Wait memory group number	1	1	1	1	1

SEG: Segment
TS: Time signal

Time signal memory group number	1	
Time signal memory number	1	2
Time signal output assignment	TS1	TS1
Start segment of time signal	2	4
Time signal start time	10 min.	15 min.
End segment of time signal	3	5
Time signal end time	20 min.	10 min.

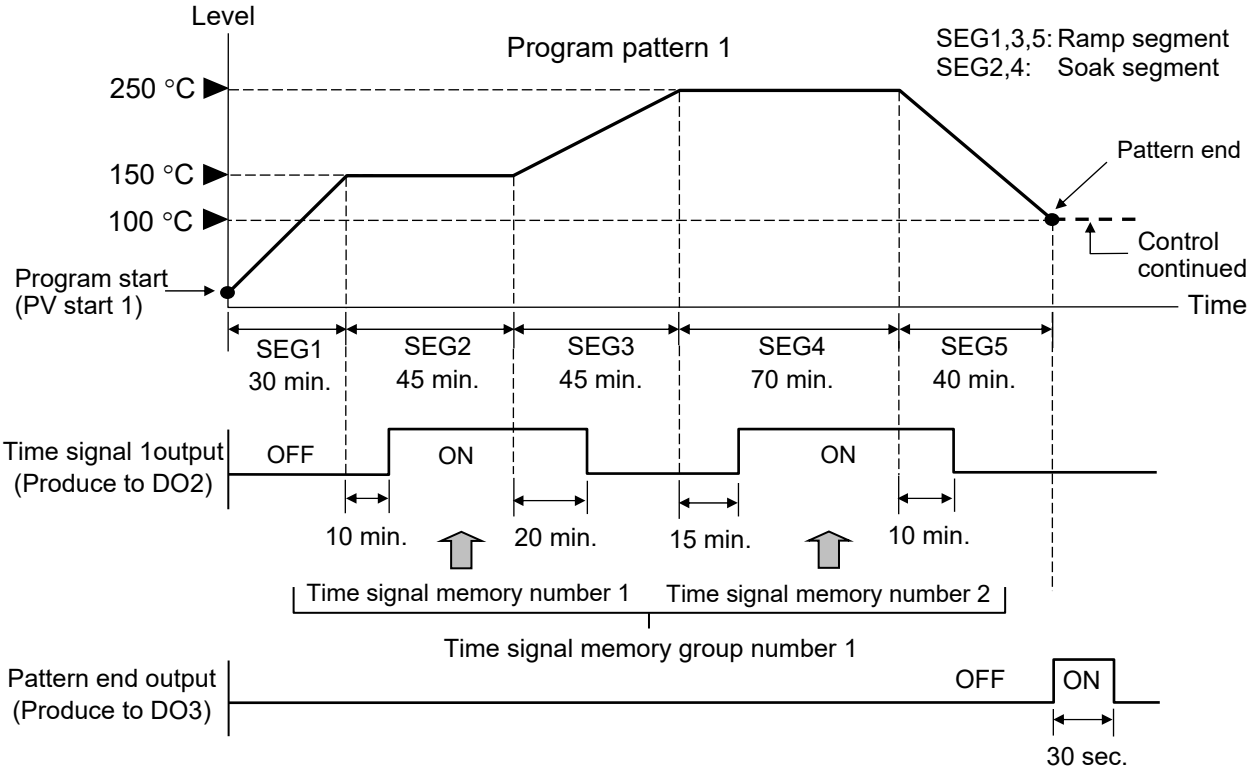
Pattern repeat execution time	2
Link pattern number	1 (No pattern link)
Pattern end output duration	30 sec.
Wait zone high	10 °C
Wait zone low	–10 °C
Wait release trigger selection	Zone wait 1

• Refer to the following values for the Initial setting parameters:

Function block 34 (F34.)	
DO2 assignment	1: Time signal 1
DO3 assignment	25: Pattern end signal
Function block 50 (F50.)	
Control action at Pattern end	0: Control continued

Function block 80 (F80.)	
SV selection at Program start	1: PV start 1 [Time fixed type]
Wait memory group number at Program start	0: Wait OFF
Program setting type	1: Partial setting type
Signal type	0: Time signal type
Set time unit	1: Minute : Second
Maximum pattern number	32: 32 pattern
Maximum segment number	32: 32 segment

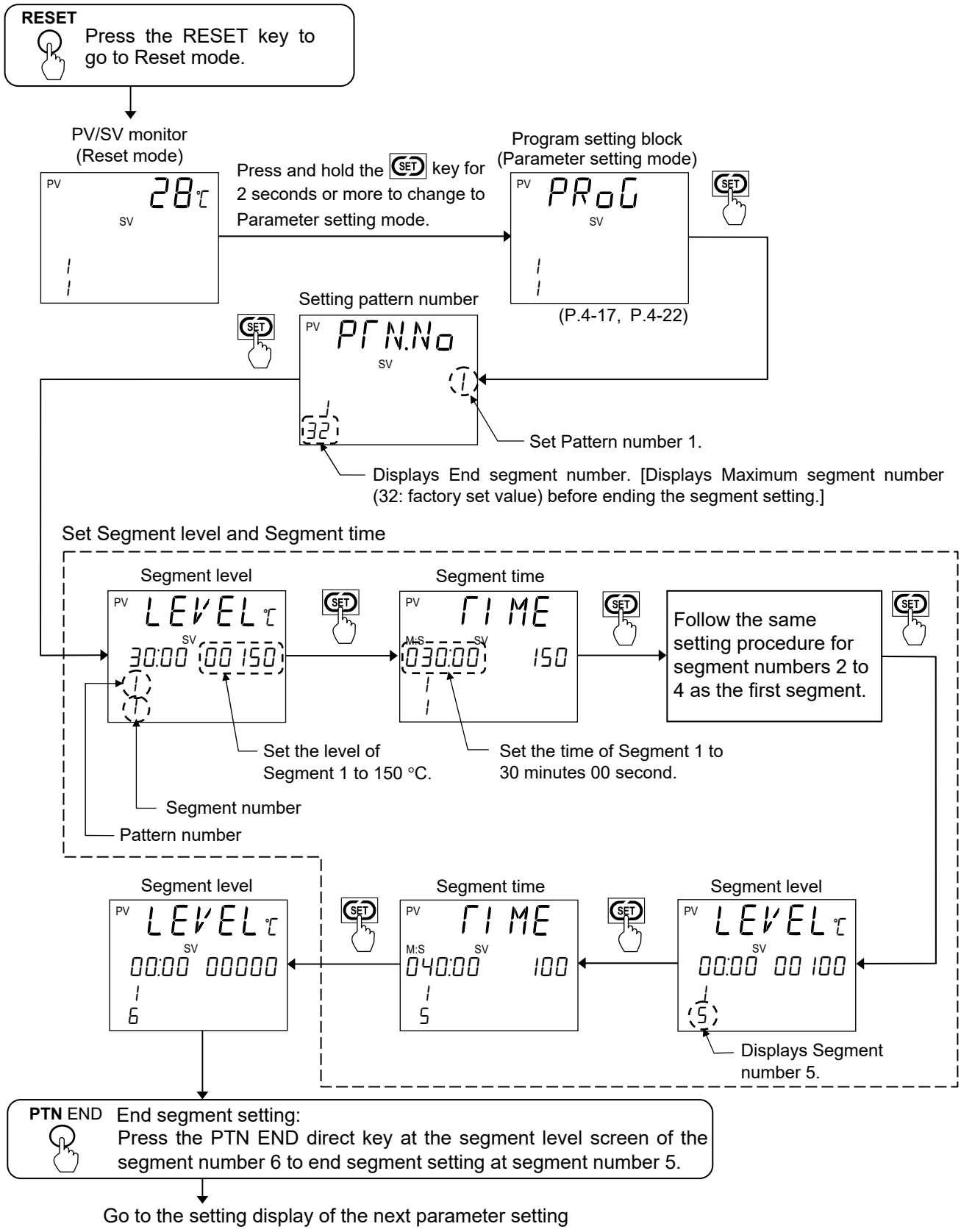
☞ For the initial setting parameter, refer to **4.5.5 Engineering mode (P. 4-32) and 5.1.4 Check set value of parameter for program control operation (P. 5-6)**.

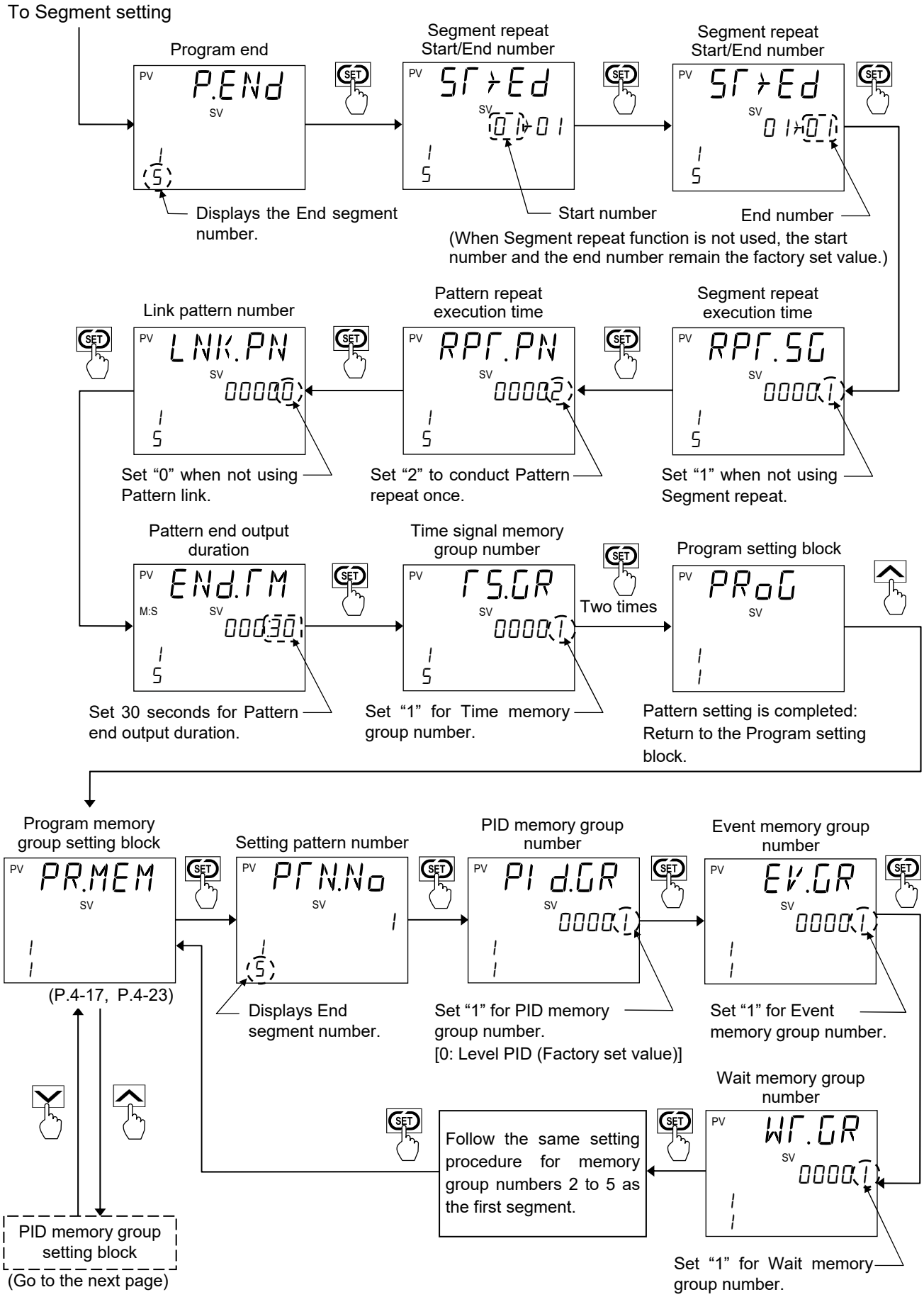


■ Setting procedure for program pattern

Setting procedure of the program pattern is described by using the parameters of the setting example and the Partial setting type (Factory set value).

☞ For Batch setting type, refer to ■ **Parameter switching [Batch setting type]** of **4.5.3 Parameter setting mode (P. 4-27)**.





☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

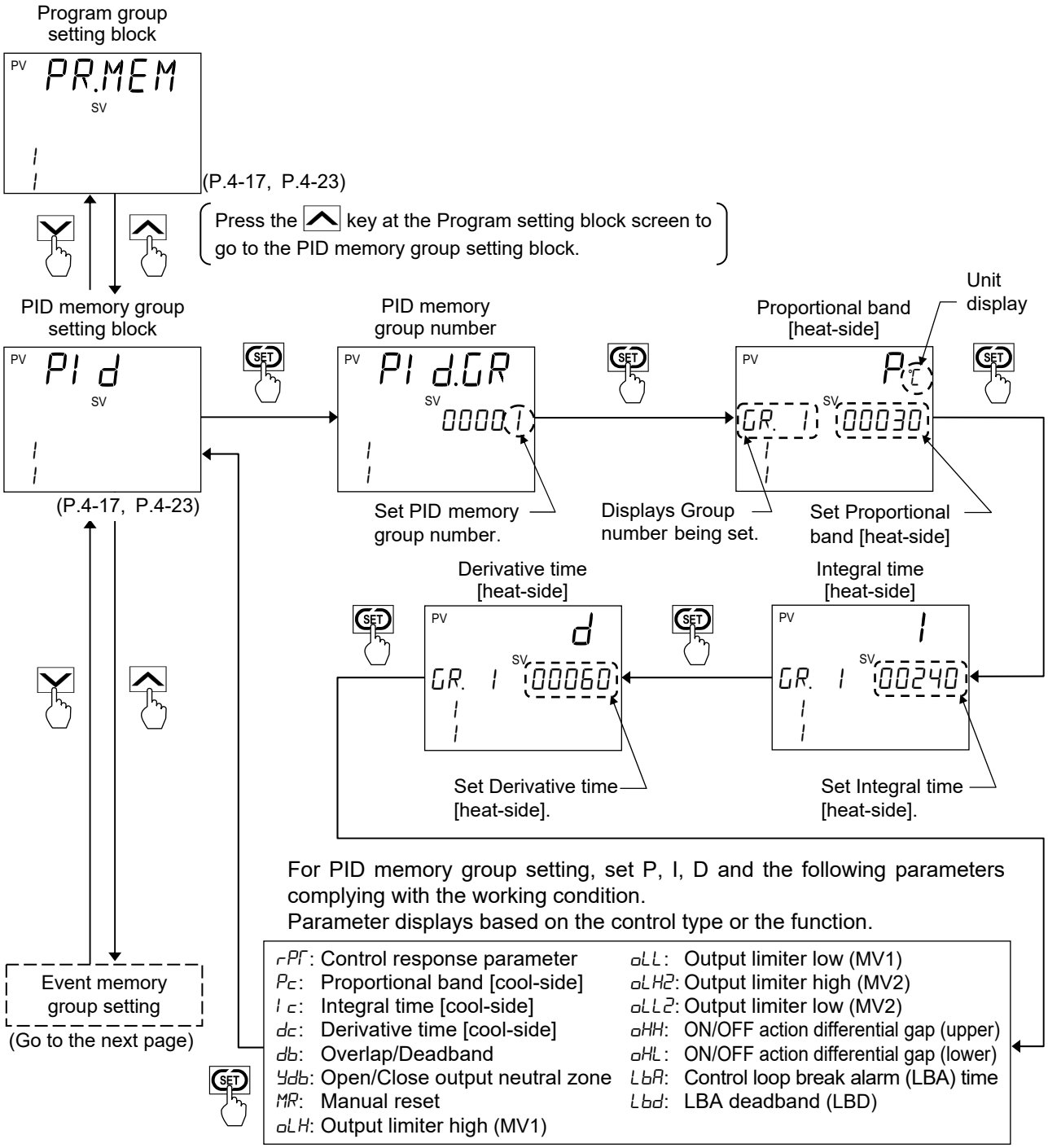
■ Parameter setting procedure for Memory group

Set the parameter of the following Memory groups after completing Program pattern setting.

- PID memory group
- Event memory group
- Wait memory group
- Time signal memory group

☞ For Memory group function, refer to **6.1 Memory Group (P. 6-2)**.

● Parameter setting for PID memory group



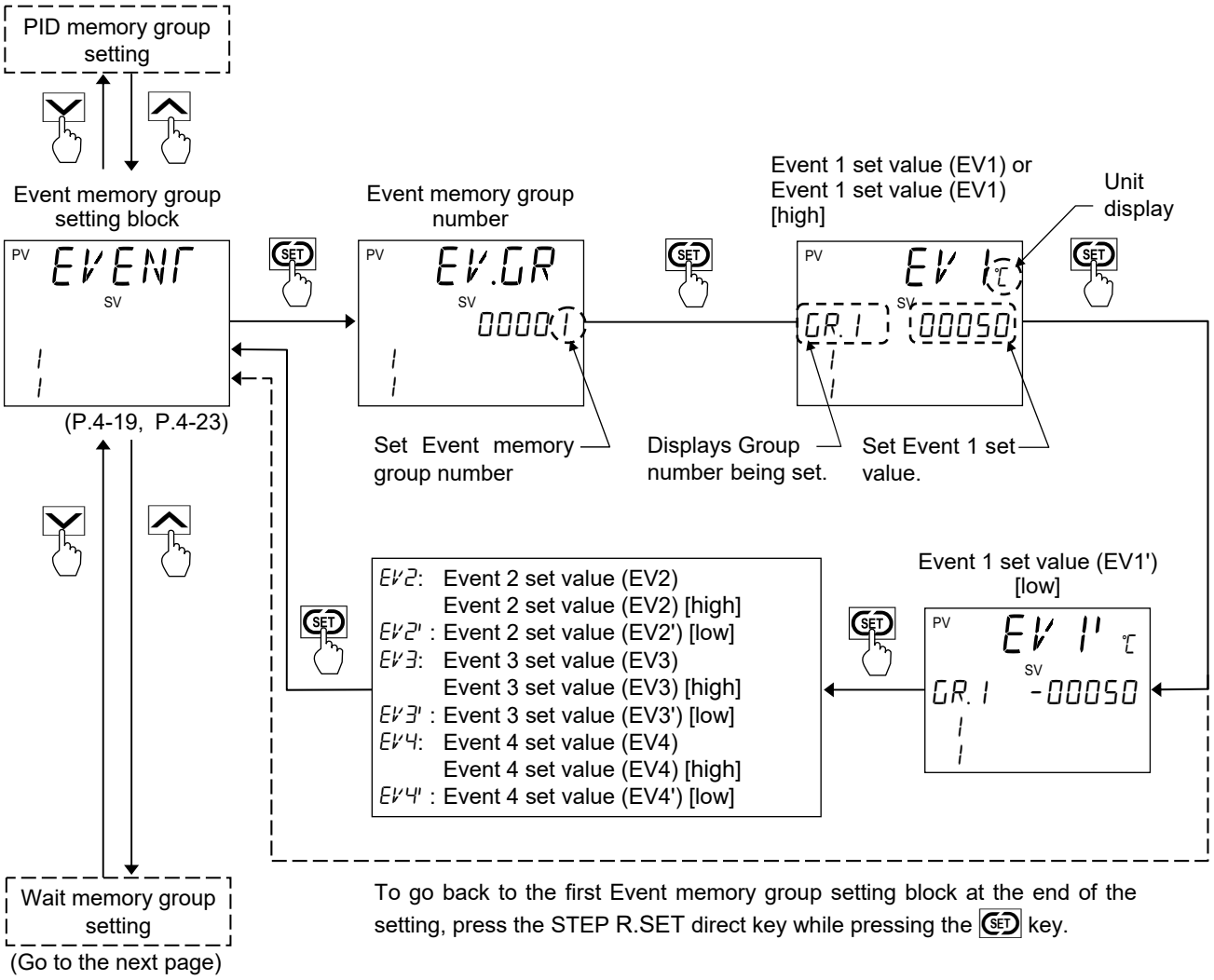
- Set the parameters for PID memory group number 2 in the same setting procedure as group number 1.

☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

☞ For the parameters related to control, refer to **6.5 Control** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

● Parameter setting for Event memory group

Set the Event memory group after PID memory group.



Event set value from 1 to 4 (EV1 to EV4) [high] and Event set value from 1 to 4 (EV1' to EV4') [low] display when selecting Deviation high/low (High/Low individual setting) or Band (High/Low individual setting) at function blocks from 41 (F41.) to 44 (F44.) in the Engineering mode.

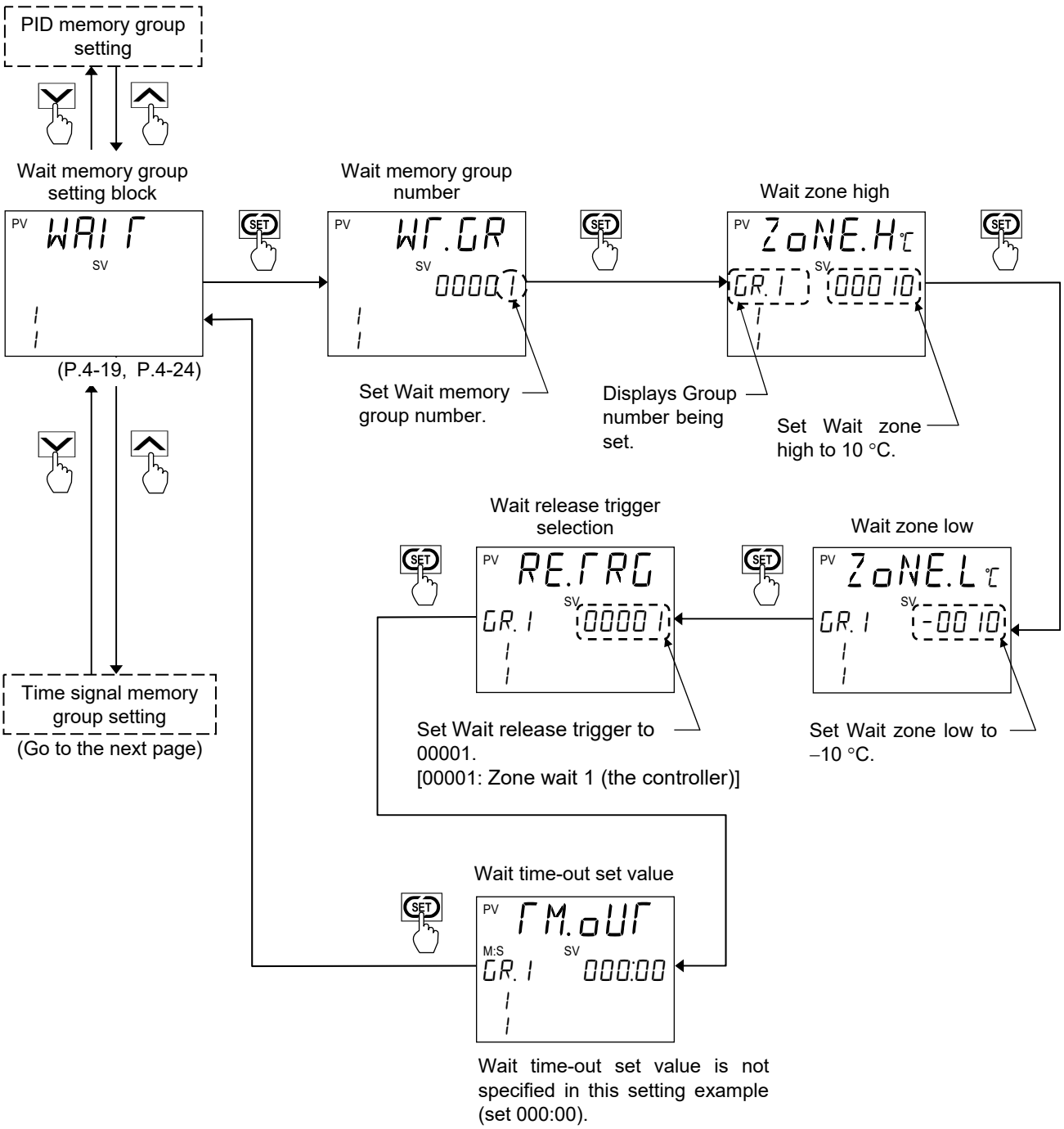
When setting "0" to Event type at the function block 41 (F41.) to 44 (F44.) in the Engineering mode, the Event setting screens for relative parameters do not display. When setting "0" to all parameters of Event 1 to Event 4, all screens related to Event do not display, including the Event memory group setting block screen.

