PF SERIES

Ramp/Soak Controller

PF900
PF901

User's Manual

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

RKC® **RKC INSTRUMENT INC.**

IMR02L04-E1

NOTICE

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

- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.

- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.

- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.

- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.

- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.

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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
0	1	2	3	4	5	6	7	8	9	–	.

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

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

U	u	V	W	X	Y	Z	Dash	/	*	Temperature units	
U	u	V	W	X	Y	Z	'	/	*	℃	℉

%	→	_
‰	⊁	_

8.	Dim lighting
8	Bright lighting

8.	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 (1or 2)		
CT (1 or 2)	Current transformer (1 or 2)		
LBA	Control loop break alarm		
LBD	LBA deadband		

Document Configuration

There are four 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:
http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Description	Remarks
PF900/PF901 User's Manual	**IMR02L04-E1**	This Manual. This document describes installation, wiring and basic operation.	Provided with product
PF900/PF901 Instruction Manual	IMR02L03-E□	This manual explains the method of the mounting and wiring, the operation of various functions, and troubleshooting.	Provided with product On CD-ROM [Downloadable]
PF900/PF901 Pattern Record Sheet	IMR02L05-E□	This spreadsheet is to record patterns for Program control operation.	
Communication Setup Tool for PF900/PF901 Program Controller (WinUCI-PF900) Instruction Manual	IMT01D09-E□	This document describes installation of communication setup tool, connection and setting of data.	

Contents

Contents (Categorized by purpose)

1. OUTLINE

1.1 Handling Procedure to Operation

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

Mounting and Wiring	☞ Refer to **2. MOUNTING (P. 2-1)** or **3. WIRING (P. 3-1)**.
Power ON	
Switch mode from RUN to RESET.	Press the RESET key to go to the Reset mode (RESET) to stop the operation. (RESET lamp turns on.)
Set operation conditions?	**No** (No need to change the specification at ordering.)
	Yes (To change the operating condition)
Initial Setting (Engineering mode)	• Check the parameter related to the input (P. 5-1) • Check the parameter related to the event (P. 5-3) • Check the parameter related to the control action (P. 5-4) ☞ For details of Engineering mode parameters, refer to **4.5.5 Engineering mode (P. 4-32)**.
Program pattern setting	Record data of Program pattern in the spreadsheet before setting. (PF900/PF901 Pattern Record Sheet is included in the CD-ROM.) Set Program pattern. ☞ Refer to **5.4.3 Program pattern composition for setting example of Program pattern (P. 5-12)**.
Start test run.	
Switch mode from RESET to RUN.	Press the RUN key to go to the Program control mode (RUN) to start operation. (RUN lamp turns on.) ☞ Refer to **5.4.4 Start/End Program control (P.5-20)** for the procedure to switch operation modes.
Conduct Autotuning (AT)	AT lamp flashes When the AT is finished, the controller will automatically returns to PID control. ☞ For details of Autotuning (AT), refer to **5.5 Autotuning (AT) (P. 5-23)**. ☞ For Autotuning (AT) with learning function, refer to **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.
Desired control result?	**No**
	Yes
Conduct manual turning.	
Start operation	

1.2 Checking the Product

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

Accessories

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 User's Manual (IMR02L04-E□)	1	B6 size (hard copy)
□ CD-ROM	1	Contents of CD-ROM • ReadMe • Communication Setup Tool for PF900/PF901 Program Controller (WinUCI-PF900)* • Communication Setup Tool for PF900/PF901 Program Controller (WinUCI-PF900) INSTRUCTION MANUAL (IMT01D09-□□)* • PF900/PF901 Instruction Manual (IMR02L03-□□)* • PF900/PF901 Pattern Record Sheet* • USB driver for COM-K communication converter* • Installation USB driver for COM-K communication converter [IMT01D07-E□]* * This manual can be downloaded from the official RKC website: http://www.rkcinst.com/english/manual_load.htm.

Sold separately

Details	Q'TY	Remarks
□ Terminal cover (parts code: KFB400-511)	2	Optional
□ Front cover (parts code: KF9-35)	1	Optional
□ 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	Optional

📖 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)		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
PF901 (PV and SV displays: White)		– □	□	□ –	□ ∗ □		□	□	□ –	□	□□□	/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 at 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]	No specify quick start code									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]	No specify quick start code										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		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		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		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 to +400 °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 to +200 °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	−200.00 to +200.00 °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)	□						
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
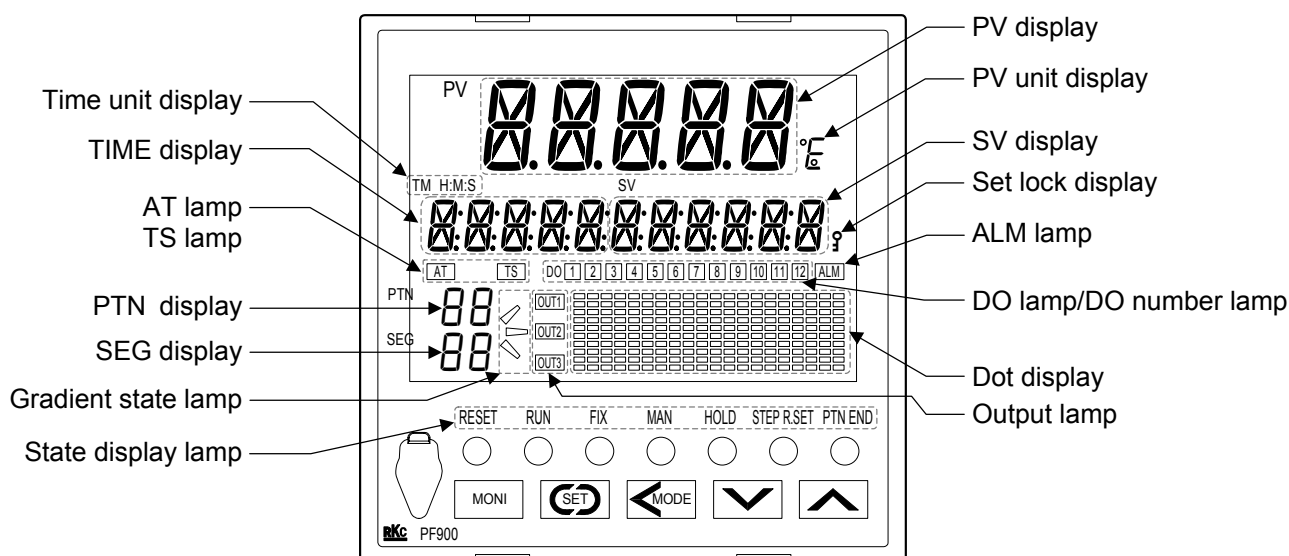
● **PV display [PF900: Green/PF901: White]**

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 "ᵖ" 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.