For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

For Event function, refer to **6.4.1 Setting procedure of Event 1 to 4** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

● Parameter setting for Wait memory group

Set the Wait memory group after Event memory group.

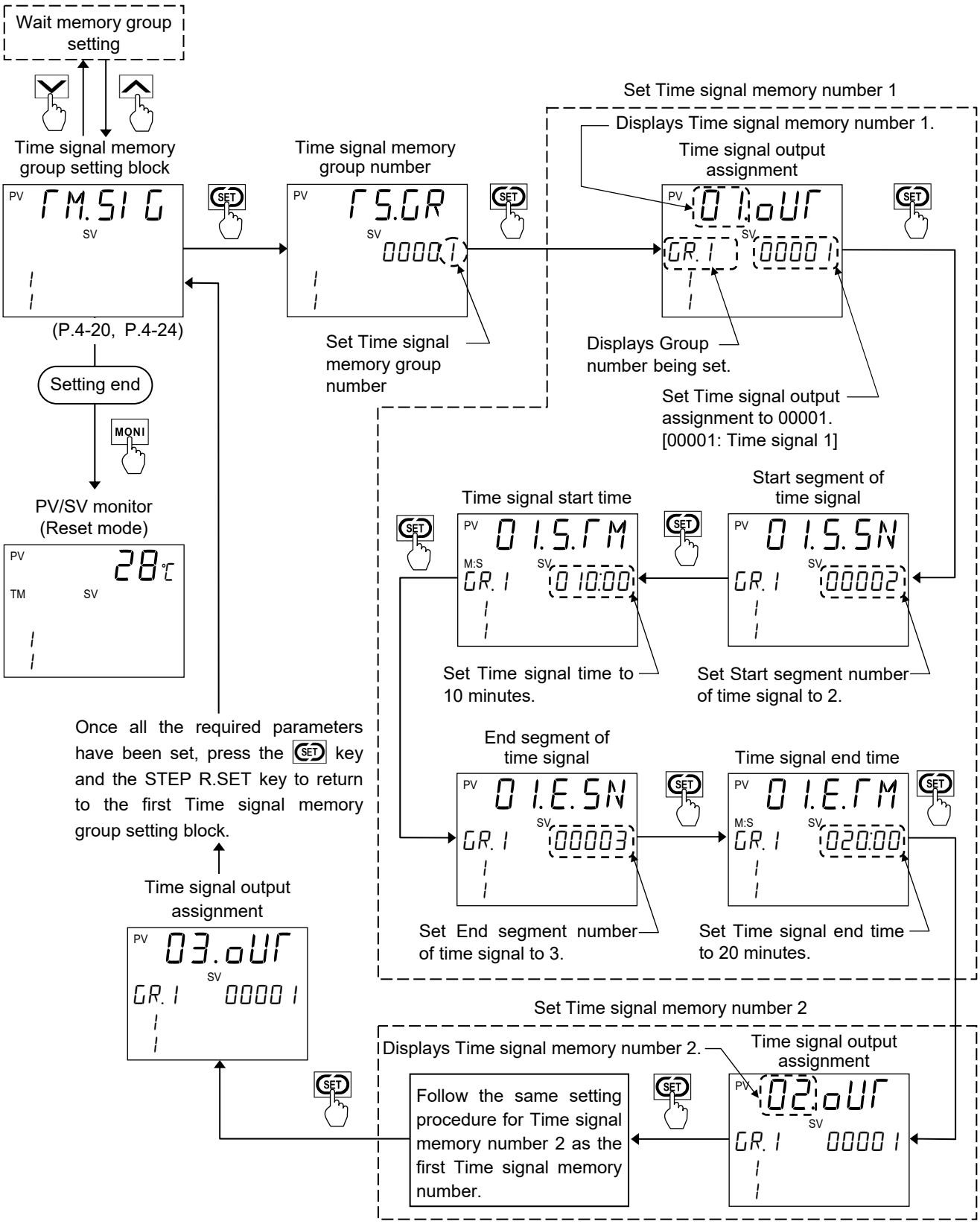


☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

☞ For Wait function, refer to **6.6 Wait (P. 6-10)**.

● Parameter setting for Time signal memory group

Set Time signal memory group after Wait memory group. Time signal memory group consists of time signal setting with 16 memory groups.



☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

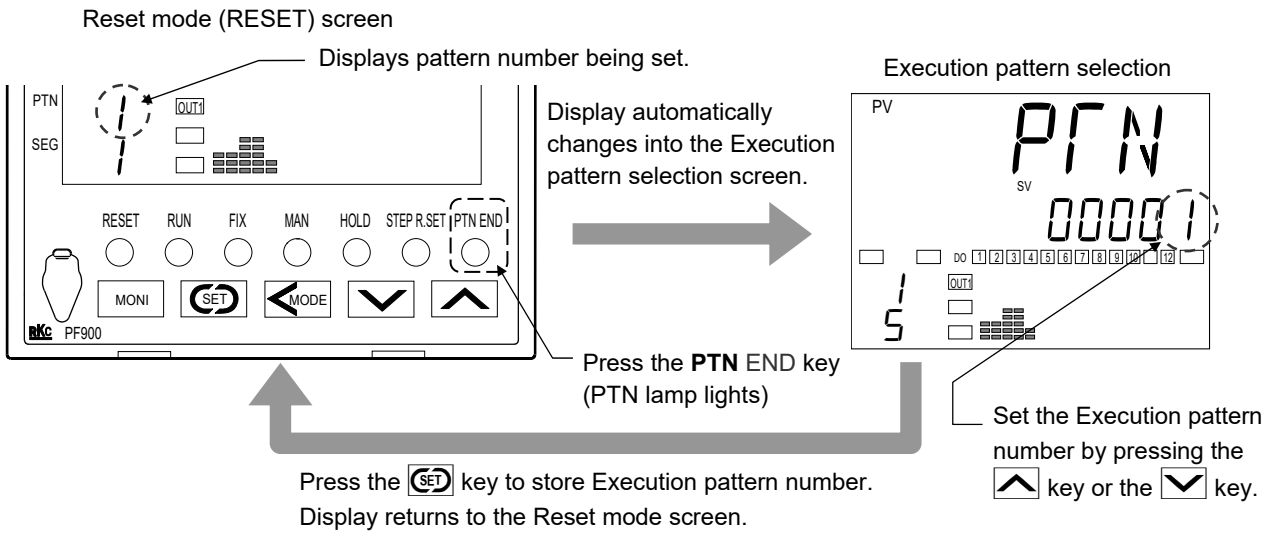
☞ For Time signal function, refer to **6.9 Time Signal (Segment Signal) (P. 6-21)**.

5.4.4 Start/End Program control

■ Start Program control

● Execution pattern selection

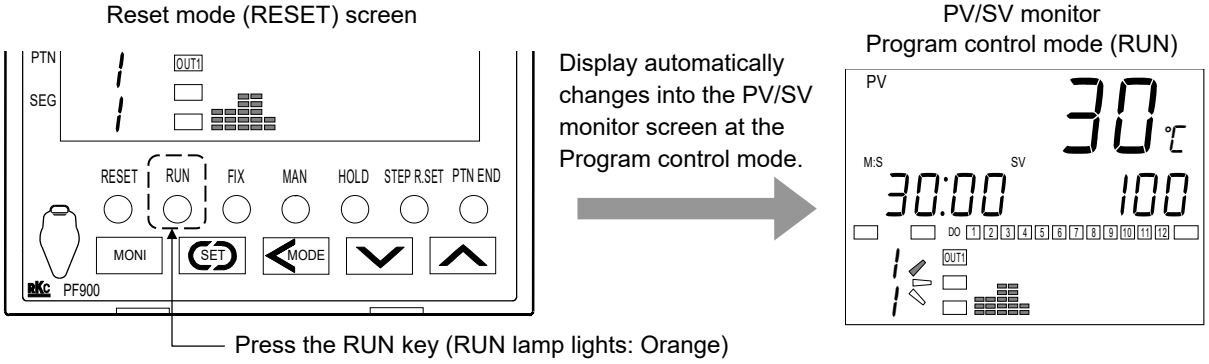
Press the PTN END key at the Reset mode (RESET) to go to the Execution pattern selection screen to set the Execution pattern number.



Tag name setting will enable the display to show a tag name instead of the Pattern number. Refer to **6.12 Tag Function (P. 6-31)** for Tag name.

● How to switch to the Program control mode

To switch to the Program control mode (RUN) and start operation, press the RUN key in the Reset mode (RESET).



● Action at switching to the Program control mode

Refer to the table below for action at switching to the Program control mode from the other operation modes.

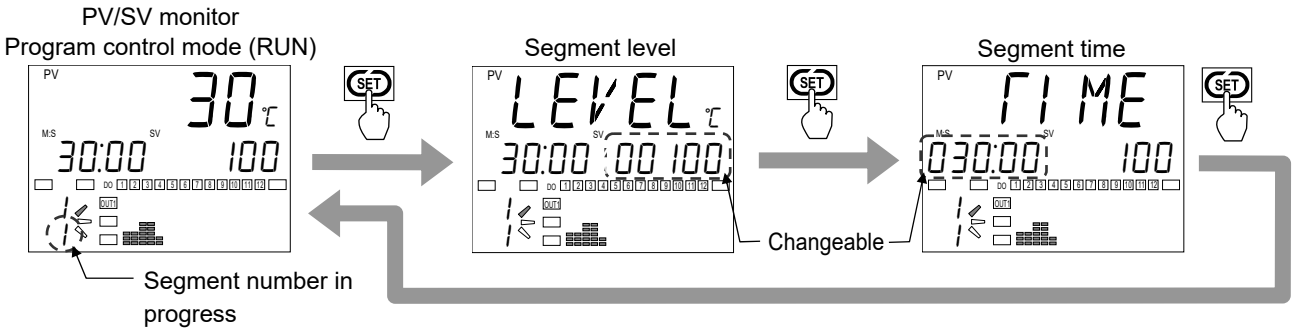
	Operation mode before switching			
Operation mode after switching	Reset mode (RESET)	Program control mode (RUN)	Fixed set point control mode (FIX)	Manual control mode (MAN)
Program control mode (RUN)	Action starts based on the Control computation result.		Action continues with the SV in the Program control mode. [1]	Manual manipulated output value. (Bumpless transfer [2])

[1] Once Program control mode is restarted, the program state will return as it was before switched to the Fixed set point control mode (FIX) or the Manual control mode (MAN). If the Program control mode is switched to the RESET mode, program state will be reset and the operation restarts from the beginning of the program when switching to the Program control mode.

[2] When changing to the operation mode with the control action P, PD or ON/OFF, output may bump when using Bumpless switch (control output does not change rapidly).

● Segment level/Segment time change in the Program control mode (RUN)

Segment level and Segment time in progress may be changed in the Program control mode (RUN).



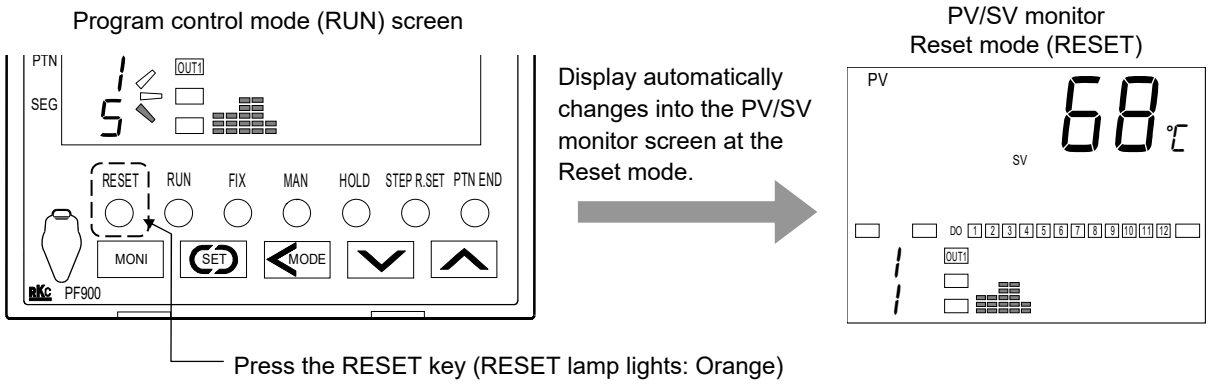
☞ Refer to the following pages for the functions related to the Program control operation.

☞ For the functions related to control such as AT with learning function and Level PID, refer to **6.5 Control** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Stop Program control

Press the RESET key to switch to the Reset mode and stop the operation. When setting certain values to the following parameters, this instrument produces fixed Manipulated output value.

- Set value (SV) in Reset mode (SV) [Factory set value: 0]
- Manipulated output value 1 (MV1) in Reset mode [Factory set value: −5.0 %]
- Manipulated output value 2 (MV2) in Reset mode [Factory set value: −5.0 %]



☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

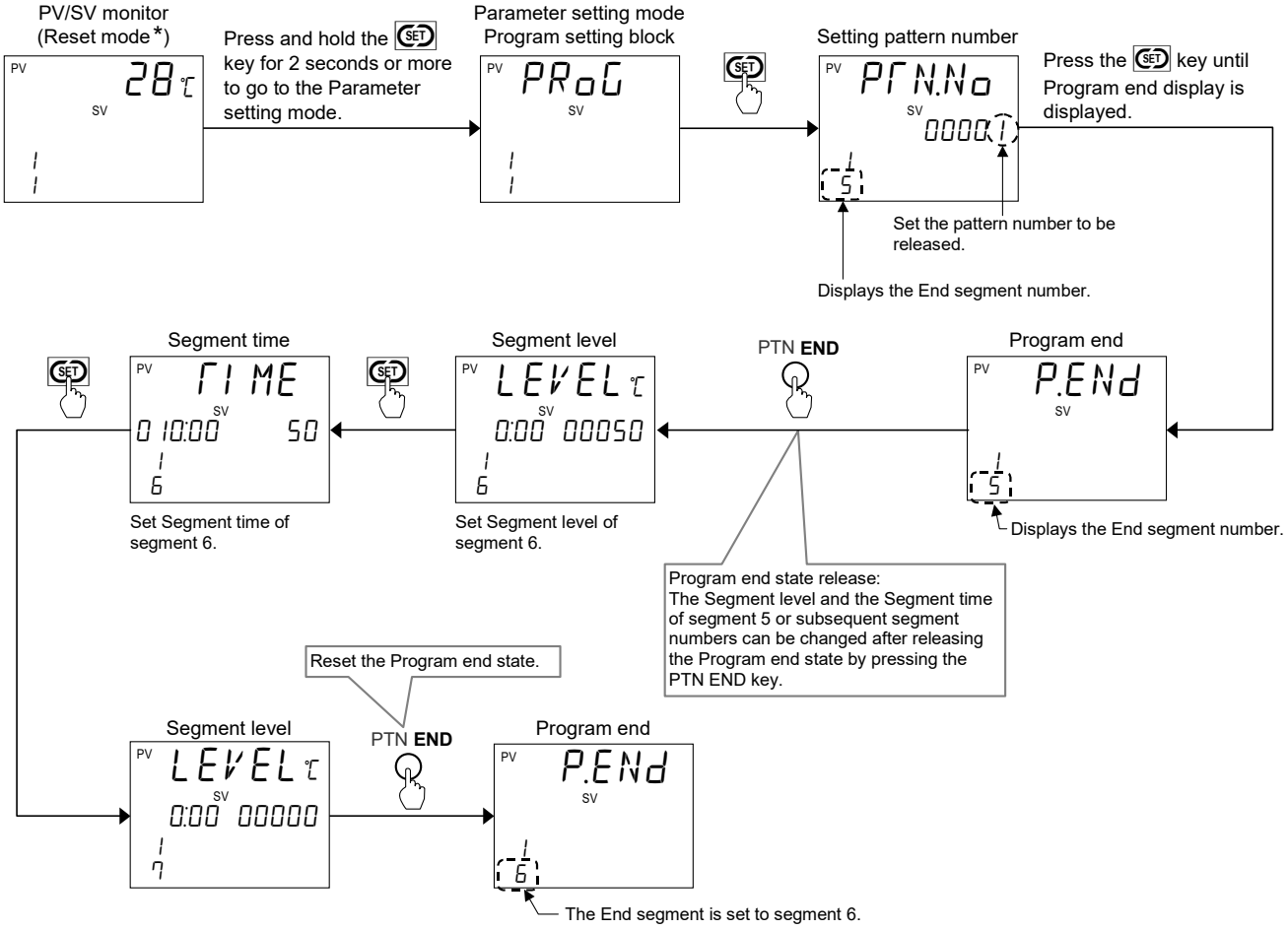
5.4.5 Changing procedure of End segment number in Program pattern

The End segment number in the composed Program pattern can be changed after releasing the Program end state.

■ Releasing procedure

Program end state will be released by switching to the Program end display and pressing the PTN END key.

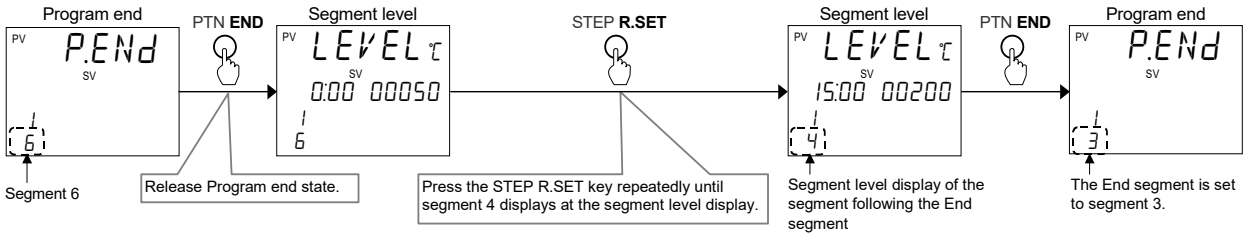
Example: When releasing the Program end state and changing the End segment number from 5 to 6
(Parameter setting in the Parameter setting mode [Partial setting type])



* To release the Program end state in the Program control mode (RUN), the Fixed set point control mode (FIX), or the Manual control mode (MAN), switch to the Parameter setting mode.

To shorten Program pattern:
Then switch to the segment level display of the segment following the End segment and press the PTN END key.

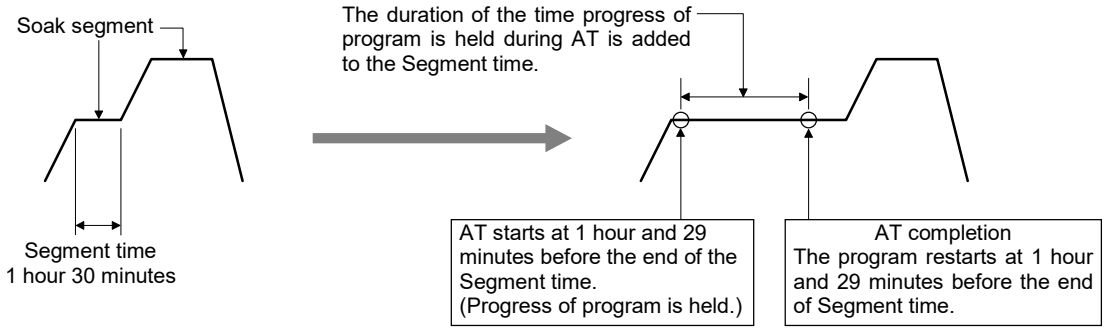
Example: To change the End segment number from 6 to 3:



5.5 Autotuning (AT)

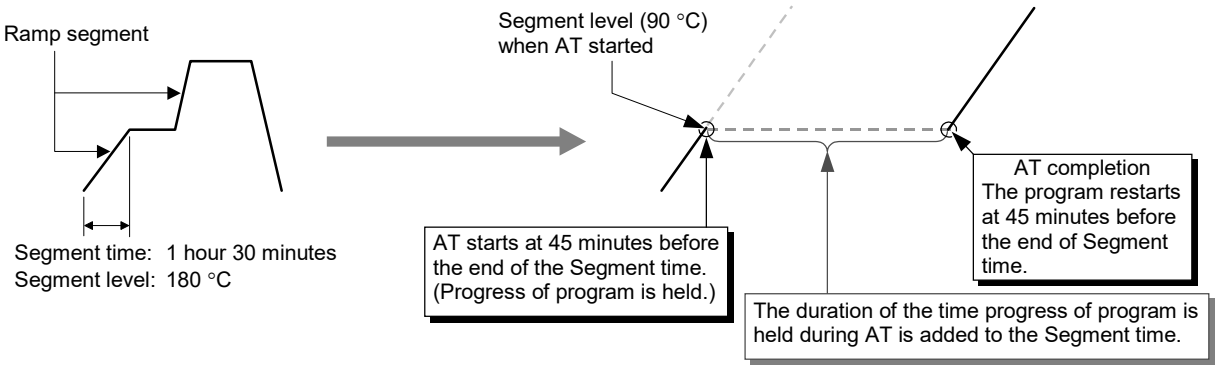
The Autotuning (AT) function automatically measures, computes and sets the optimum PID values.
The AT can be used for PID control (Direct/Reverse action), Heat/Cool PID control, and Position proportioning PID control (Direct/Reverse action).
AT can be activated when the operation is in the Program control mode (RUN) or the Fixed set point control mode (FIX). During AT, progress of the program is held automatically. When AT is finished, the program will restart automatically.

- **When conduct AT at a soak segment**

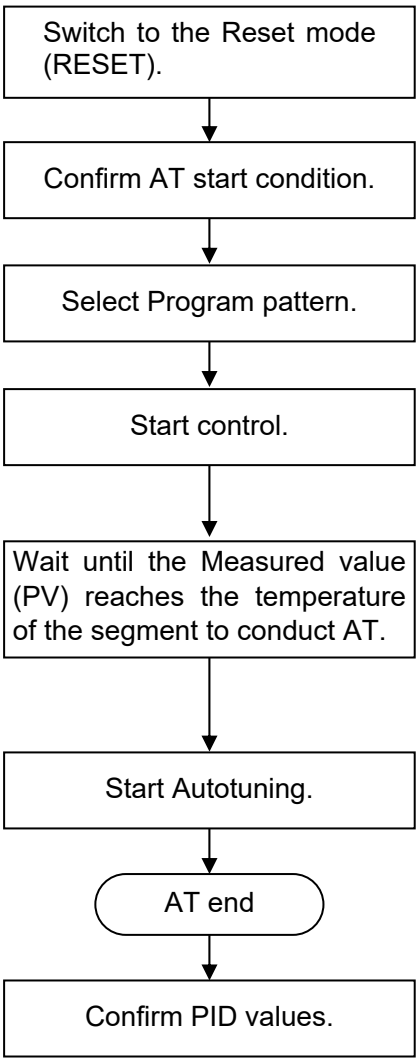


- **When conduct AT at a ramp segment**

AT activates at the Segment level where AT starts when conducting AT at a ramp segment.
During AT, progress of the program is held automatically.
When AT is finished, the program will restart automatically.



■ Operation procedure



Press the RESET key to go to the Reset mode (RESET).

☞ Refer to ■ **Requirements for AT start (P. 5-25)**.

Select Program pattern to conduct AT.
☞ Refer to ● **Execution pattern selection (P. 5-20)**.

Switch to the operation mode to conduct AT.
In Program control mode (RUN): Press the RUN key.
In Fixed set point control mode (FIX): Press the FIX key.

In Program control mode (RUN):
Wait until the Measured value (PV) reaches the temperature of the segment to conduct AT.
In Fixed set point control mode (FIX):
Wait until the Measured value (PV) reaches the temperature to conduct AT.

☞ To start Autotuning (AT), refer to ■ **Setting procedure (P. 5-26)**.

Confirm the PID values computed by Autotuning.
If PID values are not correct for the application, adjust the values manually.

■ Caution for using the Autotuning (AT)

When a temperature change (UP and/or Down) is 1 °C or less per minute during AT, 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.

■ Requirements for AT start

Start the AT when all following conditions are satisfied:
To start AT, go to PID/AT transfer [*AT U*] in Operation mode.

Operation mode state	Operation mode transfer	Program control mode or Fixed set point control mode
	PID/AT transfer	PID control (State before starting AT)
Parameter setting		PID control, Position proportioning PID control: ・Output limiter high (MV1) ≥ 0.1 %, Output limiter low (MV1) ≤ 99.9 % ・Output value with AT turned on ≥ 0.1 %, Output value with AT turned off ≤ 99.9 %
		Heat/Cool PID control: ・Output limiter high (MV1) ≥ 0.1 %, Output limiter low (MV1) ≤ 99.9 % ・Output limiter high (MV2) ≥ 0.1 %, Output limiter low (MV2) ≤ 99.9 % ・Output value with AT turned on ≥ +0.1 %, Output value with AT turned off ≤ −0.1 %
Input value state		The Measured value (PV) is not underscale or over-scale.
		Input error determination point (high) ≥ Measured value (PV) ≥ Input error determination point (low)

■ Requirements for AT cancellation

If the AT is canceled according to any of the following conditions, the controller immediately changes to PID control. The PID values will be the same as before AT was activated.