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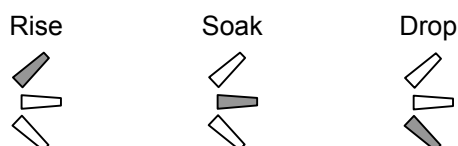
In the Program control mode (RUN):
　　　　Lights the lamp of the gradient of the segment in process.
Fixed set point control mode (FIX):
　　　　Lights soak lamp
In the Manual control mode (MAN) or the Reset mode (RESET):
　　　　Gradient state lamp does not light.

● **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

Loader communication connector

Direct keys

Up key

Monitor key   Set (SET) key   Shift key   Down key
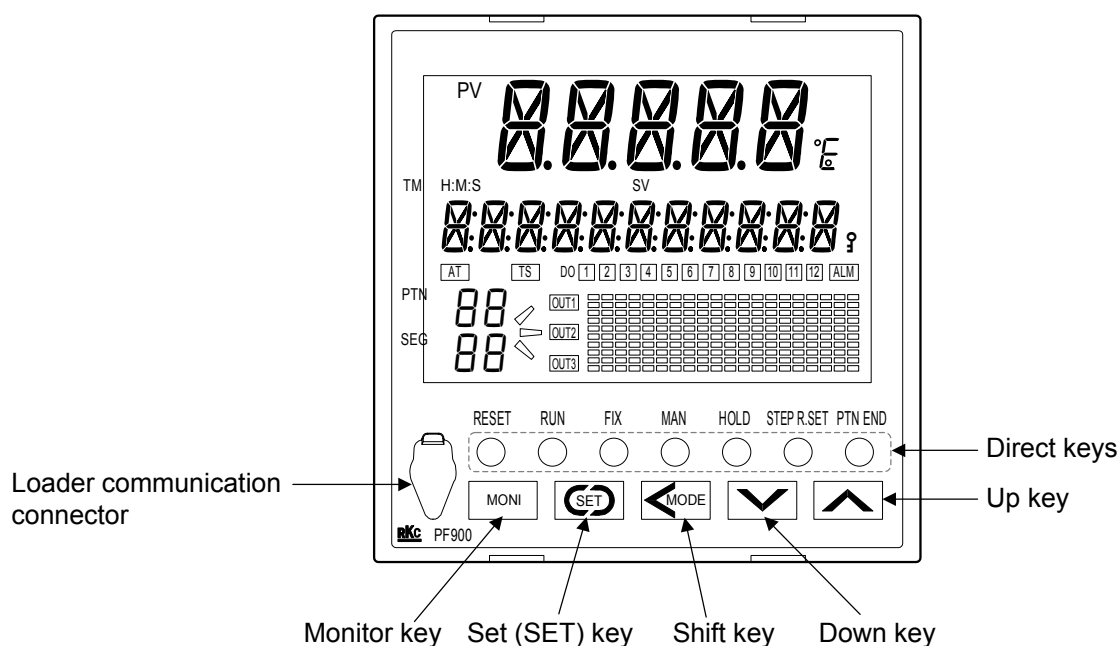
● Direct keys

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 [*PᴦN*].
	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** ⧏MODE
- Shift digits when settings are changed.
- Used to selection operation between modes.

● **Set (SET) key** SET
Used for parameter calling up and set value registration.

● **Monitor key** MONI
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□)** on the CD-ROM.

■ **Side view**

Input select switch

● **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.

Program setting
- Up to 99 patterns and 1024 segments (Max. 99 segments for each pattern)
- Segment level
- Segment time
- PID memory group
- Event memory group
- Wait memory group
- Time signal
- Output program memory group
- Pattern link/Repeat
- Segment repeat
- Copy function
- Tag function
- Data clear (Parameter initialization)

Display
- Measured value (PV) monitor
- Segment level/Segment time
- Program pattern number/Segment number
- Pattern/Segment remaining time monitor
- Current transformer (CT) input value monitor
- Manipulated output value (MV) monitor
- Pattern display (dot display)
- Operation lamps

Key operation
- Operation key: MONI, SET, <MODE and ∨, ∧ keys
- Direct key: RESET, RUN, FIX, MAN, HOLD, STEP R.SET and PTN END keys

Reset mode

Set value (SV) for Fixed set point control mode (FIX)

Operation mode transfer

RUN   RESET
FIX   MAN

Manual manipulated output setting

Measured input

TC
RTD
Voltage/ Current

Input processing
- PV digital filter
- PV bias
- PV ratio
- Square root extraction (Voltage/Current input)

Program control
- PV start
- Time signal output (8 points)
- Hold function
- Step function
- Wait function
- Pattern end function
- Output program function
- Forward/Back-up function

Control mode
- PID control
- Heat/Cool PID control
- ON/OFF action
- Position proportioning PID control
- Direct/Reverse action
- Manual control
- Fixed set point control
- Autotuning (AT)
- Auto tuning (AT) with learning function
- Level PID (8 levels)
- Segment PID
- Ramp/Soak stabilizer function

Current transformer (CT) input

CT1 *
CT2 *

Current capture processing

(CT input is not specifiable with FBR.)

Feedback resistance (FBR) input

FBR *

Input processing

(FBR is not specifiable with CT input.)