When the Operation mode is transferred	When the operation mode is changed to the Reset mode (RESET).
	When AT is conducted in the Program control mode (RUN): When switching to the Fixed set point control mode (FIX) or the Manual control mode (MAN) When AT is conducted in the Fixed set point control mode (FIX): When switching to the Program control mode (RUN) or the Manual control mode (MAN)
	When the PID/AT transfer is changed to the PID control.
When the parameter is changed	When changing Segment level or Set value (SV)
	When the PV bias, the PV digital filter, or the PV ratio is changed.
	When changing Output limiter high or low
	When performing Step function
When the input value becomes abnormal	When the Measured value (PV) goes to underscale or over-scale.
	When the Measured value (PV) goes to input error range. (Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV))
When the AT exceeded the execution time	When the AT does not end in nine hours after AT started
Power failure	When the power failure of more than 20 ms occurs.
Instrument error	When the instrument is in the FAIL state.

■ Where to store computed PID value by regular Autotuning (AT)

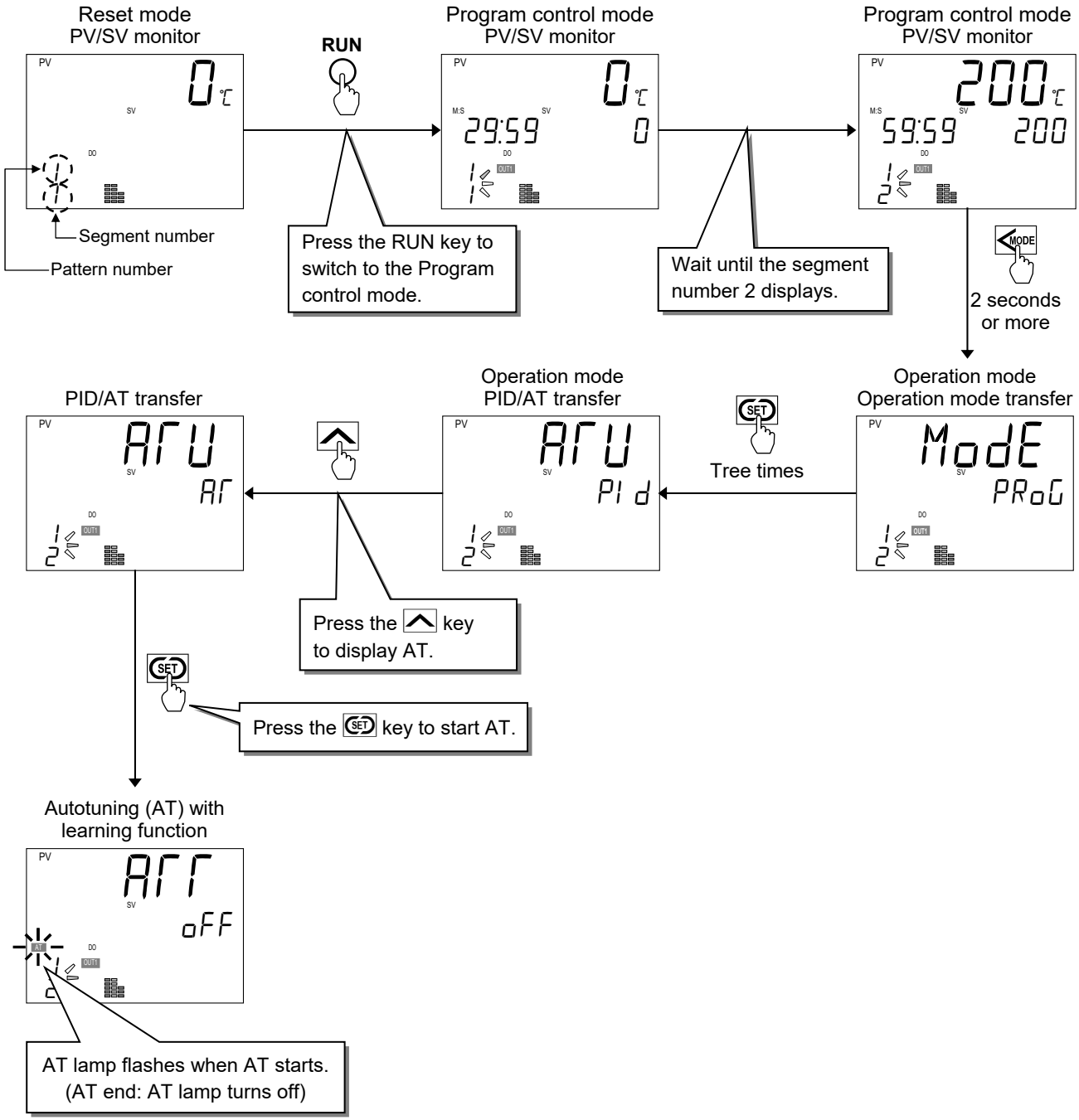
For Program control mode (RUN):
AT-computed PID values are stored in PID memory group being set for each segment.

For Fixed set point control mode (FIX):
AT-computed PID values are stored in PID memory group being set by PID memory group number [*PI d. GR*] in the Fixed set point control mode (FIX).

■ Starting Autotuning (AT)

"AT ON" or "AT OFF" can be set by Operation mode PID/AT transfer.

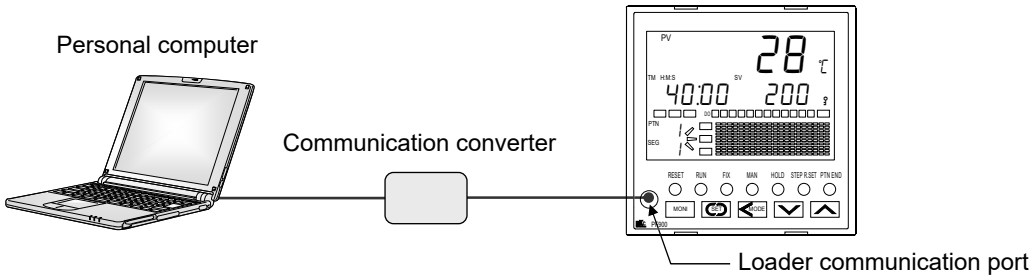
Example: When computing PID values of segment 2 (soak segment) of Program pattern 1



To conduct AT in the Fixed set point control mode (FIX), press the FIX key at the PV/SV monitor screen in the Reset mode. Follow the setting procedure described above to conduct AT in the Fixed set point control mode (FIX).

5.6 Parameter Setting via Loader Communication

Use the Communication Tool PROTEM2 for parameter setting by loader communication. It is possible to use loader communication for the instrument without communication function (optional).



NOTE

Loader communication is for set up only. Do not use for data logging during operation.

Loader communication ports are located in the front and at the bottom of the instrument. Both ports cannot be used at the same time.

Use W-BV-03 loader communication cable to connect COM-K2 or COM-KG to the loader communication port in front.

5.6.1 Preparation

Prepare the following items for parameter setting by loader communication:

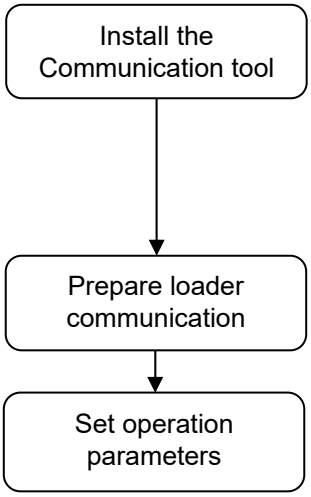
- Personal computer (with USB port)
- USB communication converter (RKC product) COM-K2 or COM-KG
- Loader communication cable

  W-BV-03: Connect to the loader communication port in front (Standard cable length: 1.5 m supplied with COM-K□-3)

  W-BV-01: Connect to the loader communication port at the bottom (Standard cable length: 1.5 m supplied with COM-K□-1)
- USB cable (Standard cable length: 1 m supplied with COM-K2 or COM-KG)
- Communication Tool PROTEM2
- USB driver for COM-K2 (Installation of the USB driver is not necessary when the COM-KG is used on Windows 10.)

5.6.2 Instructions for use

To set parameters by loader communication, follow the instructions below.



The Communication Tool PROTEM2 (and the USB driver for COM-K2) can be downloaded from the official RKC website.

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

☞ Refer to **5.6.3 Connections for loader communication (P. 5-28)** for Connecting to loader communication.

☞ To set parameters to be used for the operation, refer to **5.6.4. Parameter setting (P. 5-29)**.

5.6.3 Connections for loader communication

Connect PF900/901, COM-K2 (or COM-KG) and the personal computer by using the USB cable and loader communication cable. Confirm the orientation of the connector before connecting the cables.

NOTE

Both loader communication ports cannot be used at the same time.

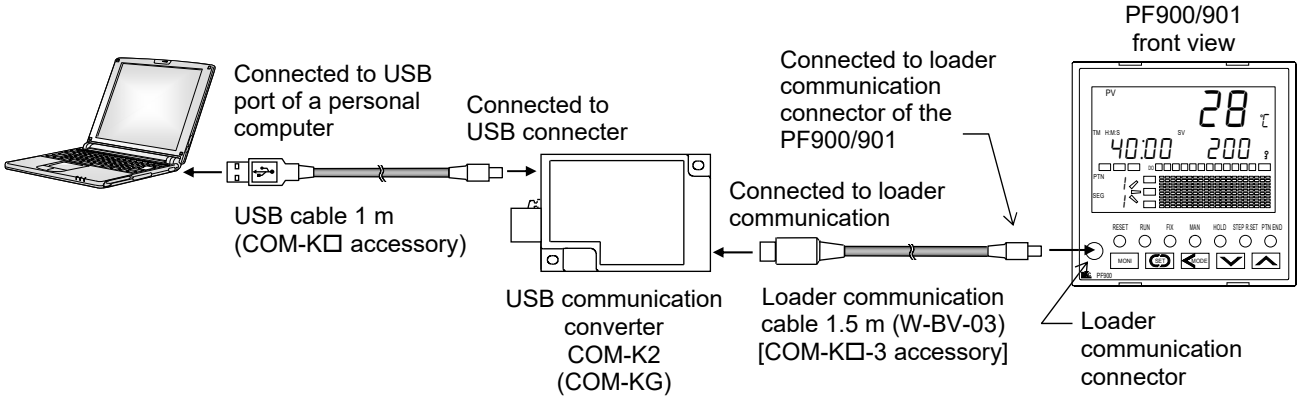
- Communication port of host computer
  USB port: Based on USB Ver. 2.0
- Communication settings on the computer (Values other than the communication port are fixed.)
  Communication speed: 38400 bps
  Start bit: 1
  Data bit: 8
  Parity bit: None
  Stop bit: 1
- The device address for Loader communication is fixed at "0."
  The setting of the device address is disregarded.

■ When using the loader communication port in front

Use COM-K2 or COM-KG communication converter and W-BV-03 loader communication cable.

NOTE

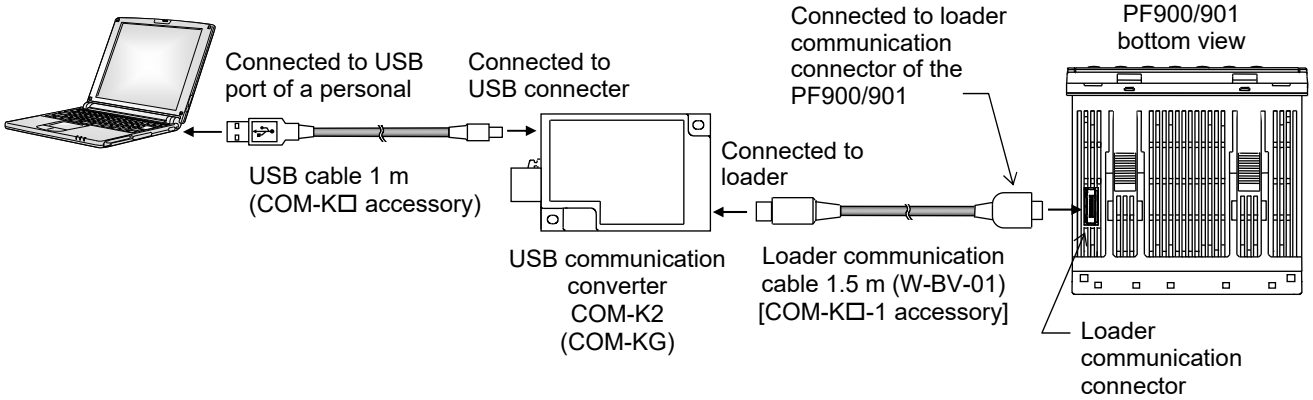
Turn ON the PF900/901 first when using the loader communication port in front.



■ When using the loader communication port at the bottom

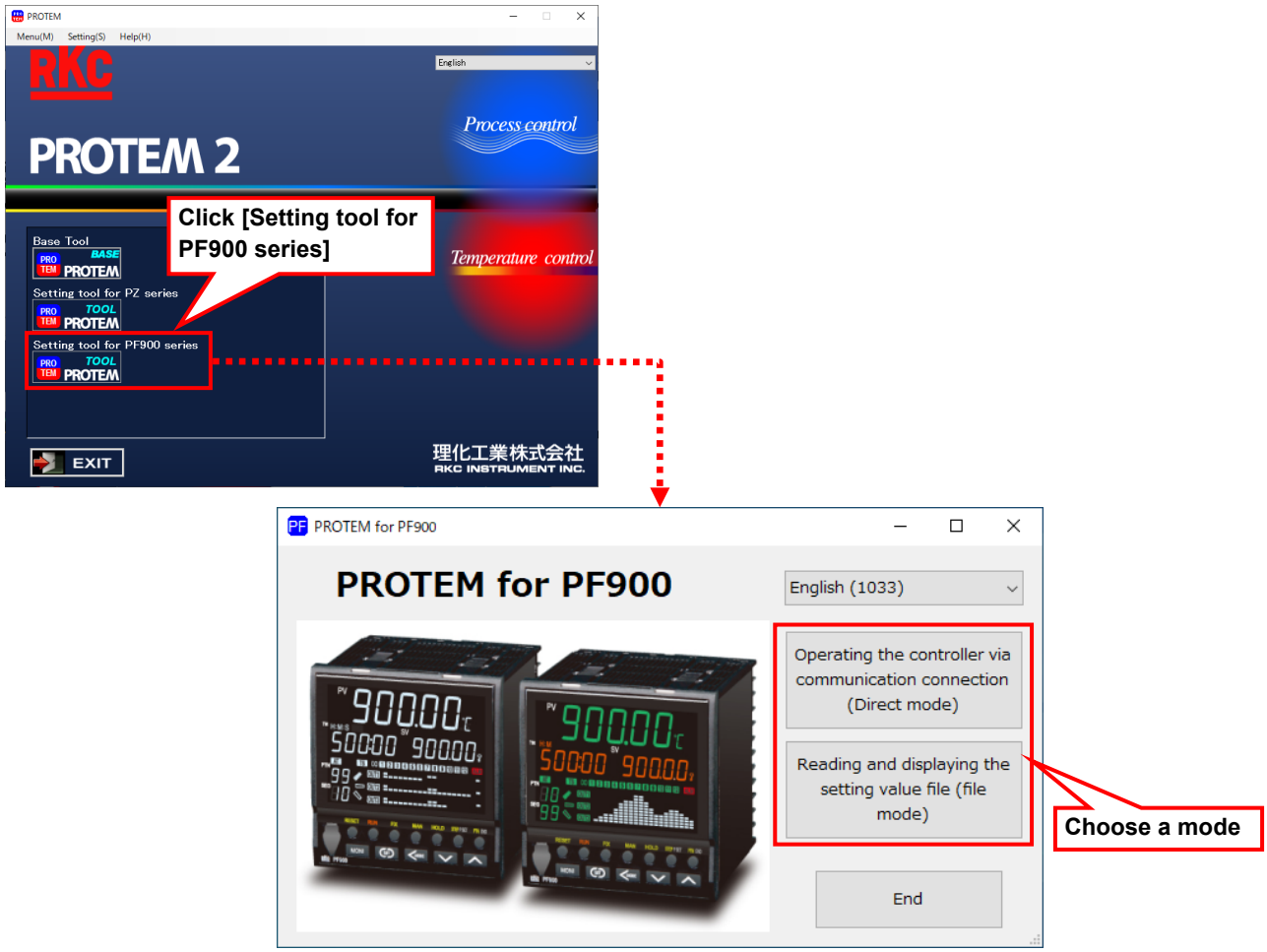
Use COM-K2 or COM-KG communication converter and W-BV-01 loader communication cable.

PF900/901 may be OFF when using the loader communication port at the bottom.



5.6.4 Parameter setting

Start the Communication Tool PROTEM2 and select the Direct mode or the File mode at the opening display.



Opening display

MEMO

6. PROGRAM CONTROL

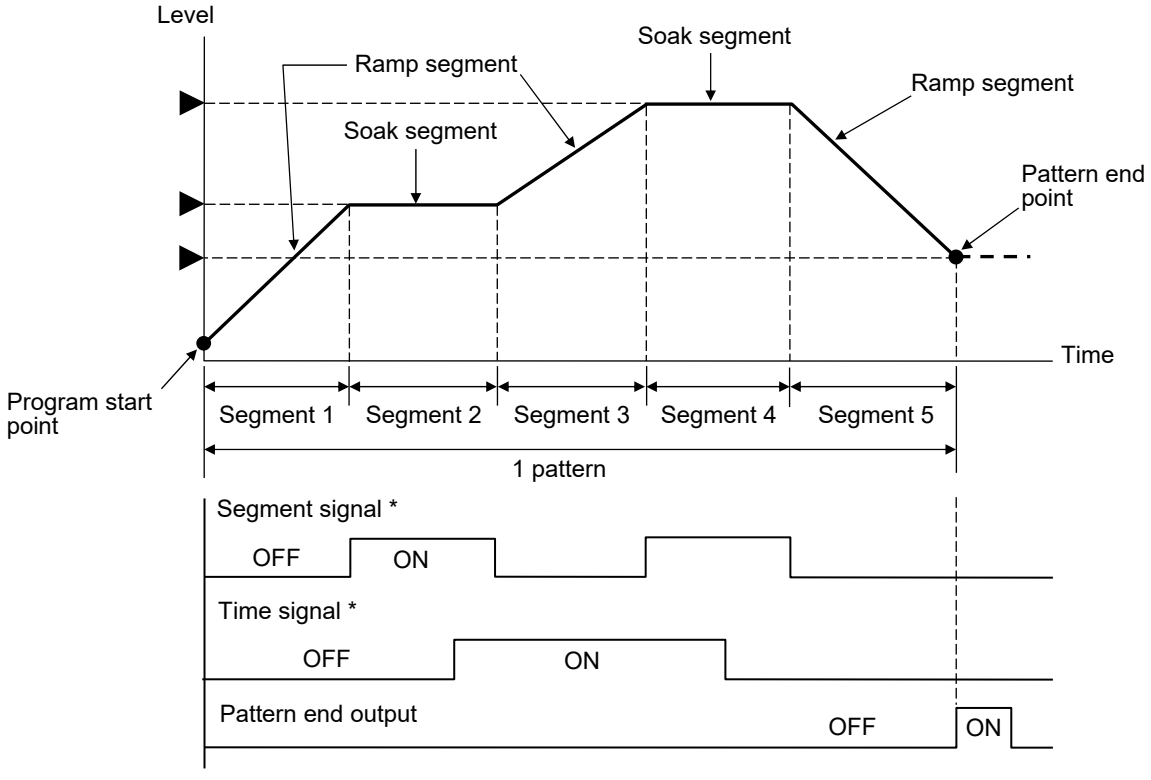
Program control operation allows specific operation of the controlled object by programming Segment levels (Set value of segment) and tracking the program progress.

☞ For the program control operation, refer to **5.4 Program Control Operation (P. 5-11)**.

■ Program configuration

- The change in Segment level from the beginning to the end of the program is defined as “Pattern.” It is possible to store up to 99 patterns.
- A pattern consists of section called “Segment.” Pattern is composed by setting Segment level (Set value of the segment) and Segment time (duration of the segment).
  It is possible to set 1024 segments maximum (up to 99 segments for one pattern).
- PID setting, Event function and Wait function can be set in each segment by using the PID memory group, Event memory group and Wait memory group. Time signal and Output program are activated by setting the Memory group of each pattern.
- Functions of Program control operation: Program control start selection, Search function, Hold, Step, Wait, Repeat, Pattern link, Pattern end, Time signal, Segment signal, Output program, Forward/Back-up function, Pattern remaining time monitor, Pattern copy/data clear and Tag function.

Example of Program pattern configuration



* The Segment signal and Time signal cannot be used at the same time.

6.1 Memory Group

PID values, Event, Wait, Time signal and Output program can be stored in a memory group.
A Memory group is set by segment or pattern.

■ Memory group to be set by segment

PID memory group: (P. 4-18)

Number of group: Up to 8 groups

Setting items:

- PID memory group number
- 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
- Open/Close output neutral zone
- Manual reset
- Output limiter high (MV1)
- Output limiter low (MV1)
- Output limiter high (MV2)
- Output limiter low (MV2)
- ON/OFF action differential gap (upper)
- ON/OFF action differential gap (lower)
- Control loop break alarm (LBA) time
- LBA deadband (LBD)

Event memory group: (P. 4-19)

Number of group: Up to 8 groups

Setting items:

- Event memory group number
- 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]

Wait memory group: (P. 4-19)

Number of group: Up to 8 groups

Setting items:

- Wait memory group number
- Wait zone high
- Wait zone low
- Wait release trigger selection
- Wait time-out set value

■ Memory group to be set by pattern

Time signal memory group: (P. 4-20)

Number of group: Up to 16 groups (Up to 16 memories for each group)

Setting items:

- Time signal memory group number
- Time signal output assignment
- Start segment of time signal
- Time signal start time
- End segment of time signal
- Time signal end time

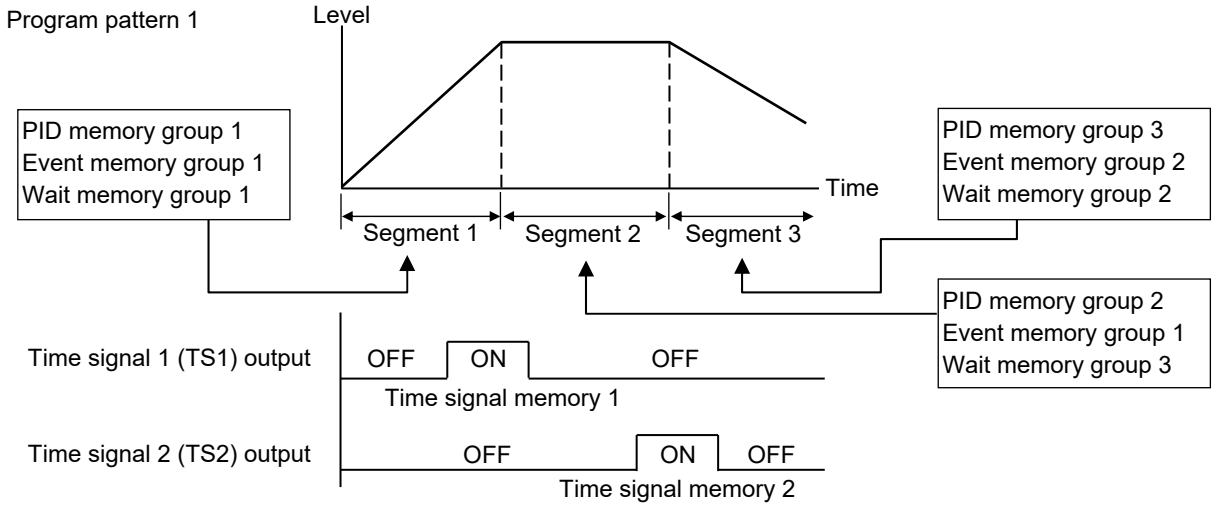
Output program memory group: (P. 4-20)

Number of group: 128/Maximum number of segments (Up to 99)
Maximum number of segments:
Number of pattern × Number of segments

Setting items:

- Output program memory group number
- Output program value 1
- Output program value 2
- Output program value 3

■ Setting example of Memory group



Pattern number	1		
Segment number	1	2	3
PID memory group number	1	2	3
Event memory group number	1	1	2
Wait memory group number	1	3	2

Time signal memory group number	1	
Time signal memory number	1	2
Time signal output assignment	1	2

6.2 Program Control Start Selection

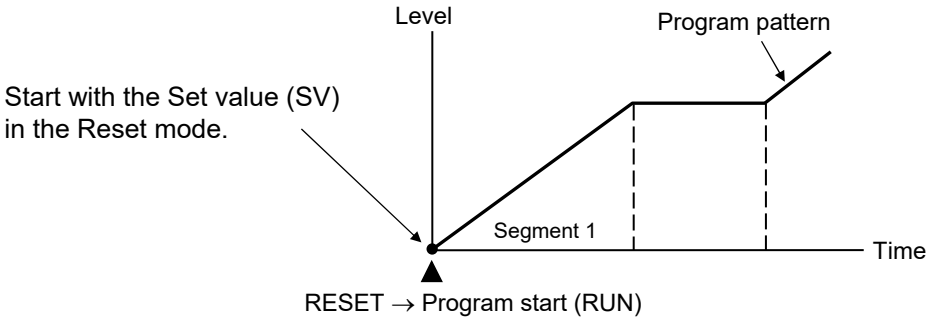
Segment level and action at Program control start are selectable from the following 5 types of SV at Program start (P. 4-29, P. 6-6) in the Setup setting mode.