Digital input 1 to 11
- Dry contact

DI1 to 6*
DI7 to 11

DI function assignment
- Reset mode setting
- Program control mode setting
- Hold function
- Step function
- Direct action/Reverse action
- Wait state release
- Pattern number switch
- Pattern increment

Control output
- Relay contact
- Voltage pulse
- Voltage/Current
- Triac
- Open collector

Control output (heat-side)
Open side for Position proportioning control

Control output (cool-side)
Close side for Position proportioning control

OUT1

OUT2

- Voltage pulse
- Voltage/Current
- Open collector

Output program

Transmission output (Voltage/Current)*
- Measured value (PV)
- Set value (SV)
- Deviation value (DEV)
- Segment time (percentage) (Output scaling is fixed)

OUT3 *

Output selections

Output scaling

Digital ouput 1 to 4
- Relay contact

DO1 to 4

Digital output 5 to 12
- Open collector

DO5 to 12*

Event, Alarm
- Event 1 to 4 (Hold action, Event timer or interlock)
- Heater break alarm (HBA) 1,2 (Number of delay times)
- Control loop break alarm (LBA)
- FAIL (Contact open when error occurs)
- Energized/De-energized Selectable for OUT2, OUT3 and DO1 through DO12 (OUT1 is fixed to Energized)

DO function assignment
- Time signal 1 to 8
- Event 1 to 4
- HBA1, HBA2
- LBA
- Input error state
- RUN mode state
- FIX mode state
- MAN mode state
- Ramp state
- Soak state
- Hold state
- Wait state
- Pattern end signal
- Autotuning (AT) state
- FAIL state
- Host communication error
- Intercontroller communication error
- FBR input error

RS-485/RS-422A/ RS-232C

Host communication*

Protocol selections

RKC communication

Modbus

RS-485

Intercontroller communication*

Modbus
For master/slave link operation

Loader communication* (front)

RKC communication
COM-K must be used to connect to a PC via the loader port.

Communication
- Host communication
- Intercontroller communication
- Loader communication

Power supply
100 to 240 V AC, 24 V AC or 24 V DC

Marked*: Optional

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/PF901 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/PF901:

- 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
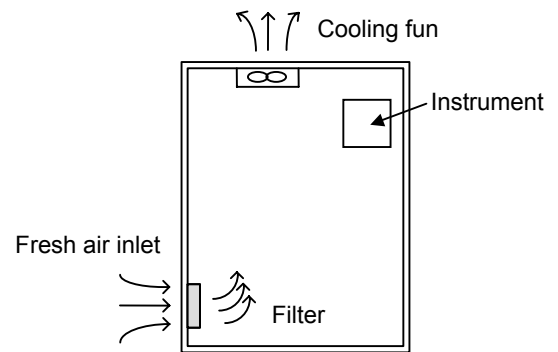
Distance from rotating machinery lines
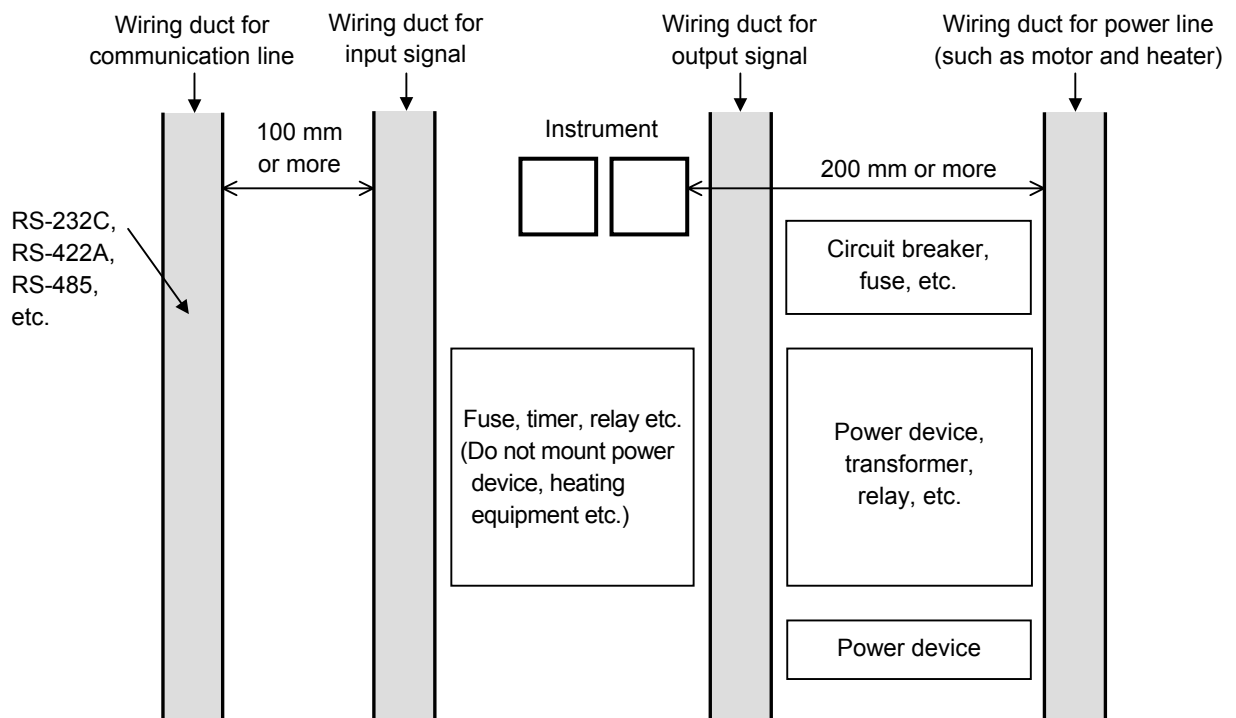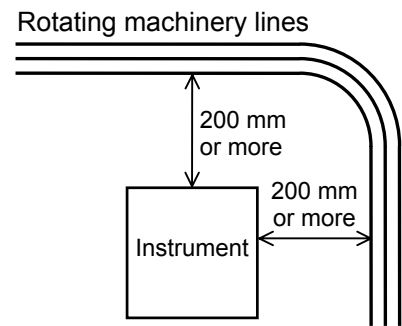
- Mount PF900/PF901 within the range of installation position (±90°).
- Concern the viewing angle of the display when mounting PF900/901.
  Viewing angle: Horizontal 90°/vertical 90° (contrast ratio 20:1)

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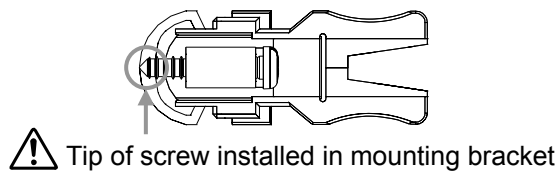
- Install two mounting brackets each on top and the bottom of the instrument. Do not install them in the grooves located on the side surfaces.
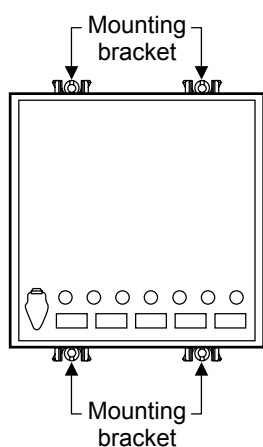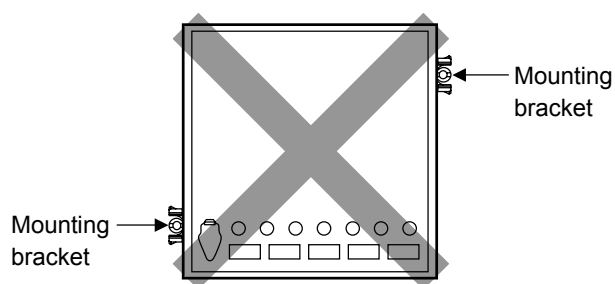
Correct installation   Incorrect installation