- Start with the Set value (SV) in the Reset mode.
- PV start 1 [Time fixed type]
- PV start 2 [Time saving & ramp holding type] (Factory set value)
- PV start 3 [Time saving & level searching type/with HOLD function at start]
- PV start 4 [Time saving & level searching type/without HOLD function at start]

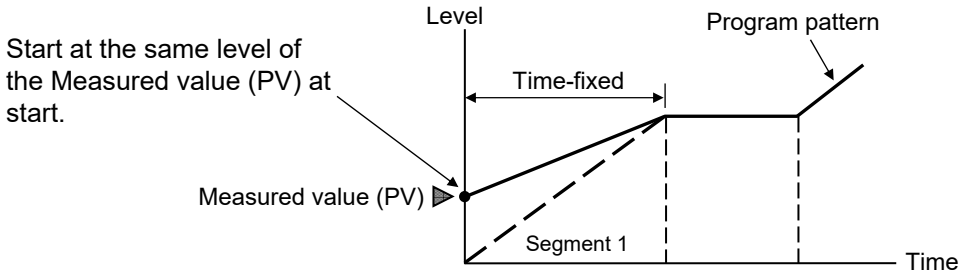
Wait function is available at Program control start. To set Wait function condition at Program control start, select Wait memory group number (P. 4-43, P. 6-6) at F80 in the Engineering mode.

6.2.1 Description of function

■ Start with the Set value (SV) in the Reset mode



■ PV start 1 [Time fixed type]



Actions when the Measured value (PV) at start exceeds the input range:

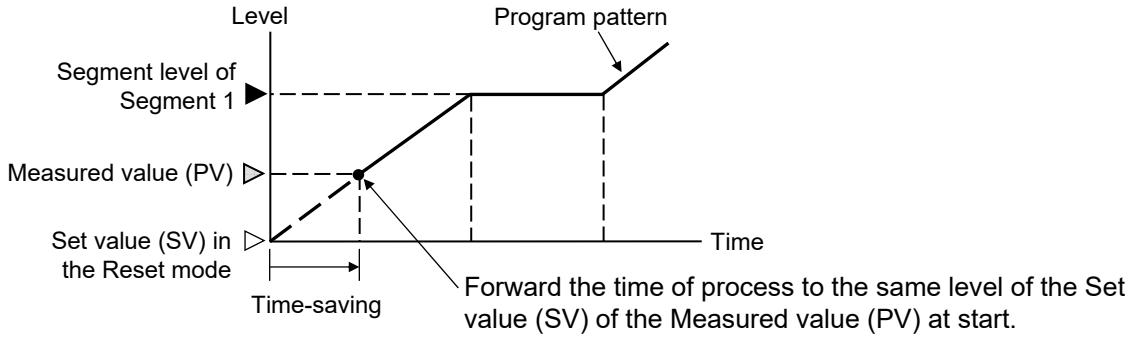
- Measured value (PV) > Input range high: Starts from the Input range high.
- Measured value (PV) < Input range low: Starts from the Input range low.

■ PV start 2 [Time saving & ramp holding type] (Factory set value)

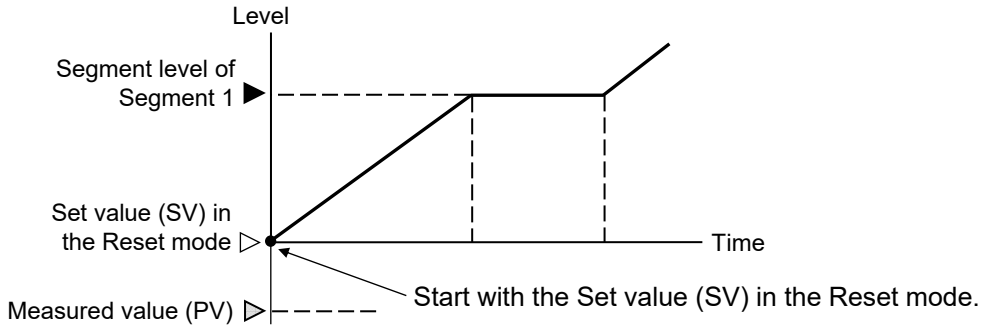
Start point varies by Measured value (PV) at start, Segment level of Segment 1 and Set value (SV) in the Reset mode.

● When Set value (SV) in the Reset mode is smaller than the Segment level of the Segment 1

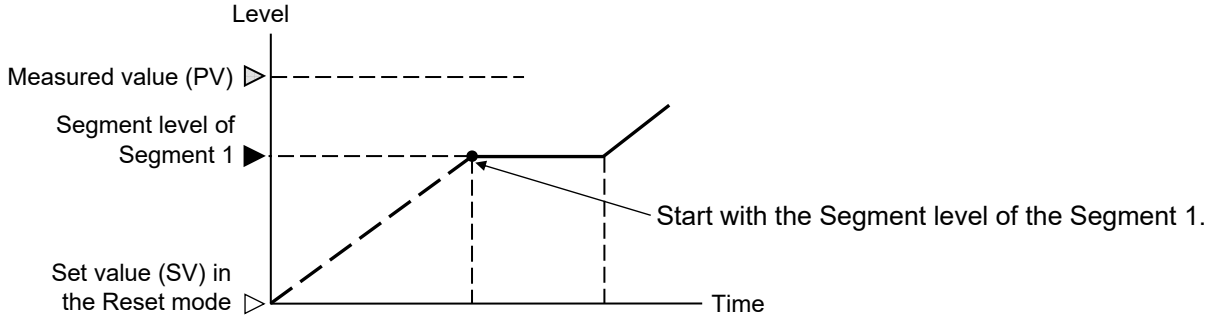
- Set value (SV) in the Reset mode < Measured value (PV) < Segment level of Segment 1



- Set value (SV) in the Reset mode ≥ Measured value (PV)

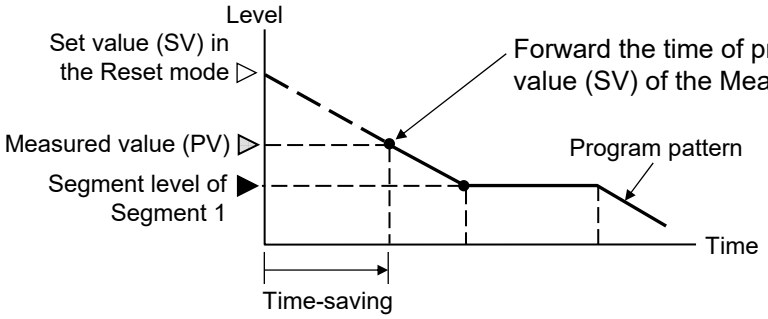


- Segment level of Segment 1 ≤ Measured value (PV)

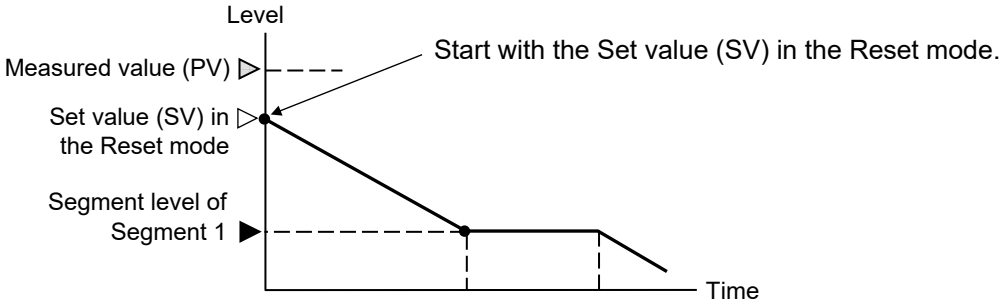


● When Set value (SV) in the Reset mode is larger than the Segment level of the Segment 1

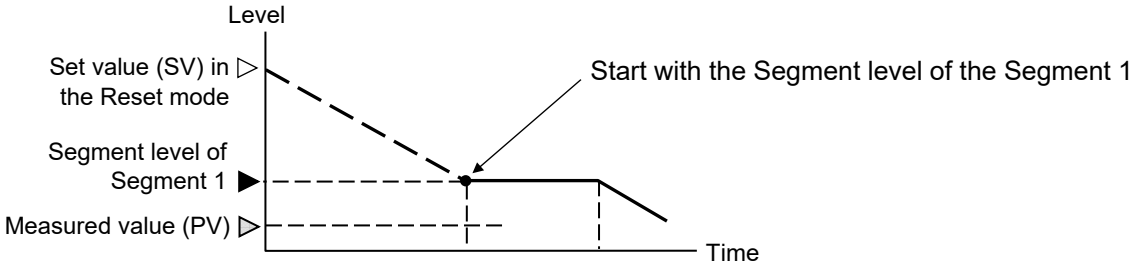
• Set value (SV) in the Reset mode ≥ Measured value (PV) ≥ Segment level of Segment 1



• Set value (SV) in the Reset mode ≤ Measured value (PV)



• Segment level of Segment 1 > Measured value (PV)



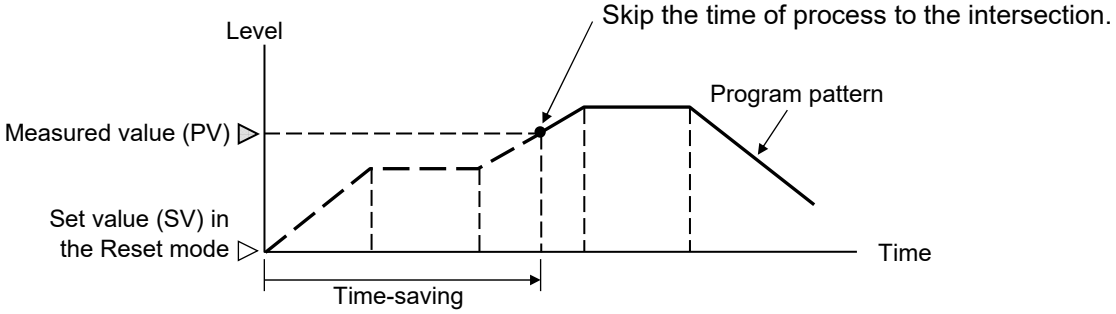
■ PV start 3/PV start 4 [Time saving & level searching type]

Search locates the intersection of the Measured value (PV) at start and Set value (SV) in the program pattern to skip time of process until the PV and the SV intersect.

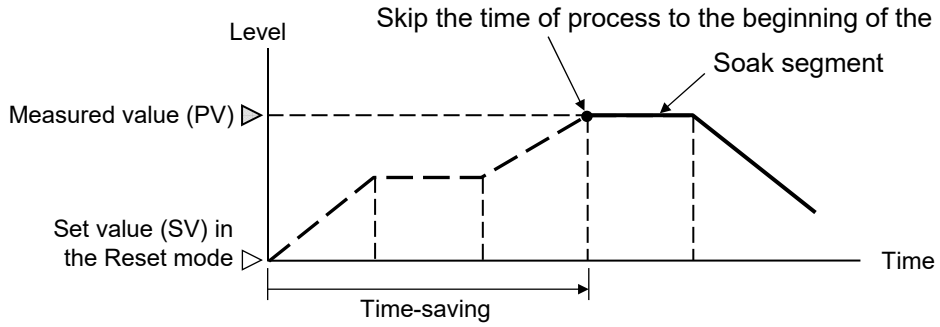
📖 Search function is not performed in the Program pattern being linked.

Differences between PV start 3 and PV start 4:
- PV start 3: Starts in Hold state
- PV start 4: Starts in RUN state (without Hold)

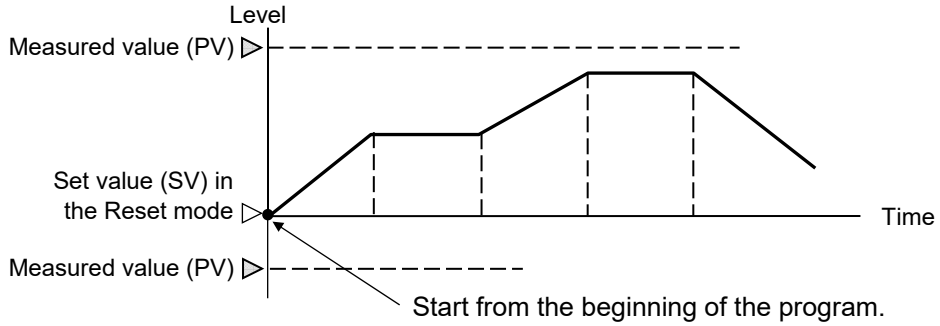
● When the intersection is found:



● **When the Measured value (PV) matches soak segment:**



● **When no intersection was found:**



6.2.2 Parameter setting

● SV selection at Program start [Setup setting mode]

Select Segment level at Program control start.

Parameter symbol	Data range	Factory set value
ST.SV	0: Start with the Set value (SV) in the Reset mode. 1: PV start 1 [Time fixed type] 2: PV start 2 [Time saving & ramp holding type] 3: PV start 3 [Time saving & level searching type/with HOLD function at start] 4: PV start 4 [Time saving & level searching type/without HOLD function at start]	2

📖 SV selection at Program start can be set at F80.01 (P. 4-43) in the Engineering mode.

● Set value (SV) in Reset mode

Set SV in the Reset mode.

Parameter symbol	Data range	Factory set value
SV	Setting limiter low to Setting limiter high	0 (0.0)

📖 SV at the Reset mode can be set in the Reset mode setting block (P. 4-20) of the Parameter setting mode.

● Wait memory group number at Program start [Engineering mode F80.02]

Select Wait memory group number as Wait function condition at Program control start.

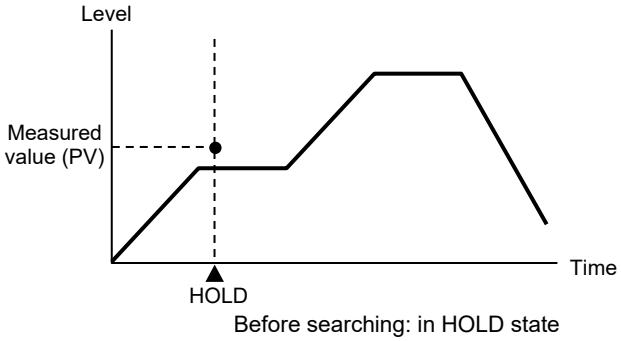
Parameter symbol	Data range		Factory set value
ST.WT	0: Wait OFF 1: Wait memory 1 2: Wait memory 2 3: Wait memory 3 4: Wait memory 4	5: Wait memory 5 6: Wait memory 6 7: Wait memory 7 8: Wait memory 8	0

6.3 Search Function

Use the Search function to skip the time of process to the intersection of the Measured value (PV) and the pattern of the program.

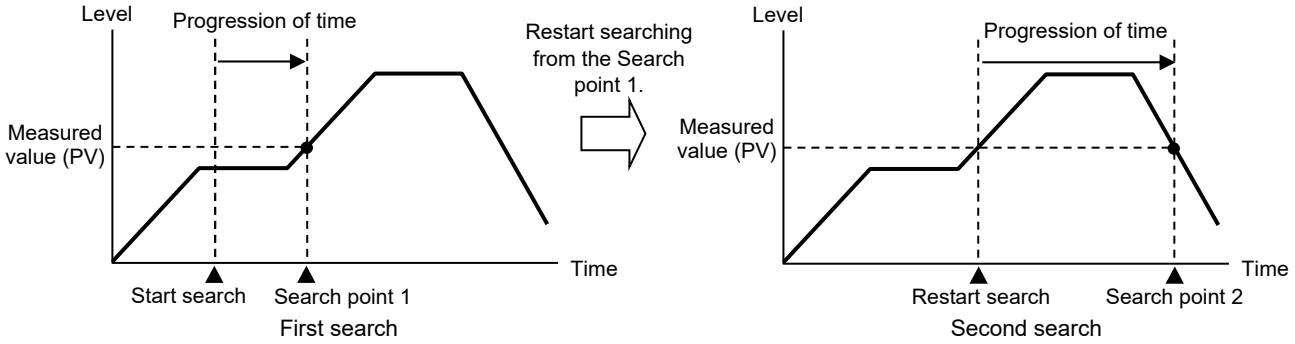
6.3.1 Description of function

Searches the intersection of the pattern and the Measured value (PV) when the pattern, position of Hold state and PV are as described in the right diagram.

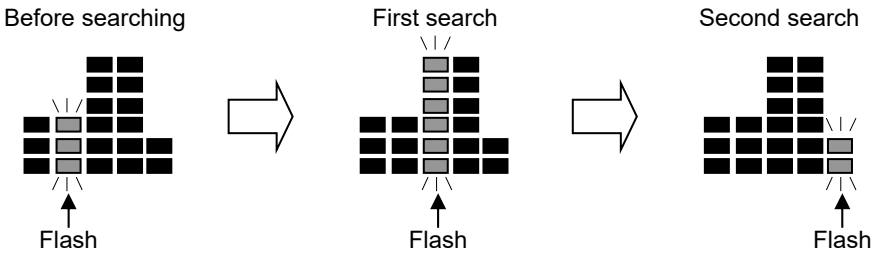


NOTE

The program must be in HOLD state to conduct Search function.



When finding an intersection: skip the time of process of the program to the intersection.
For Dot display, segments in progress flash. Next the segments of the intersection will flash.



When no intersection was found: no change in operation occurs.

- Search function is available in any time during Program control if in HOLD state.
- Scope of search function is within a pattern. It is not possible to search a pattern repeated or linked by Pattern repeat or Pattern link.
- Skip the time of process to the beginning of the soak segment being matched with the Measured value (PV). (Refer to page 6-1 for "Soak segment")
- Program control starts from the intersection of the Pattern and Measured value (PV) by releasing HOLD.
- It is also possible to conduct Search function by communication.
- ☞ For Hold function, refer to **6.5 Hold (HOLD) (P. 6-9)**.

6.3.2 Parameter setting

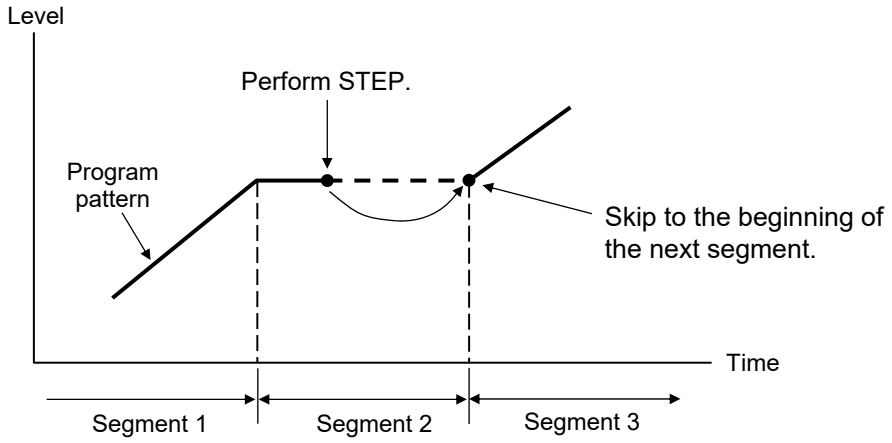
● Search function [Operation mode]

Conduct Search function.

Parameter symbol	Data range	Factory set value
SARCH	ON: Search start OFF: Search stop Turns OFF automatically when the Search function is completed.	OFF

6.4 Step (STEP)

During the Program control operation, a segment of the program may be skipped by STEP function.
Key operation, Digital input (DI) or communication is available to perform STEP function.



■ Key operation

To perform STEP function, press and hold the STEP R.SET key for 2 seconds (factory set value) during the Program control operation.

📖 STEP function is not operative when the program is in HOLD state or the operation mode is in the Reset mode (RESET), the Fixed set point control mode (FIX) or the Manual control mode (MAN).

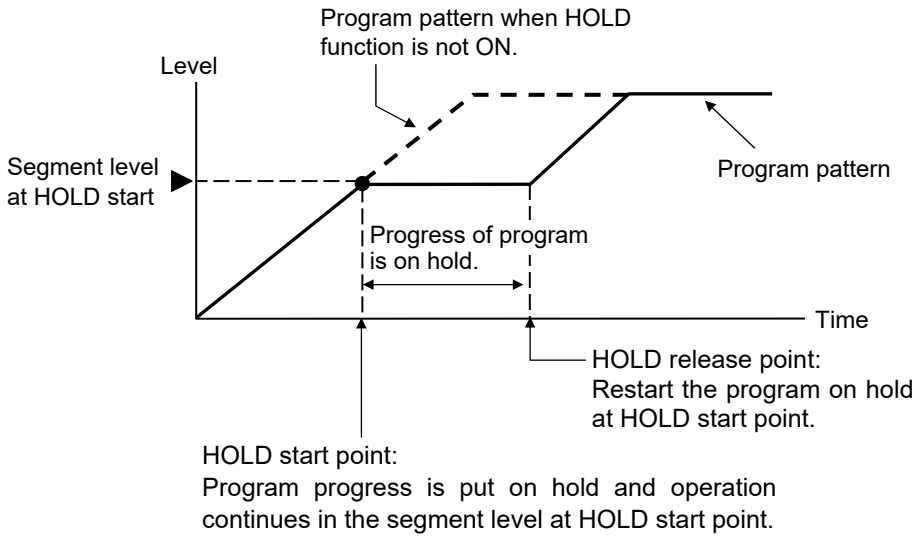
📖 If STEP function is performed while the program is in Wait state, Wait state will be released and the segment in progress skips to the next segment.

📖 Direct key type can be set individually (Press once, Press twice or Press and hold) for direct keys such as the STEP R.SET key at F11 (P. 4-33) in the Engineering mode.

☞ For STEP function by Digital input (DI), refer to ■ **Step (STEP) function** of **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

6.5 Hold (HOLD)

Progress of the program is suspended during the Program control operation.
Start or release HOLD function by using the key operation, Digital input (DI) or communication.

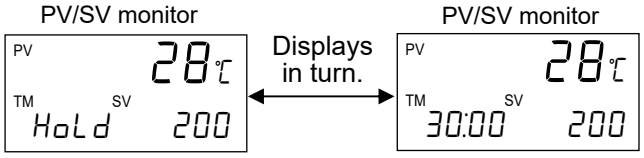


HOLD start condition
- Operation is in Program control mode (RUN).
- DI being assigned with Reset mode (RESET) is open.
- DI being assigned with Program control mode (RUN) is open.

HOLD release condition
- DI being assigned with Reset mode (RESET) is open.
- DI being assigned with Program control mode (RUN) is open.

■ HOLD display

In HOLD state, "HoLd" and the Segment remaining time will alternate on TIME monitor display.



■ Key operation

To switch to HOLD state, press the HOLD key during Program control operation.
To continue Program control operation, release HOLD by pressing the HOLD key.

- It is possible to produce the HOLD signal from OUT2, OUT3 or DO. (DO5 to DO12: optional)
- HOLD state remains in effect when changing to the Fixed set point control mode (FIX) or the Manual control mode (MAN). To release HOLD state, switch the operation mode to the Program control mode (RUN).
- Key operation or communication is not available for releasing the HOLD state conducted by using Digital input (DI).
- The program is in HOLD state when performing Autotuning (AT) during Program control operation. "HoLd" is not displayed at TIME monitor display. Restart Program control operation after completing AT.
- HOLD function is operative when the remaining time of the Pattern end output is displayed. When the operation is in HOLD state, time counting of the remaining time is suspended but Pattern end output remains ON. HOLD function is invalidated when the remaining time of the Pattern end output is zero (0).