2.3 Dimensions

● Dimensions

(Unit: mm)

96

96

91.8

91.8

106.1

*2

11

1 *1

80

90.1

[Panel thickness: 1 to 10 mm]
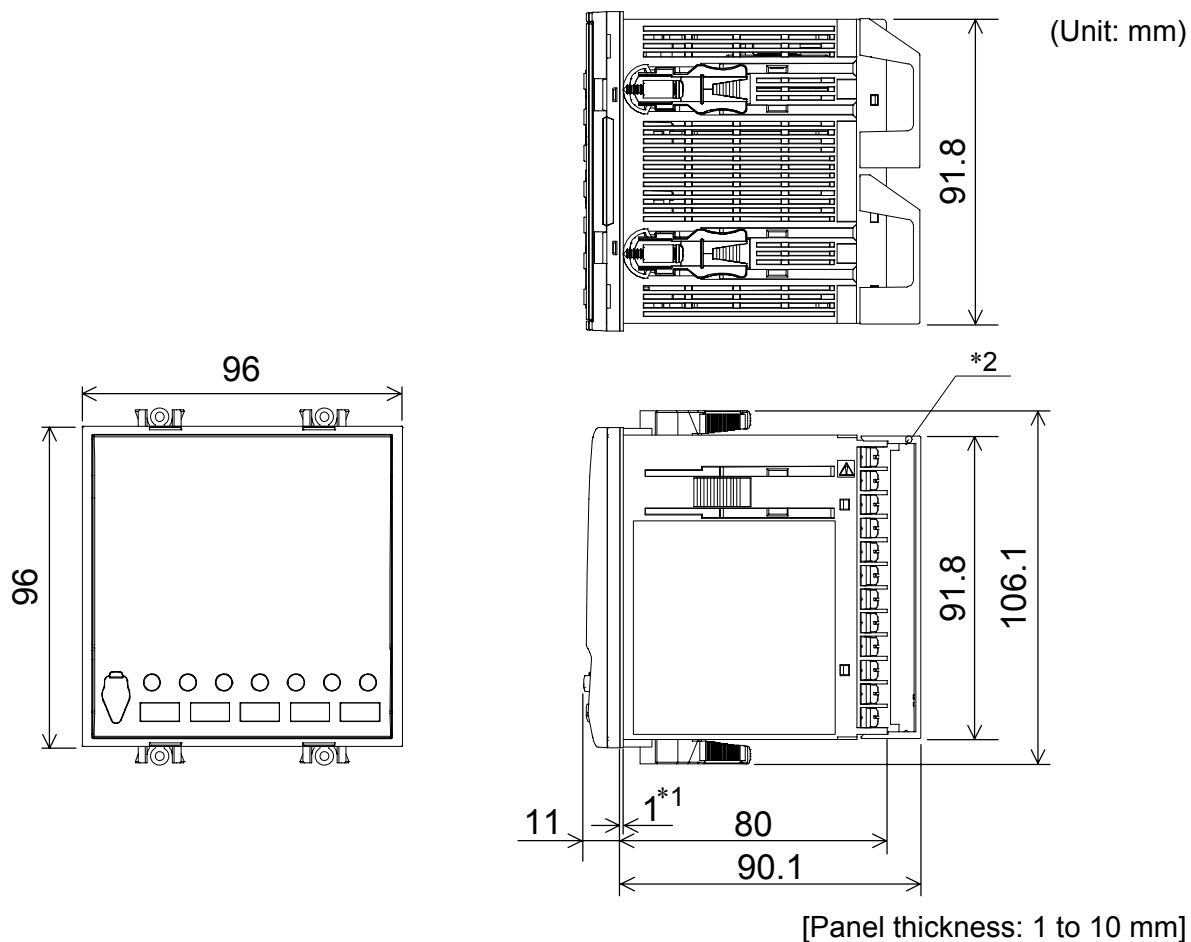
*1 Waterproof/dustproof rubber packing (Model code: KFB900-36 <1>)
*2 Terminal cover [sold separately] (Model code: KFB 400-511)

● 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.

25

$92^{+0.8}_{0}$

(Unit: mm)

$92^{+0.8}_{0}$

30
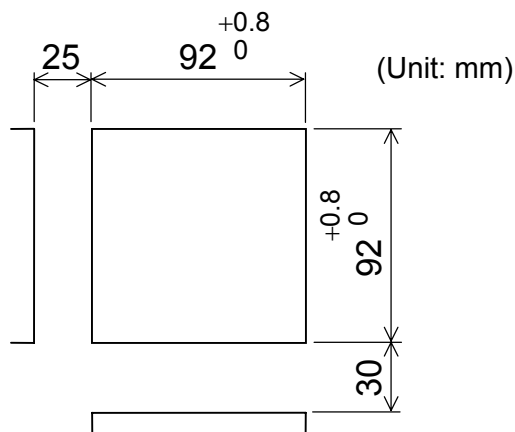
2.4 Procedures of Mounting and Removing

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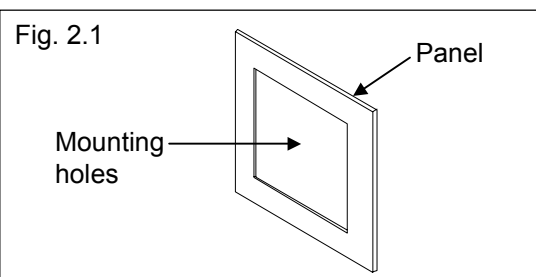
2. Set the water/dustproof rubber packing on the case from the back side of the instrument shown in Fig. 2.2. Insert the instrument through the panel cutout.

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

Fig. 2.2   Panel
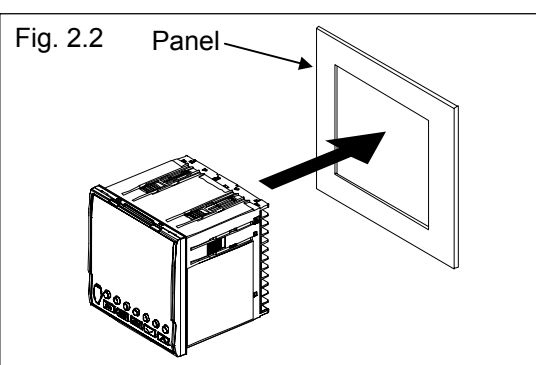
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.3)

Fig. 2.3
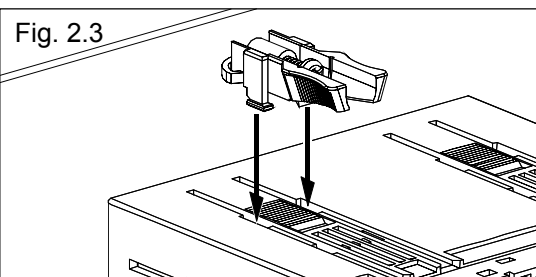
4. Push the mounting bracket forward until the bracket is firmly secured to the panel. (Fig. 2.4)

Fig. 2.4
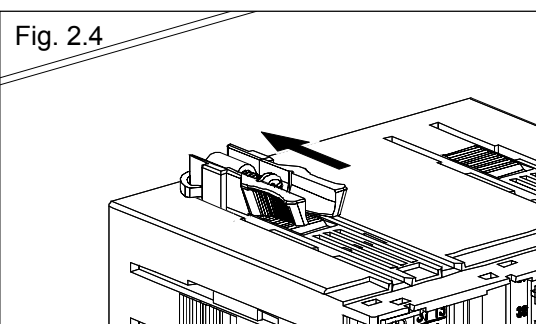
5. Turn only one full revolution after the screw touches the panel. (Fig. 2.5)

📖 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*.
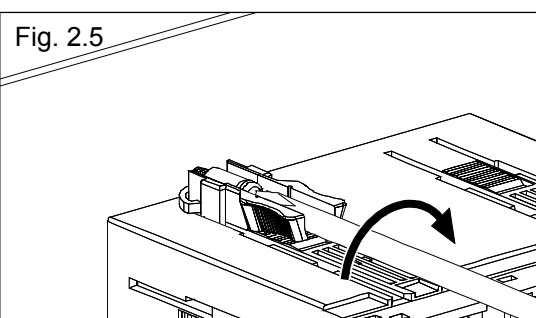
■ Removal procedures

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

Rear of mounting bracket

Fig. 2.7

[A]

[B]

Fig. 2.8   Panel
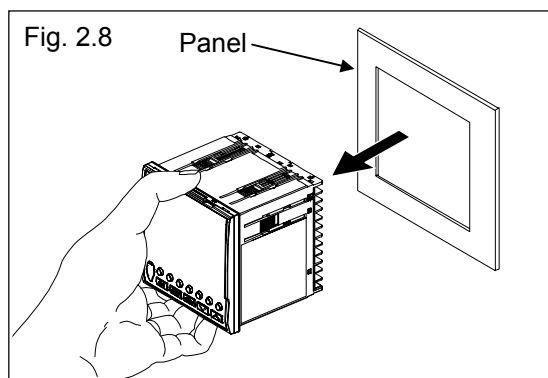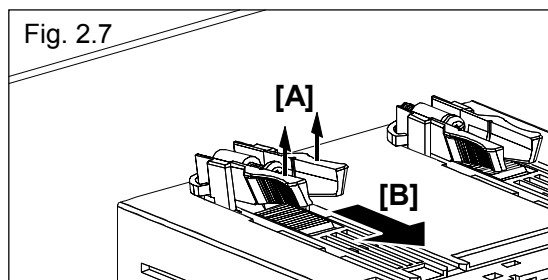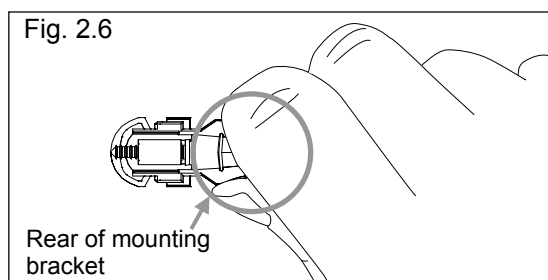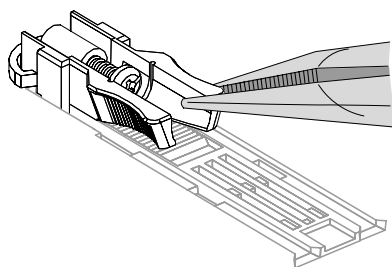
☞ To remove by using a flathead screwdriver, refer to the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

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.
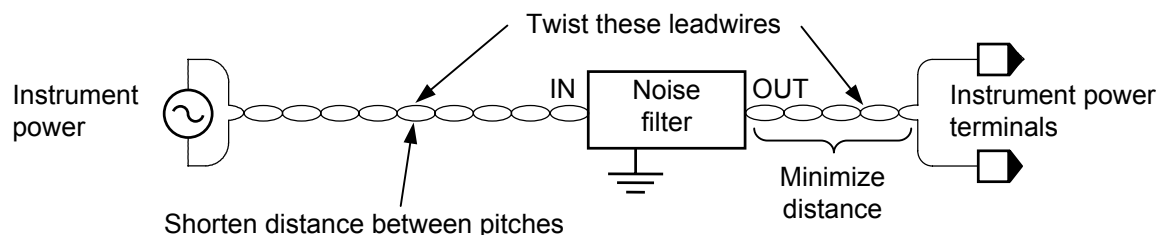
- About 5 seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch 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.
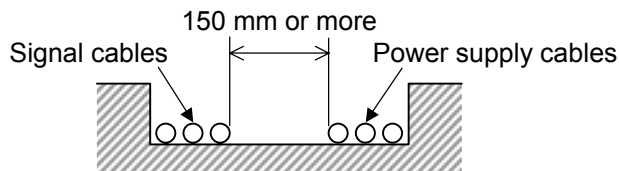
Example: Locate separator.
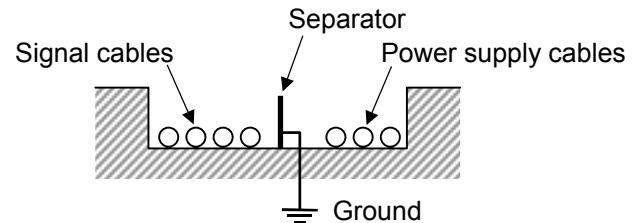
Example: Cross the cables at a right angle.