☞ For HOLD function by Digital input (DI), refer to ■ **Hold (HOLD) function** of **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

☞ For Digital output (DO) in HOLD state, refer to **6.2.2 Digital output (DO) assignment (DO1 to DO12)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

6.6 Wait

In the Program control operation, the Wait function switches the progress of segment into a standby state.
Types of Wait state:

- By Wait zone (Zone wait function)
- By segment

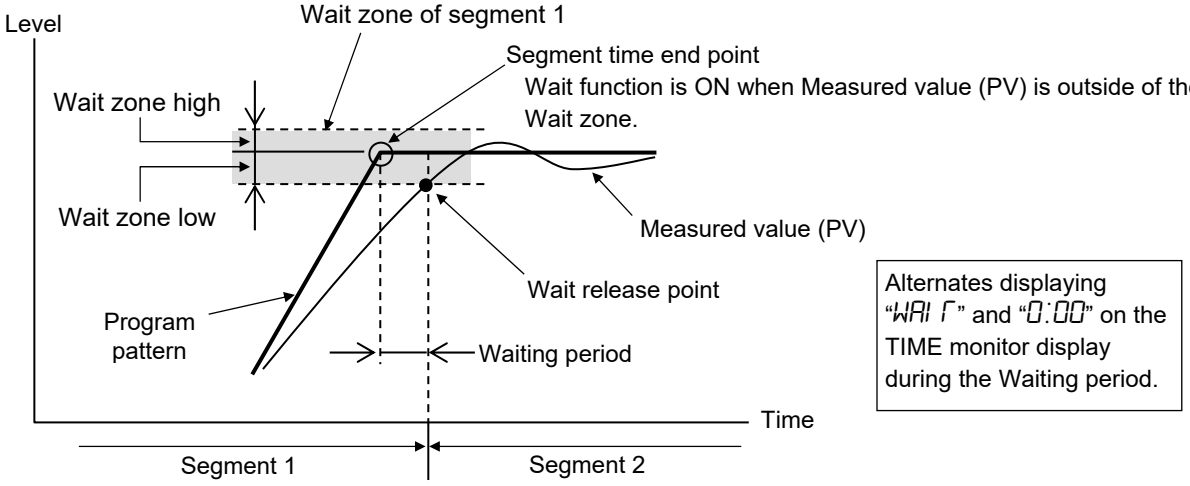
6.6.1 Description of function

■ Wait state by Wait zone (Zone wait function)

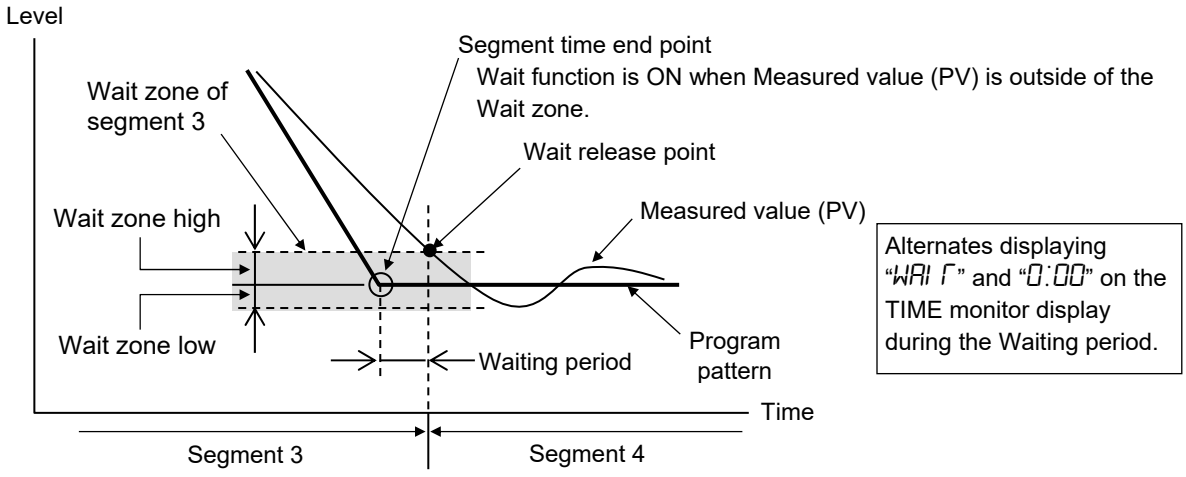
When Measured value (PV) does not follow the progress of the program (when difference between PV and SV remains) during the Program control operation, the program will be on standby state at Segment time end point until the Measured value (PV) reaches the Wait zone.

Wait releasing condition: Wait function is released when the Measured value (PV) reaches the Wait zone.

[Example: At Level rising]



[Example: At Level dropping]



☞ Wait function is available for Link operation by Intercontroller communication. For details, refer to ■ **Wait function in intercontroller communication** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

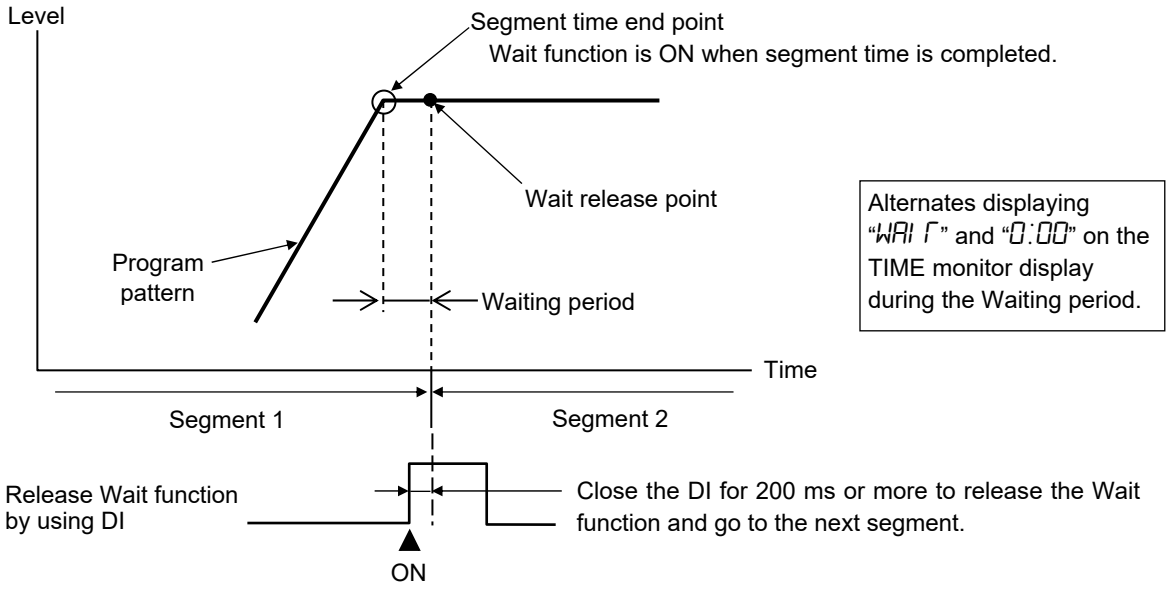
■ Wait state by segment

Program is put on standby at Segment time end point and will not go to the next segment until the Digital input (DI) assigning Wait release is received.

Wait releasing condition: Close the DI assigning Wait release.

☞ To release Wait state by DI, refer to ■ **Wait state release** of **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

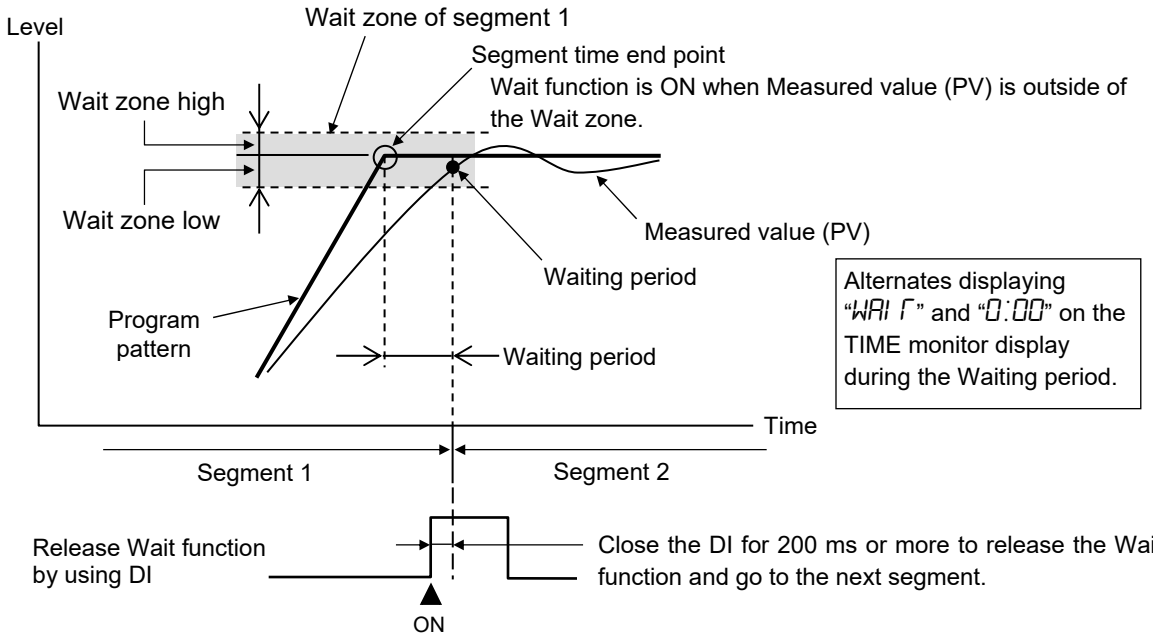
[Example]



📖 Wait function is not possible when the DI (assigning Wait release) is closed.

📖 Wait function can be released by using the Zone wait function and DI at the same time. Wait action is same as Zone wait function. Wait function is released when the Measured value (PV) reaches the Wait zone and the DI (assigning Wait release) is closed.

[Example: At Level rising]



■ Wait releasing

How to release Wait function:

- By Wait zone judgment

☞ For Wait releasing by the Wait zone judgment, refer to ■ **Wait state by Wait zone (Zone wait function) (P. 6-10)**.

- By Digital input (DI)

☞ To release Wait state by Digital input (DI), refer to ■ **Wait state by segment (P. 6-11)** and ■ **Wait state release** of **6.1.9 Digital input (DI)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

- By Wait time-out

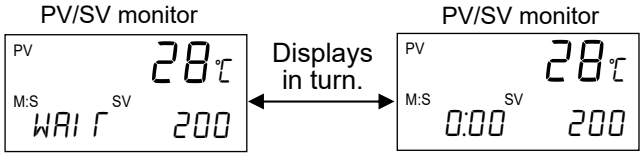
Wait state is released after the elapse of time being set.
Wait releasing by Wait time-out is available for both "Wait state by Wait zone" and "Wait state by segment."

📖 Wait state will be released by performing STEP function or Forward/Back-up function when the program is in Wait state.

📖 Wait state remains in effect when changing to the Fixed set point control mode (FIX) or the Manual control mode (MAN).

■ Wait display

Alternates displaying "WAIT" and Segment remaining time (0:00) when the program is in Wait state.



6.6.2 Parameter setting

The setting related to Wait function is stored in Wait memory group. Group number can be set for each segment.

☞ For Wait memory group, refer to **6.1 Memory Group (P. 6-2)**.

■ Parameter setting to set Wait function by Wait zone

● Wait zone high/low [Parameter setting mode: Wait memory group setting block]

Set deviation setting against segment level by setting Wait zone high (ZoNE.H) and Wait zone low (ZoNE.L) individually.

Parameter symbol	Data range	Factory set value
ZoNE.H	TC/RTD inputs: 0 (0.0, 0.00) to 200 (200.0, 200.00) (Unit: °C [°F]) Voltage (V)/Current (I) inputs: 0.0 to 20.0 % of Input span 0 (0.0, 0.00): Wait zone high becomes OFF	0
ZoNE.L	TC/RTD inputs: –200 (–200.0, –199.99) to 0 (0.0, 0.00) (Unit: °C [°F]) Voltage (V)/Current (I) inputs: –20.0 to 0.0 % of Input span 0 (0.0, 0.00): Wait zone low becomes OFF	0

● Wait release trigger selection [Parameter setting mode: Wait memory group setting block]

Select Wait release method.
Set "1" at the one place to conduct Zone wait function (Wait releasing by Wait zone judgment).
When using Digital input (DI) in combination with Zone wait function, also set "1" at hundred places.

Parameter symbol	Data range	Factory set value
RE.TRG	00000 Zone wait 1 (the controller) [0: Invalidate, 1: Validate] Zone wait 2 (all slave controllers) [0: Invalidate, 1: Validate] Wait release by digital input (DI) [0: Invalidate, 1: Validate] Unused	00001

The ten places is for slave controller of the Intercontroller communication.

● Wait time-out set value [Parameter setting mode: Wait memory group setting block]

Set duration of Time-out for wait release by Time-out.

Parameter symbol	Data range	Factory set value
TM.OUT	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) 0:00 (Hour: Minute or Minute: Second): Unused	0:00 (0 hour 00 minutes)

Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-43)**.

■ Parameter setting to set Wait function by segment

● Digital input (DI) assignment [Engineering mode F23.01]

Assign Digital input (DI).
Set 2, 3 or 4 to set wait function for each segment.

Parameter symbol	Data range	Factory set value
DI SL	0 to 5 (For details, refer to DI Assignment Code Table)	0

DI Assignment Code Table

DI number	Set value					
	0 [a]	1 [a]	2	3 [b]	4	5
DI1	PTN1	PTN1	WAIT	WAIT	WAIT	WAIT
DI2	PTN2	PTN2	WAIT	WAIT	WAIT	WAIT
DI3	PTN4	PTN4	WAIT	WAIT	WAIT	WAIT
DI4	PTN8	PTN8	WAIT	WAIT	WAIT	WAIT
DI5	PTN16	PTN16	WAIT	WAIT	WAIT	WAIT
DI6	P. SET	P. SET	WAIT	WAIT	WAIT	WAIT
DI7	RESET	RESET	PTN1	PTN1	RESET	RESET
DI8	RUN	RUN	PTN2	PTN2	RUN	RUN
DI9	STEP	STEP	PTN4	PTN4	STEP	STEP
DI10	HOLD	PTN32	PTN8	PTN8	HOLD	HOLD
DI11	PTN32	PTN64	P. SET	PTN16	Direct/ Reverse	PTN_INC

- PTN1, 2, 4, 8, 16, 32, 64: Pattern number switch
- P. SET: Pattern set
- WAIT: Wait state release
- RESET: Reset mode (RESET) setting
- RUN: Program control mode (RUN) setting
- STEP: Step (STEP) function
- HOLD: Hold (HOLD) function
- Direct/Reverse: Direct/Reverse action switching
- PNT_INC: Pattern increment

[a] Setting zero (0) or "1" is suitable when DI1 to DI6 (optional) are specified at ordering.

[b] When selecting set value 3, the set value of the Pattern input method of Digital input (DI) (P. 4-35) should be changed to 1 or 3. [Refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.]

● Wait release trigger selection [Parameter setting mode: Wait memory group setting block]

Select Wait release method.
Set "0" at the one place and "1" at hundred places set Wait function for each segment.

Parameter symbol	Data range	Factory set value
RE.TRG	00000 Zone wait 1 (the controller) [0: Invalidate, 1: Validate] Zone wait 2 (all slave controllers) [0: Invalidate, 1: Validate] Wait release by digital input (DI) [0: Invalidate, 1: Validate] Unused	00001

The ten places is for slave controller of the Intercontroller communication.

● Wait time-out set value [Parameter setting mode: Wait memory group setting block]

Set duration of Time-out for wait release by Time-out.

Parameter symbol	Data range	Factory set value
TM.OUT	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) 0:00 (Hour: Minute or Minute: Second): Unused	0:00 (0 hour 00 minutes)

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-43)**.

6.7 Repeat and Pattern Link

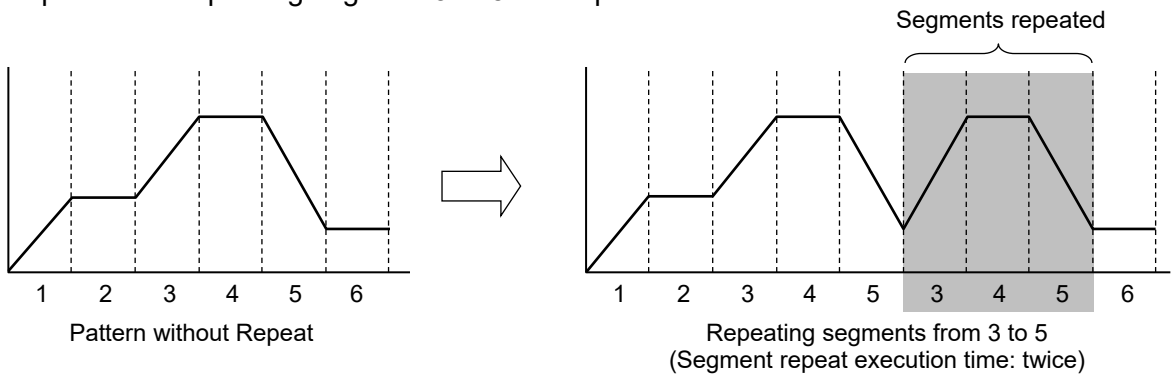
Repeat function: Repeat the program entirely or partially for the number of Repeat times.
Segment repeat and Pattern repeat are available.
Pattern link: Link the program patterns.

6.7.1 Description of function

■ Segment repeat

Repeat segments being selected in the Program pattern for the number of Segment repeat time.
Set Start segment, End segment and Segment repeat time for each pattern.

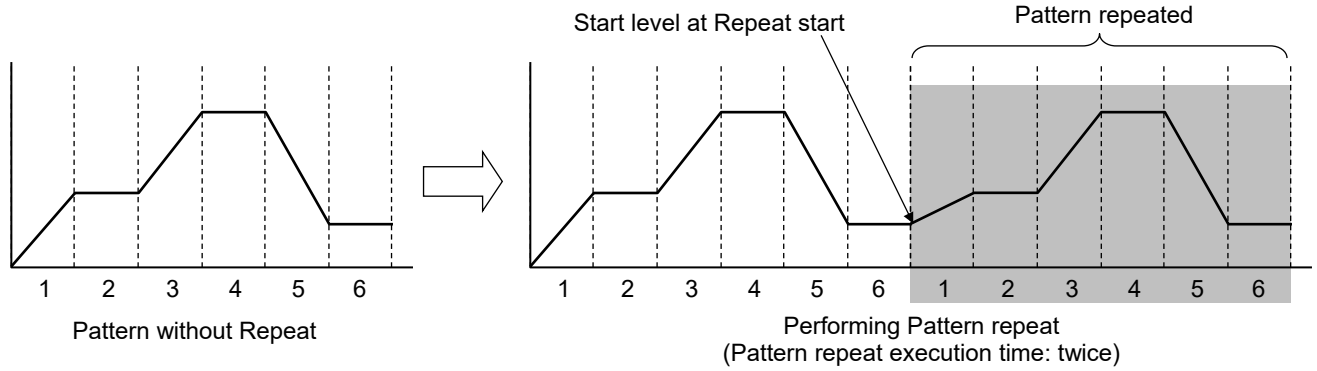
Example: When repeating segment 3 to 5 in the pattern below



■ Pattern repeat

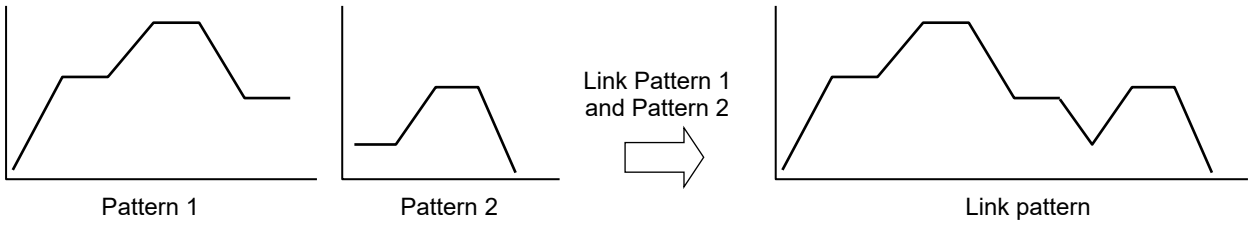
Repeat the program pattern for the number of Pattern repeat time.
The level at pattern end becomes the start level of the repeated pattern.
Set Repeat time for each pattern.

Example: When repeating the pattern below



■ Pattern link

Link program patterns by setting pattern numbers.



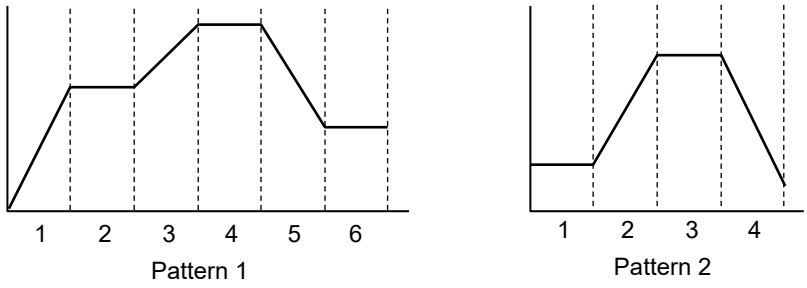
■ Combination of Repeat function and Pattern link

Segment repeat, Pattern repeat and Pattern link may be used at the same time.

Order of action: Segment repeat > Pattern repeat > Pattern link

Example: Perform following Repeat function and Pattern link:

- Repeat Segments from 3 to 6 of the Pattern 1.
- Repeat Pattern 1.
- Link Pattern 1 and Pattern 2.
- Repeat Total pattern (linked patterns of Pattern 1 and Pattern 2)



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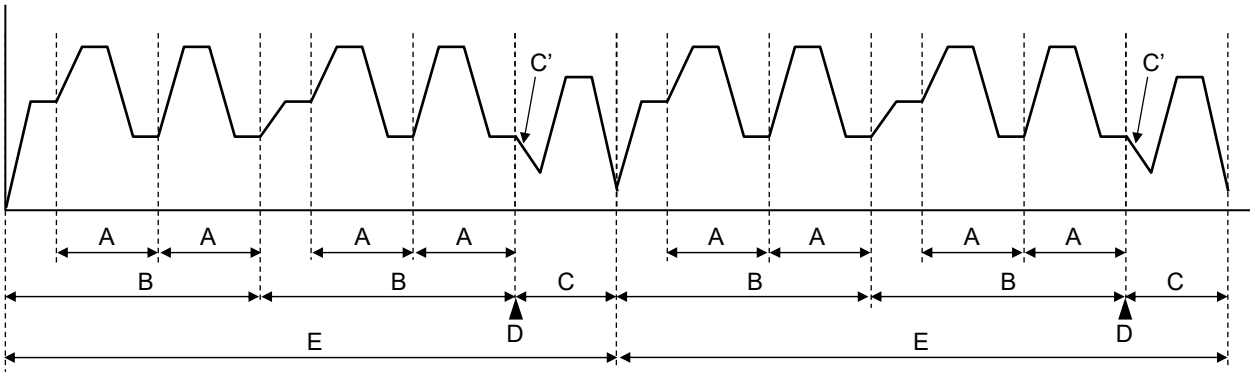
Program pattern composed by Repeat function and Pattern link



A: Repeating Segments from 3 to 6
B: Repeating Pattern 1
C: Pattern 2
D: Linking Pattern 1 and Patten 2
E: Repeating Total pattern *
* Repeat Total pattern (linked patterns)

C': The segment between Pattern 1 and Pattern 2 becomes ramp segment as there is a difference between the last segment level of Pattern 1 and the first segment level of Pattern 2.

[Parameter setting]

Pattern 1: Segment repeat start/end number: Start number: 3
End number: 6
Segment repeat execution time: 2 (A in the above diagram)
Pattern repeat execution time: 2 (B in the above diagram)
Link pattern number: 2 (D in the above diagram)

Pattern 2: Segment repeat start/end number: Start number: 1 (factory set value)
End number: 1 (factory set value)
Segment repeat execution time: 1 (No segment repeat)
Pattern repeat execution time: 2 (E in the above diagram) ⟵ Repeat setting of Total pattern
Link pattern number: 0 (No pattern link)

☞ It is possible to produce Pattern end signal at Pattern repeat and Pattern link. For details, refer to **6.8 Pattern End (P. 6-17)**.