Place materials such as the iron plate with a thickness of 1.6 mm between the cables.
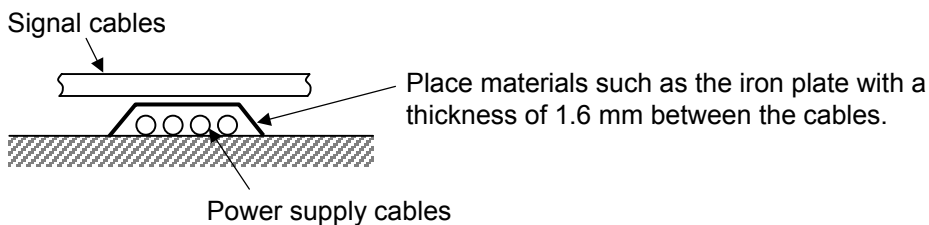
- Use independent ducts for the input/output wires and power circuits inside and outside the panel.
- If input/output wires have to be placed in the same duct as the power circuits, use shielded wires. Ground the shield to reject any noise generated by the floating capacitance between the cores and shield or by a grounding potential.

Example: When signal source is grounded, ground the shield to the signal source side.
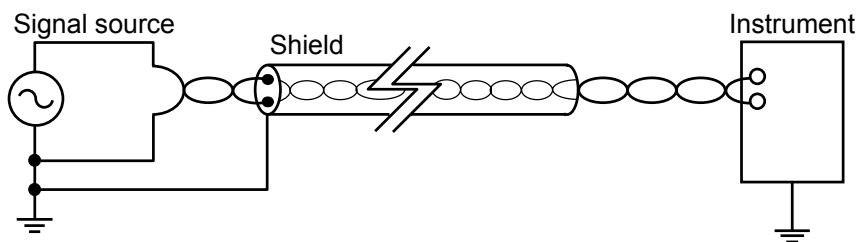
Example: When signal source is not grounded, ground the shield to the instrument side.
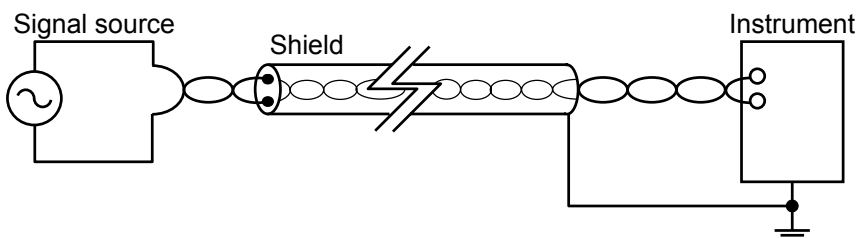
■ Ground wiring

- Ground the instrument separately from other equipment. The full grounding effect may not be produced depending on the grounding method.

Dedicated grounding: Suitable   Common grounding: Not suitable
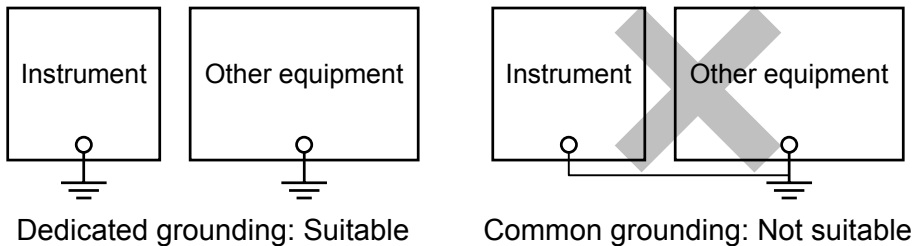
- Do not mix this grounding wire with other grounding wires.
- Do not use the same grounding wire as that for high-voltage equipment such as motors, etc.
- Do not ground grounding wires so that they form a grounding loop. Ground each wire at one point.
- The grounding resistance should be 100 Ω or less.
- Use ground wires with a cross section of 2.0 mm^2 or more.

■ 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
φ 5.9 MAX
φ 3.2 MIN   φ 5.0
5.6 mm   9.0 mm
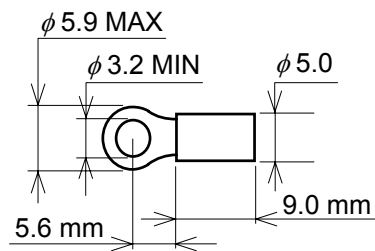
- Make sure that the any wiring such as solderless terminal is not in contact with the adjoining terminals.
- When making the connections, route from the left side toward the rear terminals as shown in Fig. 3.2. The central and right columns of terminals are slanted to facilitate connection from the left. If a terminal cover is used, connection from the right side is not possible.

Fig. 3.2 Wiring direction

Connect from the left side

When a terminal cover is attached

Connect from the left side

Connection from the right side is not possible
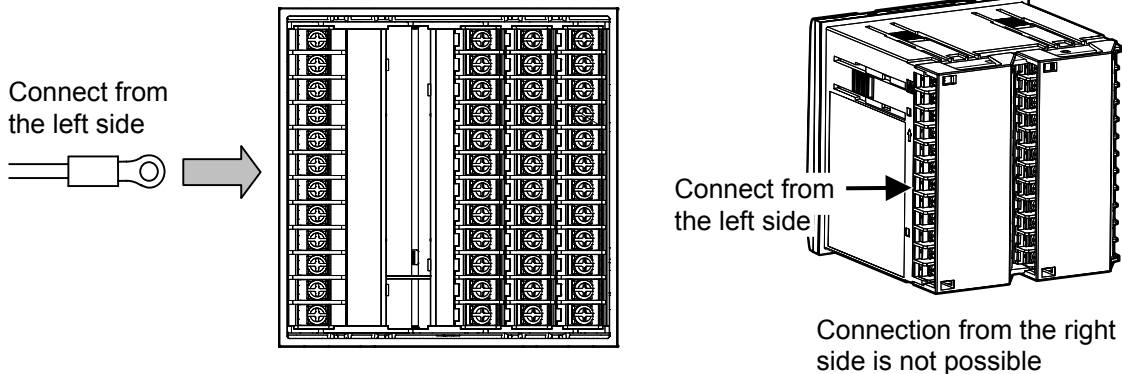
- Up to two solderless terminal lugs can be connected to one terminal screw.
  However, in this case, reinforced insulation cannot be used.

  📖 **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

Panel

Top view
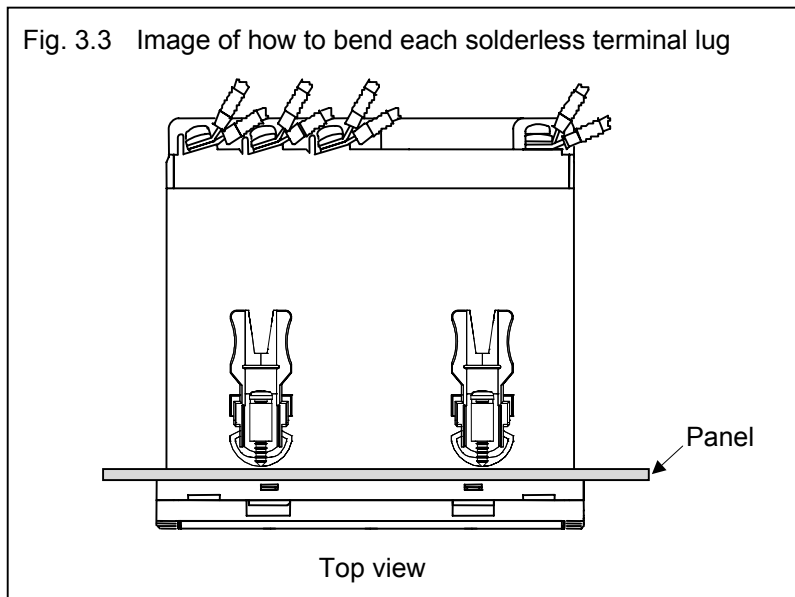
3.2 Terminal Layout

◼ 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.

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.

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

* Specify when ordering

Terminal numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 | 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48 | 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 | 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24

■ Isolations of the instrument

For isolated device Input/Output blocks, refer to the following:
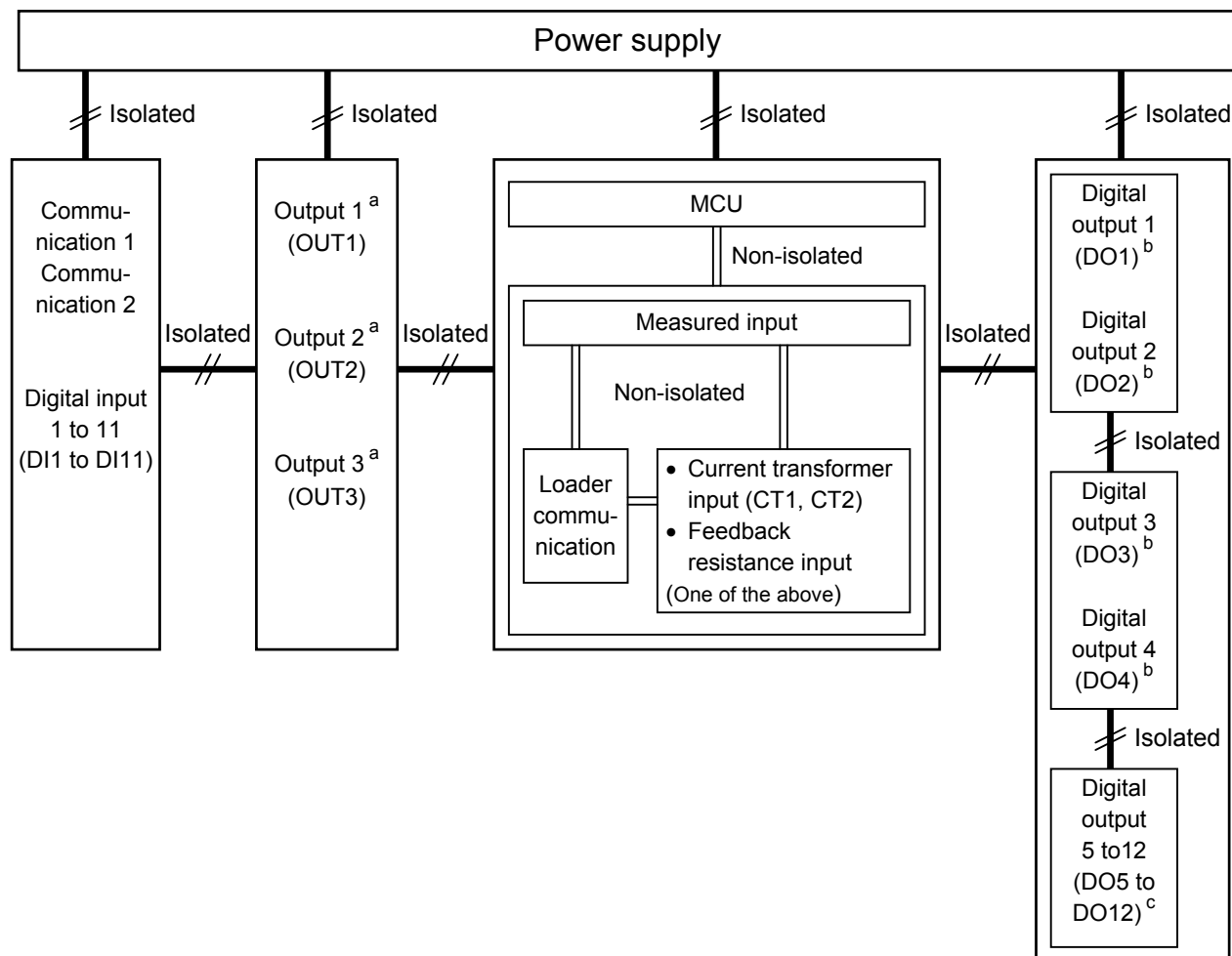
[a] OUT1, OUT2 and OUT3 are isolated when relay contact or triac is specified for OUT1 and OUT2.