6.7.2 Parameter setting

● Segment repeat start/end number [Parameter setting mode: Program setting block]

Set Start segment number and End segment number of Segment repeat.

Parameter symbol	Data range	Factory set value
SR-Ed	Start number (SR): 1 to 99 End number (Ed): 1 to 99 Within the maximum segment number	1

● Segment repeat execution time [Parameter setting mode: Program setting block]

Set Segment repeat execution time.

Parameter symbol	Data range	Factory set value
RPT.SG	1 to 9999 times 1: No segment repeat	1

● Pattern repeat execution time [Parameter setting mode: Program setting block]

Set Pattern repeat execution time.

Parameter symbol	Data range	Factory set value
RPT.PN	1 to 10000 times 1: No pattern repeat 10000: No limit	1

● Link pattern number [Parameter setting mode: Program setting block]

Set Pattern number to be linked next.

Parameter symbol	Data range	Factory set value
LNK.PN	0 to 99 (Within the maximum pattern number) 0: No pattern link	0

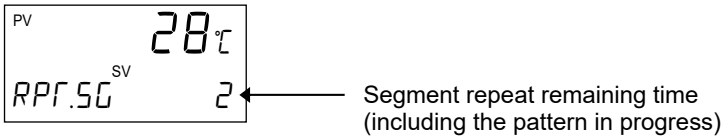
● Repeat remaining process/program progression display selection [Initial level engineering mode F10.12]

Select type of monitoring display between "Segment repeat remaining time" and "Segment repeat execution time."

Parameter symbol	Data range	Factory set value
RPT.SL	0: Segment repeat remaining time 1: Segment repeat execution time	0

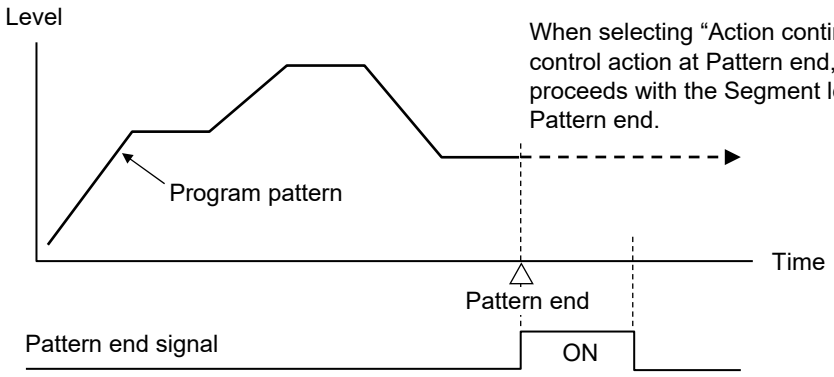
When "0" is set at Repeat remaining process/program progression display selection, the remaining time of Segment repeat (including the repeat in progress) will display at the Segment repeat remaining time/execution time monitor when the MONI key is pressed during the Program control operation.
When setting "1" at Repeat remaining process/program progression display selection, the Segment repeat execution time displays. (Same for "Pattern repeat remaining time/execution time monitor" and "Total pattern repeat remaining time/execution time monitor")

Display example: Segment repeat remaining time/execution time monitor



6.8 Pattern End

Pattern end signal is produced when program is done. Control action at Pattern end may also be selected.



Continued on the next page.

6.8.1 Description of function

■ Action at Pattern end

Pattern end signal: A Pattern end signal may be created from OUT2, OUT3 or Digital output (DO) as an Event output. Set the Pattern end output duration (P. 4-17, P. 4-26, P. 6-19). When setting "0:00" to the duration, output is continuously produced until the operation mode switches to the Reset mode.

Control action selection:

PID control, Heat/Cool PID control or Position proportioning PID control (With FBR input): Control continued or Control stop

Position proportioning PID control (When there is no FBR input or the FBR input is break):

- Control continued
- Open-side output OFF, Close-side output OFF
- Open-side output OFF, Close-side output ON
- Open-side output ON, Close-side output OFF

Event state: Action OFF or Action continued (selectable for each Event)

Transmission output state:

Action OFF or Action continued (selectable for each output)

Pattern end output at Pattern repeat or Pattern link:

OFF or ON (0.5 seconds)

🕮 It is not possible to invalidate the Pattern end output by setting the Pattern end output duration. When Pattern end output is not required, do not assign Pattern end output at Output function selection.

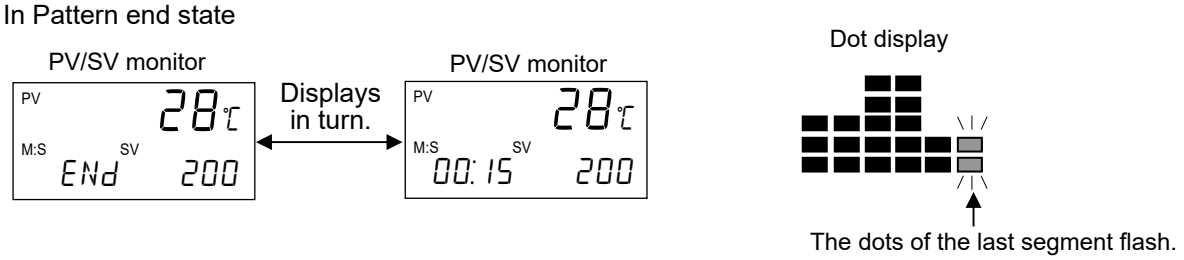
🕮 "Control stop" or "Control continued" can be set for Control action selection at Pattern end (P. 4-41) of F50.07 in the Engineering mode when Output program value is assigned to OUT1.

🕮 Pattern end signal goes OFF when switching to the Fixed set point control mode (FIX), the Manual control mode (MAN) or the Reset mode (RESET). Pattern end signal turns ON when returning to the Program control mode (RUN).

☞ To assign Pattern end output, refer to **6.2.1 Output assignment (OUT1 to OUT3)** and **6.2.2 Digital output (DO) assignment (DO1 to DO12)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Pattern end display

Alternately displays "End" and the remaining time of the Pattern end output duration when the operation is in the Pattern end state. After the elapse of Pattern end output duration only "End" flashes.
At the Dot display, the dots of the last segment of the Program pattern flash.

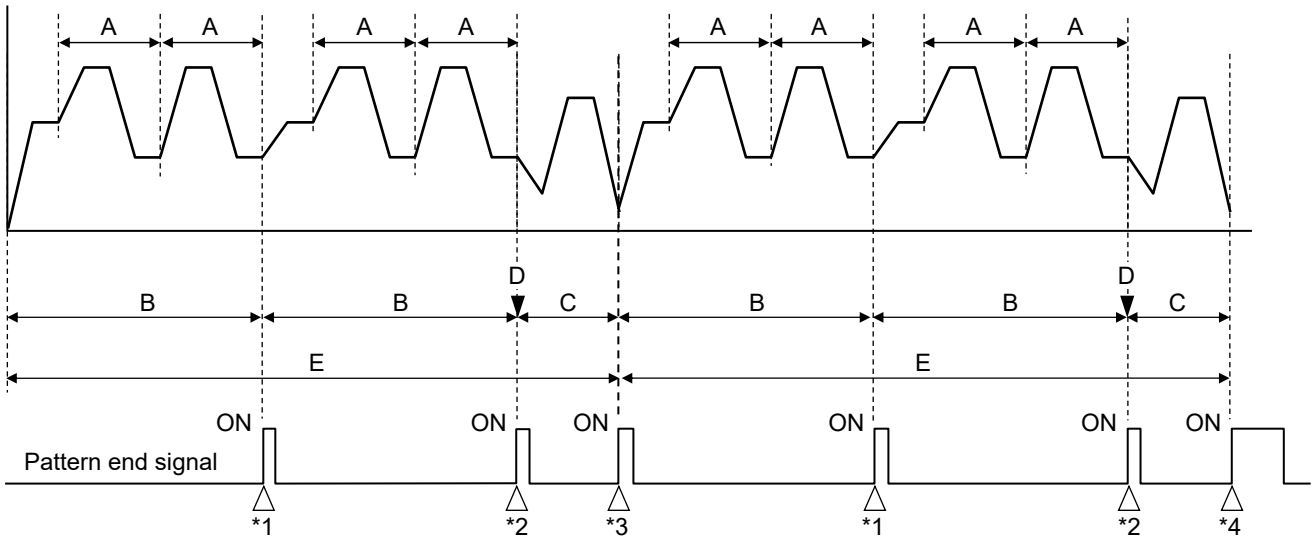


🕮 HOLD function is operative when the remaining time of the Pattern end output is displayed. When the operation is in HOLD state, time counting of the remaining time is suspended but Pattern end output remains ON. HOLD function is invalidated when the remaining time of the Pattern end output is zero (0).

■ Pattern end output action at Repeat or Link

It is possible to produce Pattern end signal for 0.5 seconds (fixed) when shifting to the segment of Pattern repeat, Total Pattern repeat or Pattern link.

Example: Program pattern composed by Repeat function and Pattern link



A: Repeating Segments from 3 to 6
B: Repeating Pattern 1
C: Pattern 2
D: Linking Pattern 1 and Patten 2
E: Repeating Total pattern *
* Repeat Total pattern (linked patterns)

*1: Pattern end signal for Pattern repeat (ON for 0.5 seconds)
*2: Pattern end signal for Pattern link (ON for 0.5 seconds)
*3: Pattern end signal for Total Pattern repeat (ON for 0.5 seconds)
*4: Pattern end signal for Pattern 2 (ON within the Pattern end output duration being set.)

☞ For the pattern diagram above, also refer to ■ **Combination of Repeat function and Pattern link (P. 6-15)**.

6.8.2 Parameter setting

● Pattern end output duration [Parameter setting mode: Program setting block]

Set the duration of the Pattern end signal.

Parameter symbol	Data range	Factory set value
End.TM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second) Output remains ON at 0:00 (Hour: Minute or Minute: Second)	0:00 (0 hour 00 minutes)

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-43)**.

Continued on the next page.

● Control action at Pattern end [Setup setting mode]

Set control action at Pattern end.

Parameter symbol	Data range	Factory set value
End.P	PID control, Heat/Cool PID control or Position proportioning PID control (With FBR input): 0: Control continued 1: Control stop Position proportioning PID control (When there is no FBR input or the FBR input is break): 0: Control continued 1: Open-side output OFF, Close-side output OFF 2: Open-side output OFF, Close-side output ON 3: Open-side output ON, Close-side output OFF	0

● Transmission output action at Pattern end [Engineering mode F30.07]

Set action of Transmission output at Pattern end.

Parameter symbol	Data range	Factory set value
P.Ed.Ao	0: Action stop 1: Action continued 00000 ← Value at SV display OUT2 OUT3 Unused	00000

● Event action at Pattern end [Engineering mode F30.08]

Set event action at Pattern end.

Parameter symbol	Data range	Factory set value
P.Ed.EV	0: Action stop 1: Action continued 00000 ← Value at SV display Event 1 Event 2 Event 3 Event 4 HBA1, HBA2	00000

● Pattern end output action at Pattern repeat/Pattern link [Initial level engineering mode F80.08]

Set Pattern end output action at Pattern repeat/Pattern link.

Parameter symbol	Data range	Factory set value
PE.SL	0: OFF 1: ON (0.5 seconds) 00000 ← Value at SV display Pattern end output is ON at Pattern repeat. Pattern end output is ON at Total pattern repeat. Pattern end output is ON at Pattern link. Unused	00000

☞ For Pattern end output action at Repeat or Link, refer to **4.5.6 Initial level engineering mode** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

6.9 Time Signal (Segment Signal)

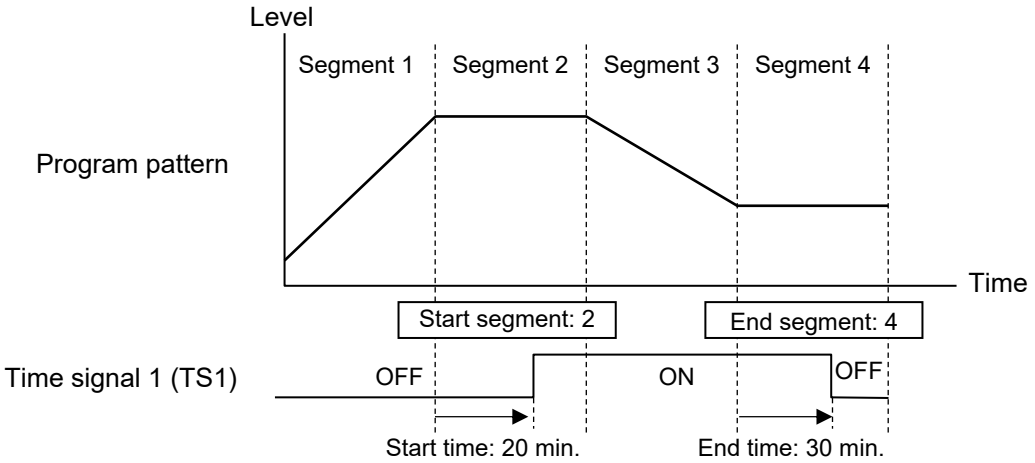
Time signal (Segment signal) is a function to produce ON/OFF signals along the state of progress of the program to the external devices such as Sequencer and Alarm unit. Only Time signal or Segment signal is selectable.

6.9.1 Description of function

■ Time signal

It is possible to produce a signal over two or more segments by setting Start/End segment number and Start/End time.

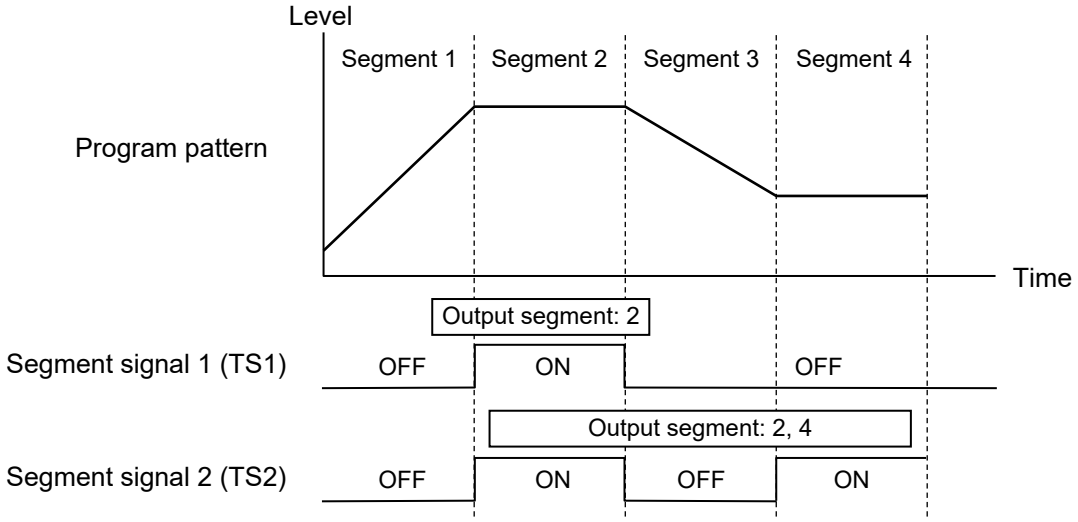
[Image of Time signal]



■ Segment signal

The signal is produced on a segment basis. Set ON or OFF to each segment of the Segment signal 1 through 8 (TS1 to TS8).

[Image of Segment signal]



■ Time signal (Segment signal) output

Number of Time signal (Segment signal): 8 points (TS1 to TS8)
Time signal (Segment signal) output assignment: Up to 14 points (OUT2, OUT3, DO1 to DO12)

☞ To assign Time signal (Segment signal) output, refer to **6.2.1 Output assignment (OUT1 to OUT3)** and **6.2.2 Digital output (DO) assignment (DO1 to DO12)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Time signal (Segment signal) during AT

It is possible to set Time signal (Segment signal) action during Autotuning (AT).

Time signal OFF: Time signal (Segment signal) action stops during Autotuning (AT). When completing AT, Time signal (Segment signal) action restarts as set.

Time signal ON: Time signal (Segment signal) action continues during Autotuning (AT).

When setting "Time signal ON," Time signal (Segment signal) action continues while the operation is on HOLD by Autotuning (AT) in the Program control mode.

Time signal is not produced during AT with learning function.

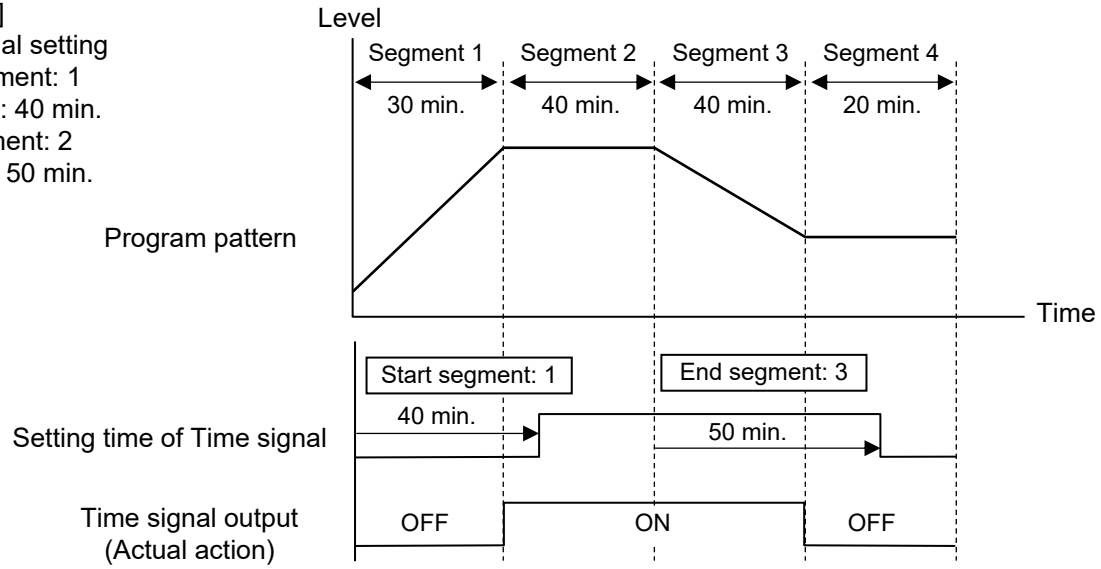
■ Precaution for Time signal setting

- For Time signal, set smaller numbers to Start segment rather than End segment. Time signal output is not produced if the number of Start segment is larger than the End segment.

  Start segment ＜ End segment

- When the duration of the Start segment is larger than Segment time in progress, Time signal turns ON in the next segment. When the duration of the End segment is larger than Segment time in progress, Time signal turns OFF in the next segment.

[Example]
Time signal setting
Start segment: 1
Start time: 40 min.
End segment: 2
End time: 50 min.



If the End segment is the final segment of the pattern and duration of the End segment is longer than the final segment, Time signal will go OFF in Pattern end state. When the program is linked (Pattern link) or repeated (Pattern repeat), Time signal action continues by following the program.

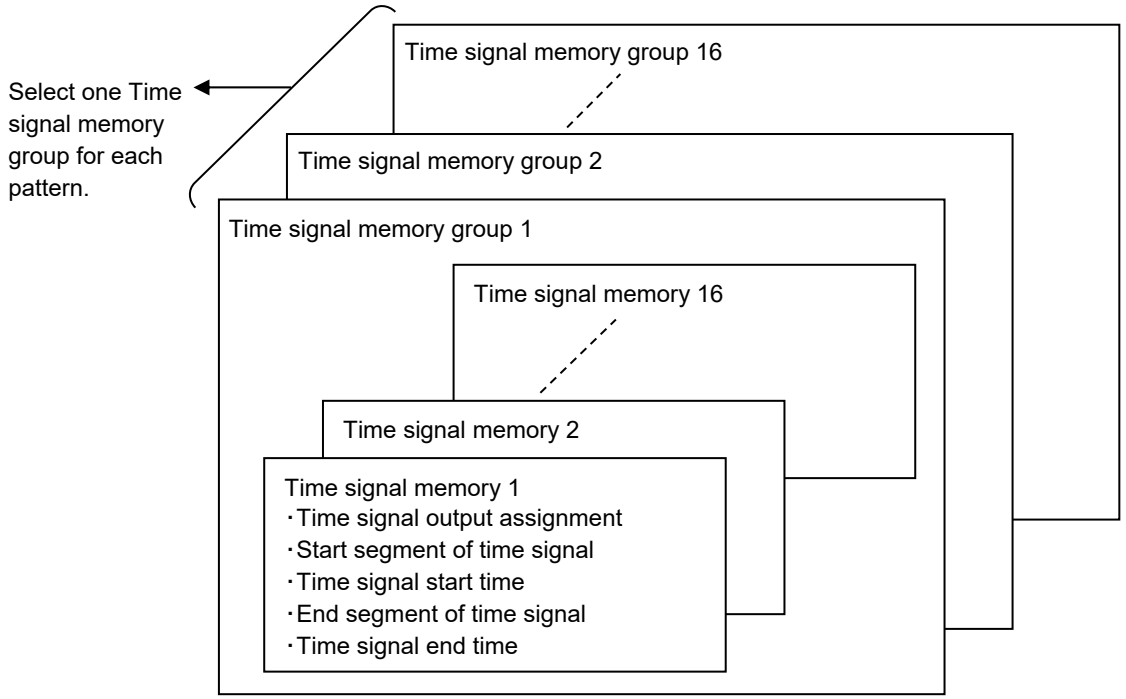
If the duration of End time of Time signal and the Segment time in progress is equal, Time signal goes off when Wait function is performed. (The extended time by Wait function is not considered.) If the duration of End time of Time signal is longer than the Segment time in progress, Time signal remains ON when Wait function is performed. (The extended time by Wait function is considered to be a part of the duration of Time signal since the segment in progress is the final segment of the program.)

When the Time signal is ON, switching the operation mode to the Fixed set point control mode (FIX) or the Manual control mode (MAN) turns OFF the Time signal. Time signal turns ON when switching to the Program control mode (RUN).

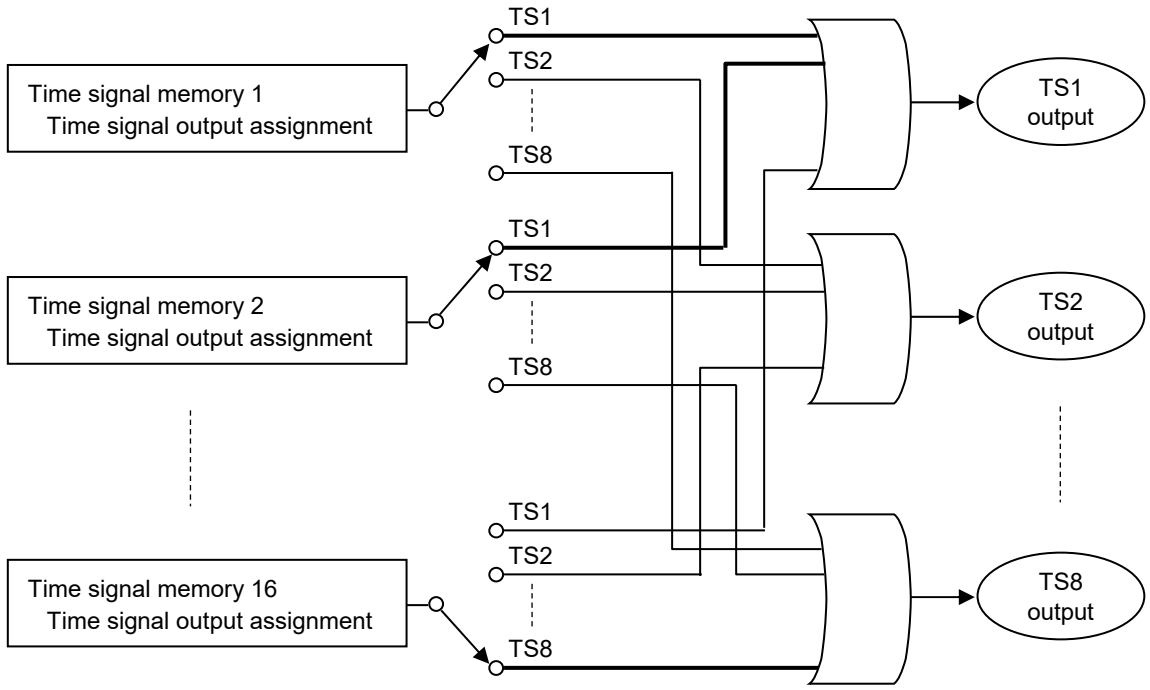
Even if the Segment time (TIME) is set to "0," while the instrument is in the WAIT mode, the Time signal action and the Segment signal action can be turned on.

Time signal memory group

Select one Time signal memory group for each pattern (up to 16 memory groups are available). Memory group consists of 16 memories and each one of the memories is used for setting each Time signal.
When several Time signals are assigned to one Time signal output, signal will be produced by logical *OR*.

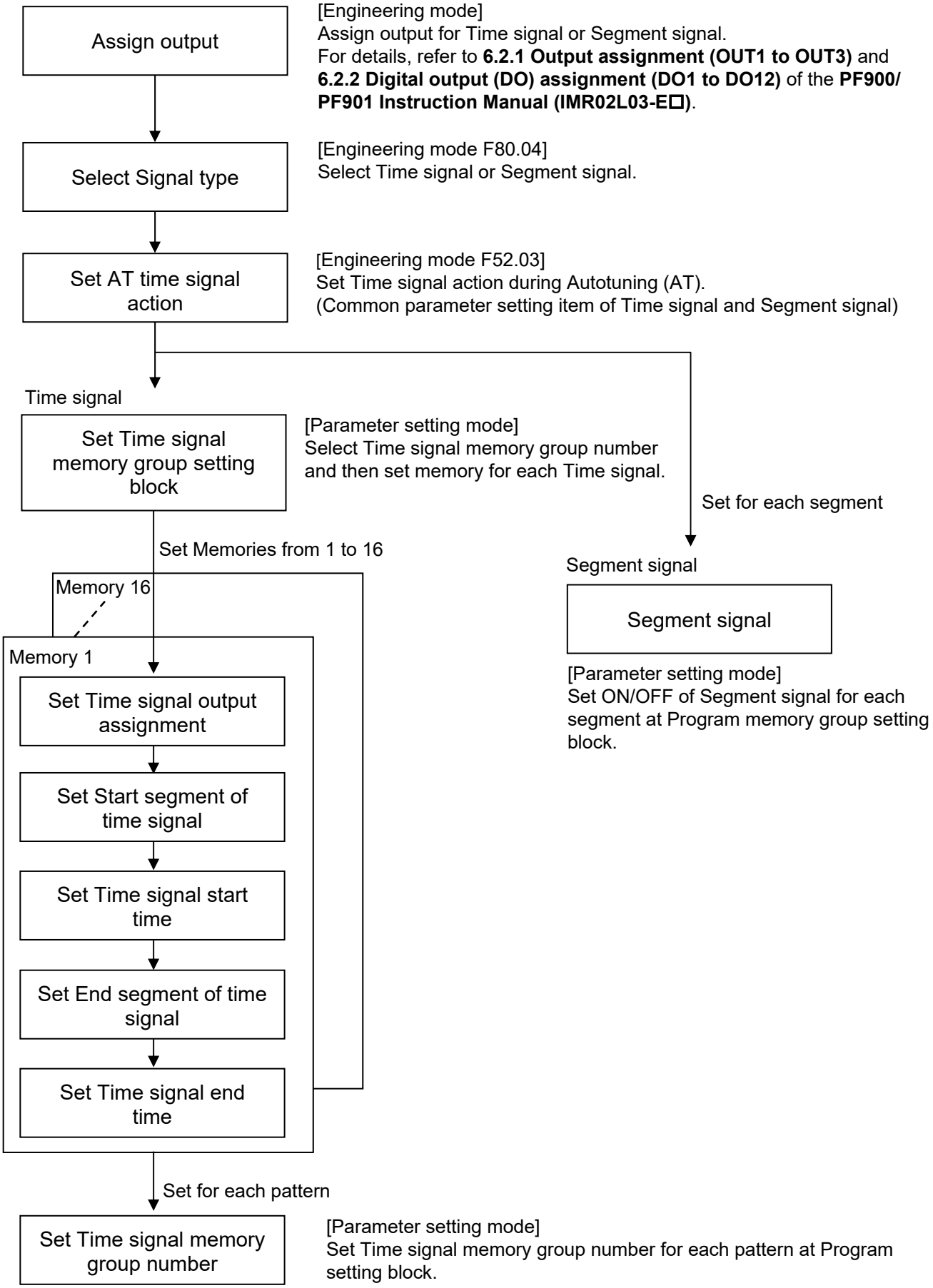


[Outline of Time signal output]



Time signal 1 (TS1) turns ON when either Time signal memory 1 or 2 turns ON as Time signal 1 (TS1) output is selected to be the output assignment of Time signal memory 1 and 2 in the above diagram.

6.9.2 Setting procedure



6.9.3 Parameter setting

■ Time signal type or Segment signal type

● Signal type [Engineering mode F80.04]

Select Time signal or Segment signal.

Parameter symbol	Data range	Factory set value
r5.typ	0: Time signal type 1: Segment signal type	0

■ Common parameter setting item of Time signal and Segment signal

● AT Time signal action [Engineering mode F52.03]

Set Time signal action during Autotuning (AT).

Parameter symbol	Data range	Factory set value
Arr5	0: Time signal OFF 1: Time signal ON	0

■ Parameter setting item of Time signal

Settings related to Time signal are stored as Time signal memory group in the Parameter setting mode.

● Time signal memory group number [Parameter setting mode: Program setting block]

Set Time signal memory group number for each pattern.

Parameter symbol	Data range	Factory set value
r5.GR	0 to 16 0: No assignment	1

● Time signal output assignment [Parameter setting mode: Time signal memory group setting block]

Set output assignment of Time signal for each memory.

Parameter symbol	Data range	Factory set value
01.oUt	1 to 8: Time sugnal 1 to 8 0: No assignment	0

● Start segment of time signal [Parameter setting mode: Time signal memory group setting block]

Set Start segment number of Time signal.

Parameter symbol	Data range	Factory set value
01.5.SN	1 to 99 Within the maximum segment number.	1

● Time signal start time [Parameter setting mode: Time signal memory group setting block]

Set duration of Start time of Time signal start segment.

Parameter symbol	Data range	Factory set value
01.5.tM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-43)**.

● End segment of time signal
[Parameter setting mode: Time signal memory group setting block]

Set End segment number of Time signal.

Parameter symbol	Data range	Factory set value
01.E.SN	1 to 99 Within the maximum segment number.	1

● Time signal end time
[Parameter setting mode: Time signal memory group setting block]

Set duration of End time of Time signal end segment.

Parameter symbol	Data range	Factory set value
01.E.rM	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0:00 (0 hour 00 minutes)

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-43)**.

■ Parameter setting item of Segment signal
[Parameter setting mode: Program signal memory group setting block]

● Segment signal

Set ON/OFF to Segment signal for each segment.

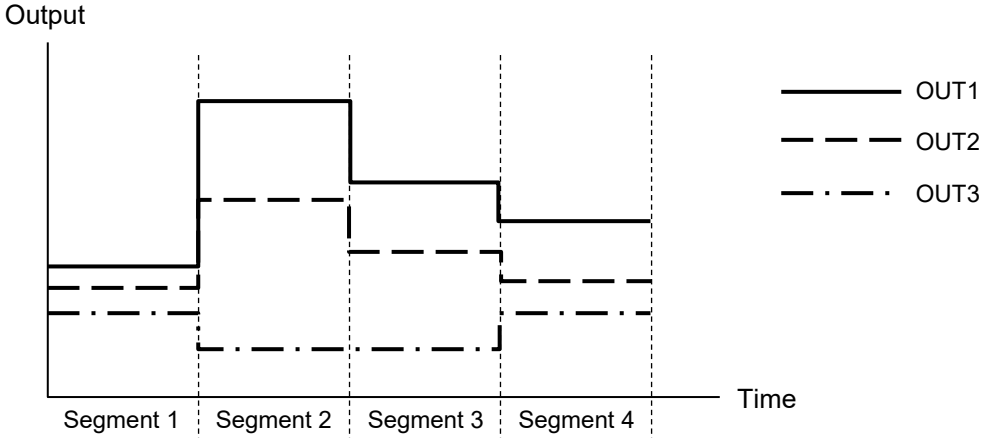
Parameter symbol	Data range	Factory set value
SI GNL	0: OFF 1: ON 00000000 ← Value at SV display Segment signal 1 Segment signal 2 Segment signal 3 Segment signal 4 Segment signal 5 Segment signal 6 Segment signal 7 Segment signal 8	00000000

6.10 Output Program

6.10.1 Description of function

Output values being set arbitrarily is produced in order of segment.
Number of output: Up to 3 points (It is possible to assign to OUT1 through OUT3)

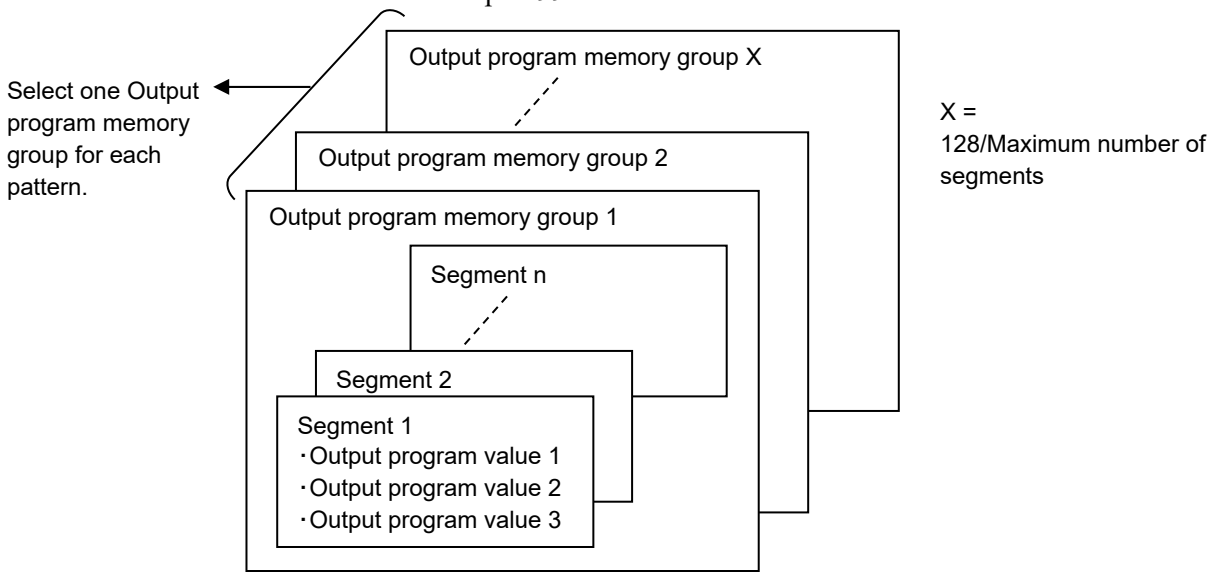
[Example of Output program]



■ Output program memory group

Select one Memory group for each pattern to set Output program value of segments stored in the Memory group.

Output program memory group number: 0 to (128/Maximum number of segments)
Up to 99



📖 "Control stop" or "Control continued" can be set for Control action selection at Pattern end (P. 4-41) of F50.07 in the Engineering mode when Output program value is assigned to OUT1.
"Control stop" or "Control continued" can be set for Transmission output action at Pattern end (P. 4-36) of F30.07 in the Engineering mode when Output program value is assigned to OUT2 or OUT3.

☞ To assign Output program, refer to **6.2.1 Output assignment (OUT1 to OUT3)** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

6.10.2 Parameter setting

Settings related to Output program are stored as Output program memory group in the Parameter setting mode.

📖 Assign Output program value at Output function before performing Output program function.

● Output program memory group number [Parameter setting mode: Program setting block]

Set Output program memory group number for each pattern.

Parameter symbol	Data range	Factory set value
P.MV.GR	0 to [128/Maximum number of segments] Up to 99 0: No assignment	0

● Output program value [Parameter setting mode: Output program memory group setting block]

Set Output program value for each segment.

Parameter symbol	Data range	Factory set value
P.MV 1	Output program value 1: −5.0 to +105.0 %	−5.0
P.MV2	Output program value 2: −5.0 to +105.0 %	−5.0
P.MV3	Output program value 3: −5.0 to +105.0 %	−5.0

6.11 Edit Function

Copy and Data clear are available for edit function.

Pattern copy or Data clear is only available at the Reset mode (RESET).

6.11.1 Description of function

■ Pattern copy

All set values of a pattern may be copied to another pattern.

■ Segment copy

Within a pattern, settings of the previous segment may be copied to the next segment.

To copy the setting data of the previous segment, press the ∧ key and the ∨ key at the same time at parameter setting display of the next segment.

Items to be copied: Segment level, Segment time, PID memory group number, Event memory group number, Wait memory group number, Segment signal

■ Data clear

Set values at the Parameter setting mode and Tag name may be initialized based on the set values such as Input types, and Decimal point position being set in the Engineering mode.

6.11.2 Parameter setting

● Pattern copy [Parameter setting mode: Editing block]

Set copy source pattern number and copy destination pattern number.

Parameter symbol	Data range	Factory set value
CoPy	Copy source number: 0 to 99 Copy destination number: 0 to 99 Within the maximum pattern number.	0

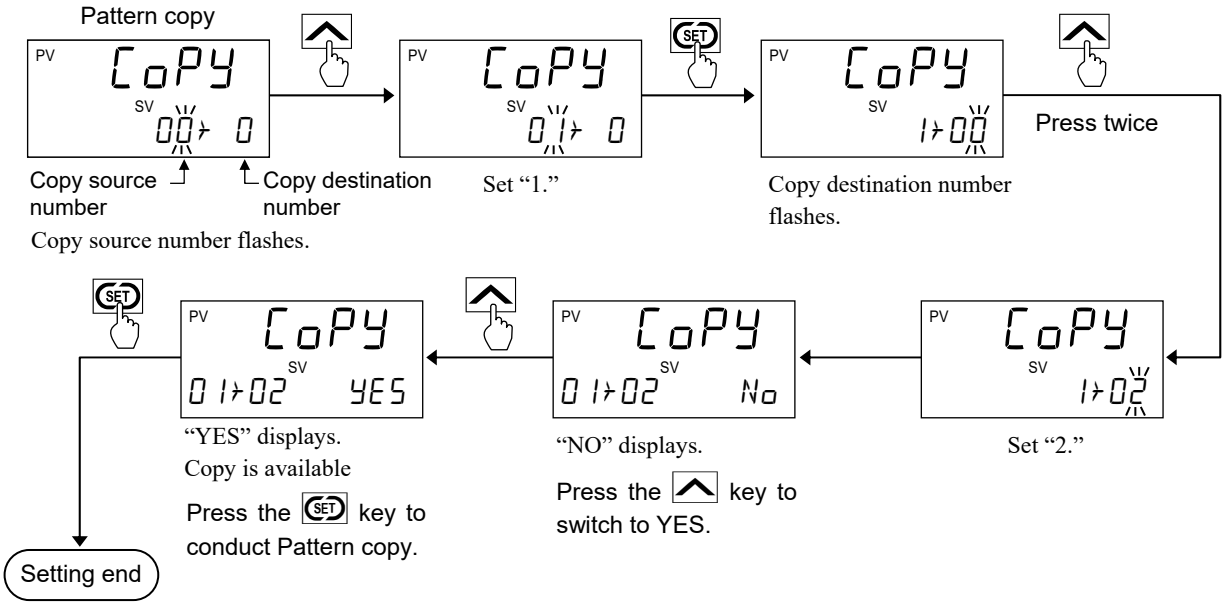
● Data clear [Parameter setting mode: Editing block]

Parameter symbol	Data range	Factory set value
CLR	All set values in the Parameter setting mode will be initialized after setting 9999 and switching from NO to YES.	0

6.11.3 Setting procedure

■ How to conduct Pattern copy

[Example: Copy the data of Pattern 1 to Pattern 2.]

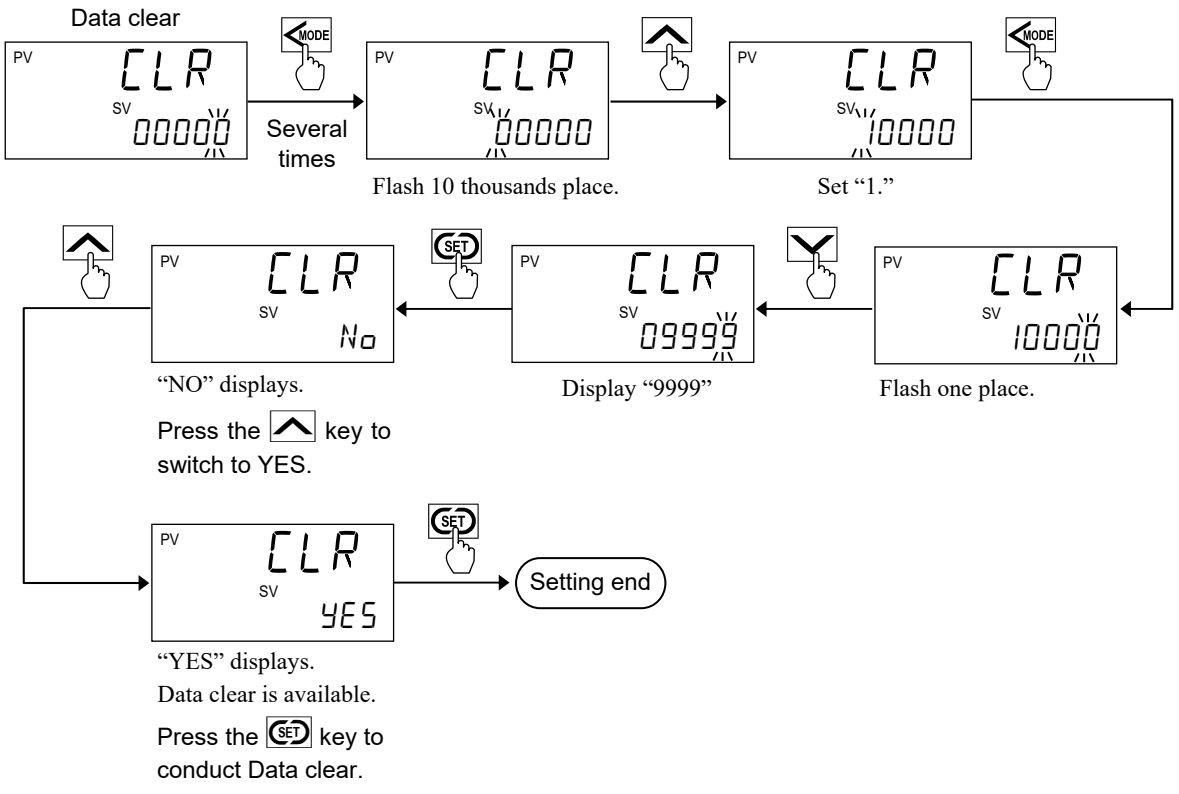


The next parameter displays instead of YES/NO display when the same value or "0" is set to the numbers of Copy source and Copy destination.

■ How to conduct Data clear

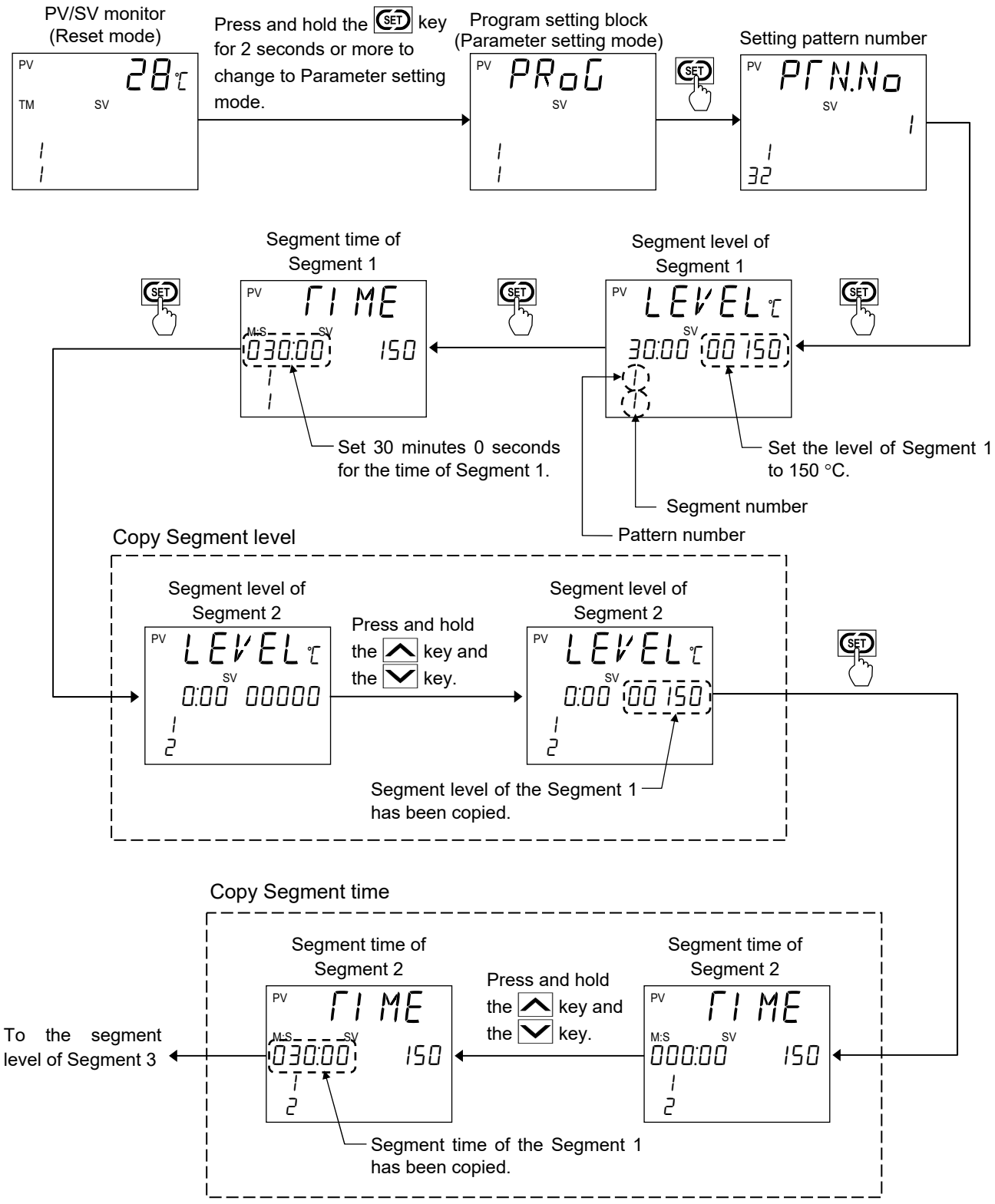
To conduct Data clear, set "9999."

Tip: It is easier to set "10000" first and press the key to reduce the number by 1 rather than setting "9" to each place.



■ How to conduct Segment copy

[Example: Copy Segment level and Segment time]



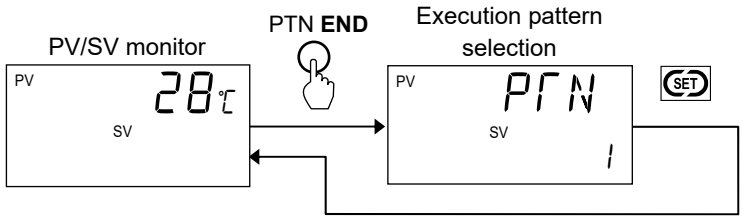
6.12 Tag Function

Alphanumeric Tag name (up to 11 letters) displays instead of pattern number when setting Execution pattern. Use communication (Protocol: RKC communication) to set Tag name.

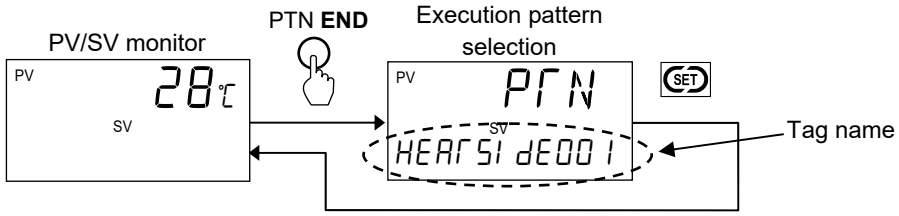
■ Tag name display

Press the PTN END key (PTN lamp lights) to go to the Execution pattern selecting display.

[Example of display without Tag name]



[Example of display with Tag name]



Use the Communication Tool PROTEM2 to input a Tag name.

Alphanumeric character of JIS/ACSII code is only available for setting Tag name.

To set Tag name, refer to **7.3 RKC Communication Protocol** and **7.5 Communication Data List** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

6.13 Forward/Back-up Function

It is possible to speed up the progress of time process program by pressing and holding the ∧ key during the Program control. To back-up the progress of time process, press and hold the ∨ key.

NOTE

Forward/Back-up function is not available in the Factory set value.
Set Key accelerating speed Forward/Back-up function to 1 or more by using communication (Protocol: RKC communication [Identifier: KW]) before conducting Forward/Back-up function. Key operation is not available.

☞ To set Key accelerating speed Forward/Back-up function, refer to **7.3 RKC Communication Protocol** and **7.5 Communication Data List** of the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

■ Forward function

Time process of program may be speeded up by pressing and holding the ∧ key. For the condition of time progression, refer to the Key accelerating speed below. Operation progresses by following settings including Pattern link and Repeat until reaching to the Program end.

■ Back-up function

Time process of program may be back-up by pressing and holding the ∨ key. For the condition of time progression, refer to the Key accelerating speed below. The progress of the program returns to the Program start of the pattern by conducting Back-up function. It is not possible to go beyond the linked patterns when conducting back-up function. For example, when conducting a Back-up function to the program linked by Pattern A and Pattern B, the program returns to the beginning of Pattern B.
It is possible to back-up segment or pattern for up to the numbers of Segment repeat or Pattern repeat being set (10000 times maximum). When setting "No limit" at Pattern repeat execution time, Back-up function is available up to 10000 times.

■ Key accelerating speed

Time progression of Program when pressing and holding the ∧ key or the ∨ key.

∧ ∨ keys operation state	Time progression
Press	Progress for one second
Press and hold the key for 3 seconds	Progress at double speed
Press and hold the key for 3 seconds or more	Progress at the rate being set at Key accelerating speed Forward/Back-up function (Factory set value: 0). When setting "1," the program progresses at double speed. Forward/Back-up function turns OFF when setting "0."

- Forward/Back-up function does not affect operation of Program control operation or Time signal action.
- Forward/Back-up function is not available when the operation is in HOLD state or Pattern end state.
- Wait function is not available when conducting Forward/Back-up function.

7. ERROR DISPLAY

7.1 Display when Input Error Occurs

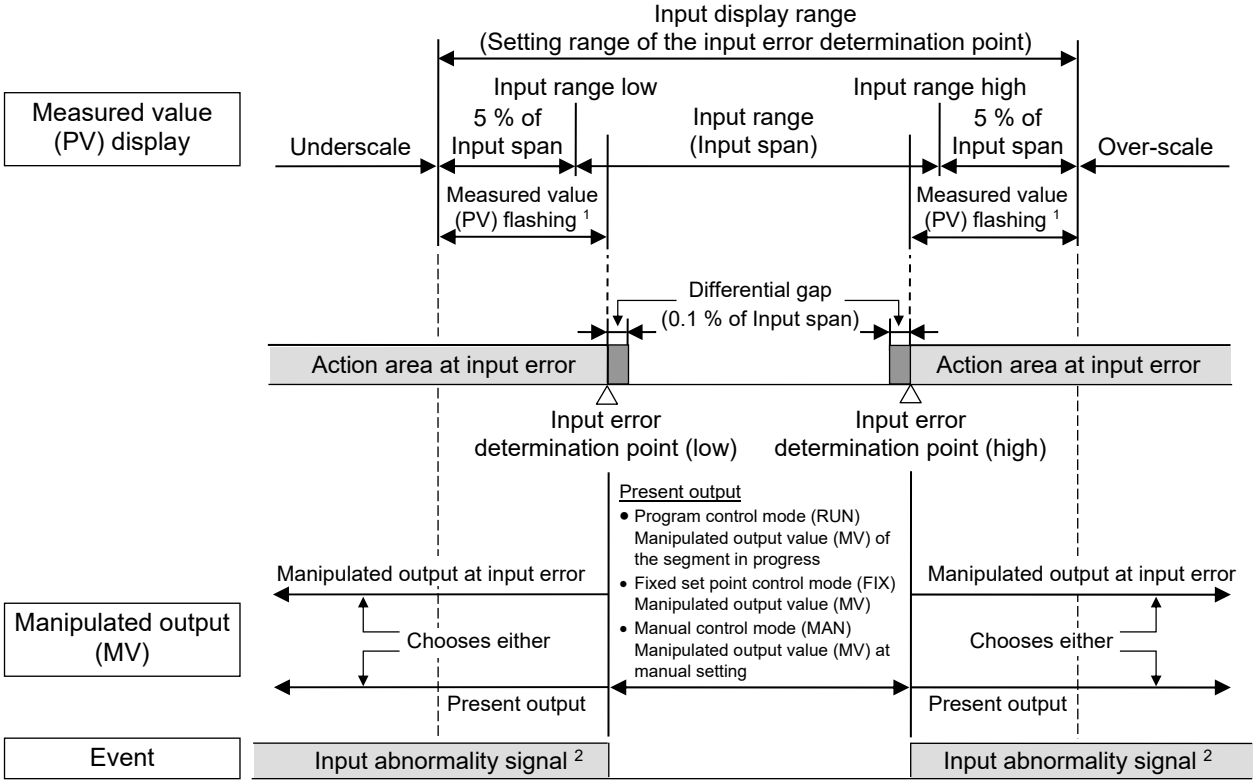
The table below shows displays, description, control actions and solutions when the Measured value (PV) exceeds the display range.

NOTE

Prior to replacing the sensor, always turn OFF the power.

Display	Description	Action (Output)	Solution
Measured value (PV) [Flashing]	• Measured value (PV) exceeds the Input scale high/low. • Measured value (PV) exceeds the Input error determination point (high/low limit).	Action at input error: Output depending on the Action (high or low) at input error [Refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.] Event output: Output depending on the Event output action at input error	Check Input type, Input range and connecting state of sensor. Confirm that the sensor or wire is not broken.
▭▭▭▭▭ [Flashing]	Over-scale Measured value (PV) is above the input display range high (or +99999).		
▭▭▭▭▭ [Flashing]	Underscale Measured value (PV) is below the input display range low (or –19999).		

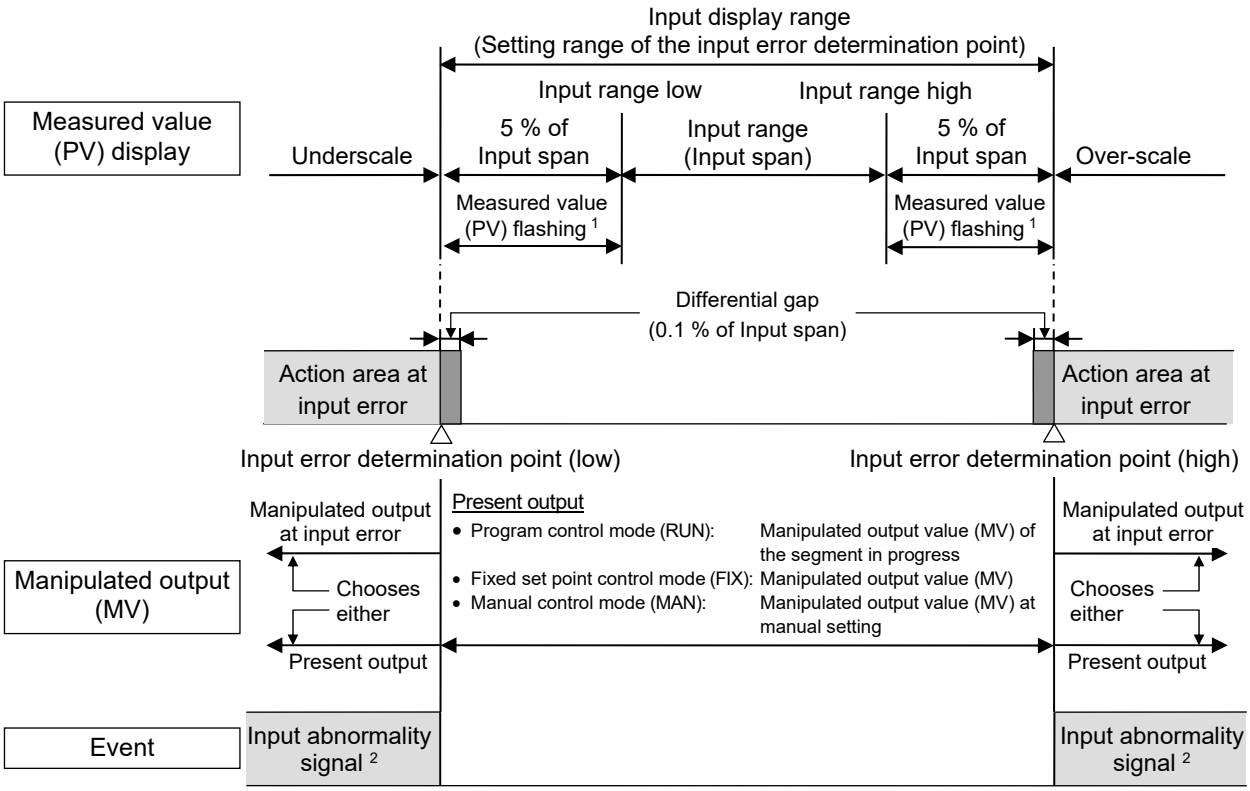
● Setting Input error determination point within input range



1 "Flashing display" or "Non-flashing display" of PV can be selected for the PV flashing display at input error of the Engineering mode (F10.01).

2 For Event output at input error and Input abnormality output, refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

● Setting Input error determination point when out of input range



1 "Flashing display" or "Non-flashing display" of PV can be selected for the PV flashing display at input error of the Engineering mode (F10.01).

2 For Event output at input error and Input abnormality output, refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

7.2 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 codes is displayed.

Error code	Description	Action	Solution
1	Adjusted data error	Display: Error display (Err) Output: All the output is OFF Produces Fail output when the Fail output is allocated to output terminals. Communication: Send Error code. Communication is available.	Turn off the power at once. If the PF900/901 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. If an error occurs after the power is turned on again, the PF900/901 must be repaired or replaced. Please contact RKC sales office or the agent.
2	Data back-up error • Back-up action is abnormal • Data write failure		
4	A/D conversion error • Response signal from A/D converter is abnormal.		
	Temperature compensation error • The temperature compensation data is out of range.		
8	Segment level error • Segment level of the segment in progress is outside of the input range.	Display: Error number and PV/SV display alternatively. Output: Control is continued. Communication: Send Error code. Communication is available.	Set the segment level within the input range.[1]
16	Intercontroller communication error (Link error) • No response from the slave • Error message received from the slave, Example: Sending data out of the setting range or sending data to a non-existing address	Display: Error number and PV/SV display alternatively. Output: Continues based on the operation mode in progress. Communication: Send Error code. Communication is available.	Check connection between the slave, data to be sent to the slave, and other settings such as controller communication address. [2]
No error display	Watchdog timer error • The part of an internal program stops the action.	Display: ALM lamp ON, other lamps are all OFF. Output: All output is OFF Communication: Stop	Turn off the power at once. If an error occurs after the power is turned again, the PF900/901 must be repaired or replaced. Please contact RKC sales office or the agent.
	Power supply voltage is abnormal (power supply voltage monitoring) • Reduction in Power supply voltage	Display: All display is OFF Output: All output is OFF Communication: Stop	

[1] Error display can be released by switching to the Reset mode by front key operation.

[2] Error display can be released by pressing the MONI key and the MODE key.

MEMO

8. SPECIFICATIONS

■ Measured input

Input type:

• Low voltage group *

TC: K, J, T, S, R, E, B, N (JIS-C1602-1995)
PL II (NBS), W5Re/W26Re (ASTM-E988-96)
U, L (DIN43710-1985)
PR40-20 (ASTM-E17551-00)

RTD: Pt100 (JIS-C1604-1997)
JPt100 (JIS-C1604-1981 of Pt100)
3-wire system

Voltage: 0 to 10 mV DC, −10 to +10 mV DC,
0 to 100 mV DC, −100 to +100 mV DC,
0 to 1 V DC, −1 to +1 V DC

• High voltage group *

Voltage: 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 group *

Current: 4 to 20 mA DC, 0 to 20 mA DC

* Universal input
(Use the input select switch to change input group.)

Sampling cycle:
100 ms (50 ms or 250 ms is selectable)

Influence of external resistance:
Approx. 0.2 μV/Ω
(Converted depending on TC types)

Influence of input lead:
Approx. 0.01 % of span (Only RTD input)
10 Ω or less per wire
(When the value is 10 Ω or more, measuring range may be limited.)

Input impedance:
Voltage (low) input: Approx. 1 MΩ or more
Voltage (high) input: Approx. 1 MΩ or more
Current input: Approx. 50 Ω

Measured current:
Approx. 0.25 mA (Only RTD input)

Allowable input voltage:
Within ±5 V
(High voltage group: Within ±12 V)

Square root extraction (Voltage/Current inputs):
Calculation method:
Measured value = $\sqrt{\text{(Input value)}}$ × PV ratio + PV bias
PV low input cut-off:
0.00 to 25.00 % of Input span

■ Current transformer (CT) input [optional]

Number of inputs: 2 points

Input range: CTL-6-P-N: 0.0 to 30.0 A
CTL-12-S56-10L-N: 0.0 to 100.0 A

■ Feedback resistance (FBR) input [optional]

Number of input: 1 point

Permissible resistance range:
100 Ω to 10 kΩ (Standard: 135 Ω)

Input range: 0.0 to 100.0 %
(for adjustment span of open and close)

■ Digital input

Number of inputs: Up to 11 points
(6 points: DI1 to DI6 [optional], 5 points: DI7 to DI11 [standard])

Input method: Dry contact input
Open state: 10 kΩ or more
Close state: 1 kΩ or less
Contact current: 5 mA or less
Voltage at open: Approx. 5 V DC

Capture judgment time:
200 ms max. + 1 sampling cycle

■ Output

Number of outputs:
Up to 15 points (OUT1 to OUT3, DO1 to DO12)
OUT3 and DO5 to DO12 is optional

Output type:

• Relay contact output (OUT1 and OUT2)
Contact type: 1a contact
Contact rating (Resistive load):
250 V AC 3 A, 30 V DC 1 A

• Relay contact output (DO1 to DO4)
Contact type: 1a contact
Contact rating (Resistive load):
250 V AC 1 A, 30 V DC 1 A

• Voltage pulse output (OUT1 to OUT3)
Output voltage: 0/12 V DC (Rating)
ON voltage: 11 V or more, 13 V or less
OFF voltage: 0.2 V or less
Allowable load resistance:
600 Ω or more (20 mA or less)
OUT1: 300 Ω or more when not using OUT2.
(40 mA or less)

• Current output (OUT1 to OUT3)
Output current (Rating):
4 to 20 mA DC, 0 to 20 mA DC
Allowable load resistance: 600 Ω or less

• Voltage output (OUT1 to OUT3)
Output voltage (Rating):
0 to 1 V DC *, 0 to 5 V DC, 1 to 5 V DC,
0 to 10 V DC * Available for OUT3
Allowable load resistance: 1 kΩ or more

• Triac output (OUT1 and OUT2)
Output method: AC output (Zero-cross method)
Allowable load current:
0.5 A (Ambient temperature 40 °C or less)
(Derating: −0.02A/°C when ambient is 40 °C or more.)
Load voltage: 75 to 250 V AC
Minimum load current: 30 mA
ON voltage: 1.6 V or less (at maximum load current)

• Open collector output (OUT1 to OUT3)
Allowable load current: 100 mA
Load voltage: 30 V DC or less
ON voltage: 2 V or less (at maximum load current)
Leakage current at OFF: 0.1 mA or less

• Open collector output (DO5 to DO12)

Output method: Sink type
Use same common terminal for DO5 to DO8 and DO9 to DO12.
Allowable load current: 100 mA
Load voltage: 30 V DC or less
ON voltage: 2 V or less (at maximum load current)
Leakage current at OFF: 0.1 mA or less

■ Performance (at the ambient temperature 23 ±2 °C)

Input accuracy:

• Measured input:

Input type	Input range	Accuracy
K, J, T, PLII, E, U, L (Accuracy is not guaranteed for less than −100 °C)	Less than −100 °C	±1.0 °C
	−100°C or more, less than +500 °C	±0.5 °C
	500 °C or more	±(0.1 % of Reading)
S, R, N, 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
	400°C or more, less than 1000 °C	±1.4 °C
	1000 °C or more	±(0.1 % of Reading)
PR40-20	Less than 400 °C	±20 °C
	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)
Voltage	±0.1 % of Input span	
Current		

Cold-junction temperature compensation error:
Within ±1.0 °C
Within ±1.5 °C (Between −10 to +55 °C)

• Current transformer (CT) input:

±5 % of Reading or ±2 A (whichever is larger)

• Feedback resistance (FBR) input:

±0.5 % ±1 digit of Input span (for adjustment span of open and close)

Output accuracy:

Current output: ±0.1 % of Output span
Output resolution: Approx. 1/10000
Voltage output: ±0.1 % of Output span
Output resolution: Approx. 1/10000

■ Control

Control method:

a) Brilliant II PID control
b) Brilliant II Heat/Cool PID control
c) Brilliant II Position proportioning PID control
d) Manual control
Selectable from a) to d)

■ Event function

Number of events: Up to 4 points (Event 1 to 4)

Event action:

Deviation high, Deviation low,
Deviation high/low (High/Low common setting),
Deviation high/low (High/Low individual setting),
Band (High/Low common setting), Band (High/Low individual setting), Process high, Process low,
SV high, SV low, MV1 high [heat-side] *,
MV1 low [heat-side] *, MV2 high [cool-side],
MV2 low [cool-side]

* Position proportioning PID control: Feedback resistance (FBR) input value

■ Control loop break alarm (LBA)

Setting range:

Control loop break alarm (LBA) time:
0 to 7200 seconds (0: LBA function OFF)

LBA deadband (LBD):
0 to Input span

Additional function: LBA interlock

■ Heater break alarm (HBA) [for time proportional-control output] (optional)

Number of HBA:
Up to 2 points (1 point for three-phase)

Setting range:
0.0 to 100.0 A (0.0: HBA function OFF)
Current value monitor is available regardless of whether HBA is OFF. It is not possible to detect the value if the ON time or OFF time of control output is within:
160 ms (with CT sampling cycle of 200 ms).
140 ms (with CT sampling cycle of 100 ms).
220 ms (with CT sampling cycle of 500 ms).

Additional function:
Number of HBA delay times,
HBA interlock

■ Transmission output [optional]

Number of output: 1 point (Use the OUT1 to OUT3)

Output contents:

Measured value (PV), Set value (SV) monitor,
Deviation value, Output program value *,
Segment time (percentage basis)

* For OUT1, only Output program value 1 is available.

■ Communication function [optional]

● Communication 1 (For the host communication)

Interface:
Based on RS-232C, EIA standard
Based on RS-485, EIA standard
Based on RS-422A, EIA standard
Multi-drop connection of RS-485 and RS-422A is available.

Connection method:
RS-422A: 4-wire system, half-duplex multi-drop connection
RS-485: 2-wire system, half-duplex multi-drop connection
RS-232C: 3-wire system, point-to-point connection

Synchronous method: Start/Stop synchronous type

Communication speed:
2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps

Protocol:
RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4) or Modbus-RTU

Data bit configuration:
Start bit: 1
Data bit: 7 or 8 (Modbus: 8-bit only)
Parity bit: None, Odd or Even
(Modbus cannot be select the Odd)
Stop bit: 1 or 2

Maximum connections:
Up to 31 controllers (RS-485, RS-422A)
1 controller (RS-232C)

● Communication 2 (For the intercontroller communication)

Function:
Send the Set value (SV) to the slave controllers being connected to link operation.
It is possible to link PID memory area.

Interface:
Based on RS-485, EIA standard

Connection method:
RS-485: 2-wire system, half-duplex multi-drop connection

Synchronous method: Start/Stop synchronous type

Communication speed:
9600 bps, 19200 bps, 38400 bps

Protocol: Modbus-RTU

Data bit configuration:
Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1

Slave connections: Up to 4 controllers (0: Link OFF)

Slave controllers: FB series, RB series or PF900/901

■ Loader communication

Loader ports: 1 point (Front or bottom)
The front loader port only works when instrument is ON. It is not possible to use the loader port at the front and the one at the bottom at the same time.

Synchronous method: Start/Stop synchronous type

Communication speed: 38400 bps

Protocol:
RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)

Data bit configuration:
Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1

Maximum connections: 1 point

Connection method: COM-K☐ special cable
Front port: W-BV-03
Bottom port: W-BV-01

■ Program control

Time accuracy:
±0.01 % of Reading or Input sampling cycle (whichever is larger)
Delay for input sampling cycle at every shift of segment of "segment time = 0."

Number of program memories:
Number of program patterns: Up to 99 patterns
Number of segments: Up to 1024 segments
Up to 99 segments for each pattern

Time signal output:
Number of outputs: 8 points
Output assignment:
Up to 14 points (The relay outputs are 4 points.)
Select by OUT2, OUT3 or DO assignments.

■ General specifications

Power supply voltage:
100 to 240 V AC type (Rating 100 to 240 V AC):
85 to 264 V AC [Including power supply voltage variation], 50/60 Hz
Frequency variation: 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)
24 V AC type (Rating 24 V AC):
20.4 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
Frequency variation: 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)
24 V DC type (Rating 24 V DC):
20.4 to 26.4 V DC [Including power supply voltage variation]

Power consumption/Current (at maximum load):
100 to 240 V AC type:
9.5 VA max. (at 100 V AC), 13.5 VA max. (at 240 V AC)
Rush current: 7.5 A or less (at 100 V AC), 17.5 A or less (at 240 V AC)
Power saving mode:
7.1 VA [Approximately 15 % OFF] (at 100 V AC)
10.9 VA [Approximately 16 % OFF] (at 240 V AC)
Varies from condition.

24 V AC type:
8.5 VA max. (at 24 V AC)
Rush current: 8.5 A or less
Power saving mode:
6.2 VA (Approximately 16 % OFF)
Varies from condition.

24 V DC type:
230 mA max. (at 24 V DC)
Rush current: 6.0 A or less
Power saving mode:
173 mA (Approximately 19 % OFF)
Varies from condition.

Insulation resistance:
Between measuring terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply and measuring terminals:
20 MΩ or more at 500 V DC
When grounding is not provided: Between panels

Withstand voltage:

Time: 1 min.	①	②	③	④	⑤
① Grounding terminal					
② Power terminal	1500 V AC				
③ Measured input terminal	1500 V AC	2300 V AC			
④ Output terminal (Relay contact, Triac)	1500 V AC	2300 V AC	2300 V AC		
⑤ Output terminal (Other than ④)	1500 V AC	2300 V AC	1500 V AC		
⑥ Communication, digital input (DI) terminals	1500 V AC	2300 V AC	510 V AC	2300 V AC	1000 V AC

Power failure:
A power failure of 20 ms or less will not affect the control action.

Memory backup:
Backed up by non-volatile memory
Number of writing:
Approximately ten billion times (FRAM)
(Depending on storage and operating conditions.)
Data storage period:
Approximately 10 years (FRAM)

Power failure recovery:
Hot/Cold start:
Restart at the Reset mode (RESET) when power failure occurs at the Reset mode.
Start determination point:
0 to Input span
(0: Action conforms to the Hot/Cold start)
Unit: same as the reading

Allowable ambient temperature:
−10 to +55 °C

Allowable ambient humidity:
5 to 95 %RH
Absolute humidity:
MAX.W.C 29 g/m^3 dry air at 101.3 kPa

Vibration · Shock:
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)

Installation environment conditions:
Indoor use
Altitude up to 2000 m

Transportation and Storage environment conditions:
Vibration: Random vibration (Based on JIS Z-0232 7.3.1)
Shock: Height 600 mm or less
Packed state
Temperature: −40 to +70 °C
Humidity: 5 to 95 %RH (Non condensing)
Absolute humidity:
MAX.W.C 35 g/m^3 dry air at 101.3kPa

Mounting and Structure:
Mounting method: Panel-mounted
Mounting orientation: Datum plane ± 90°
Front panel material: Polycarbonate
Case material: Polycarbonate
Filter material: Acrylic
Terminal cover material: Polycarbonate

Weight: Approx. 470 g

Dimensions: 96 mm × 96 mm × 80 mm (W × H × D)

Mounting size: 25 mm (Wide), 30 mm (High)

☞ For product specification, refer to **9. SPECIFICATIONS** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)**.

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