[b] Not isolated between DO 1 and DO 2 or DO 3 and DO 4

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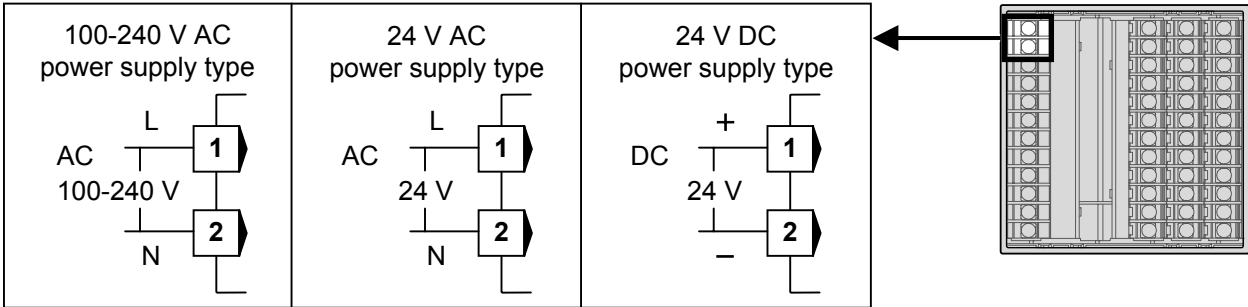
- The power supply types must be specified when ordering. Power supply voltage for the controller must be within the range shown below for the controller to satisfy the control accuracy in the specifications.

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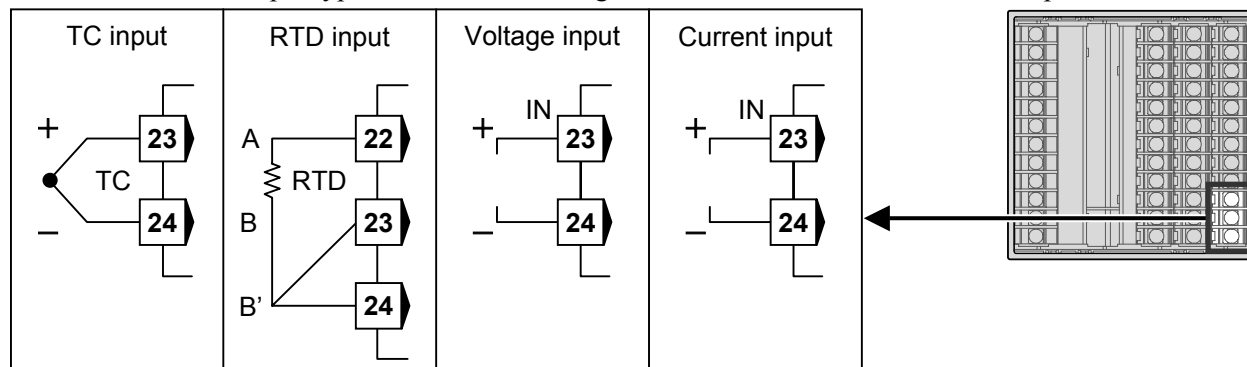
- Select the Voltage (low) input group, the Voltage (high) input group or the Current input group to conform to the input type to be set.

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).
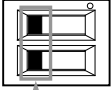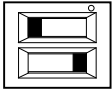
📖 **NOTE**

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

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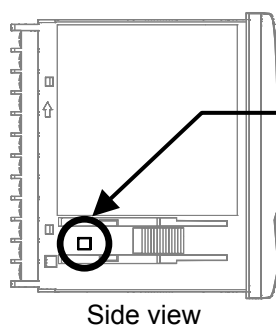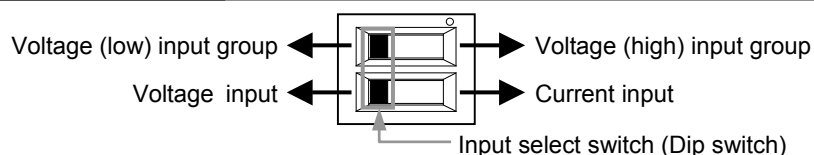
Input group		Input type	Input select switch
Voltage (low) input group	TC input	K, J, E, T, S, R, B, N (JIS-C1602-1995) PLII (NBS) W5Re/W26Re (ASTM-E988-96) U, L (DIN43710-1985) PR40-20 (ASTM-E1751-00)	
	RTD input	Pt100 (JIS-C1604-1997) JPt100 (JIS-C1604-1981 Pt100)	
	Voltage (low) input	0 to 10 mV DC,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

OUT2 (Specify when ordering)
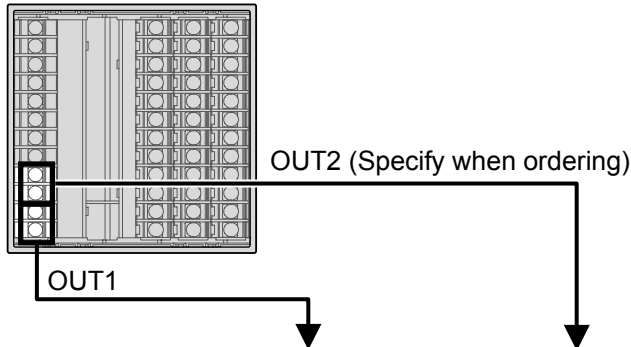
OUT1

	OUT1	OUT2	Wiring example
Relay contact	OUT1 NO 11 12	OUT2 NO 9 10	Load OUT1 11 NO 12
Voltage pulse	OUT1 + − 11 12	OUT2 + − 9 10	Load SSR OUT1 11 + 0/12 V DC 12 −
Voltage, Current	OUT1 + − 11 12	OUT2 + − 9 10	Load Actuator OUT1 11 + 4 to 20 mA DC 12 −
Triac	OUT1 Triac 11 12	OUT2 Triac 9 10	Load OUT1 11 Triac 12
Open collector	OUT1 11 12	OUT2 9 10	Load OUT1 11 + − 12

: 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 (LoGC1) [Refer to P. 4-36.]
OUT2	Control output, Transmission output or Event output	Engineering mode F32.01: OUT2 assignment (LoGC2) [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)
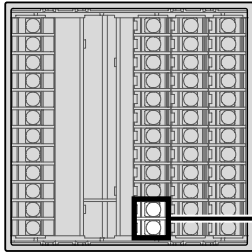
OUT3 (Specify when ordering)

Voltage pulse	Voltage/Current	Open collector	Wiring example
OUT3 + − 47 48	OUT3 + − 47 48	OUT3 47 48	Recorder + 47 − 48 AO + 4 to 20 mA DC −

: 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
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 (LoLC3). *

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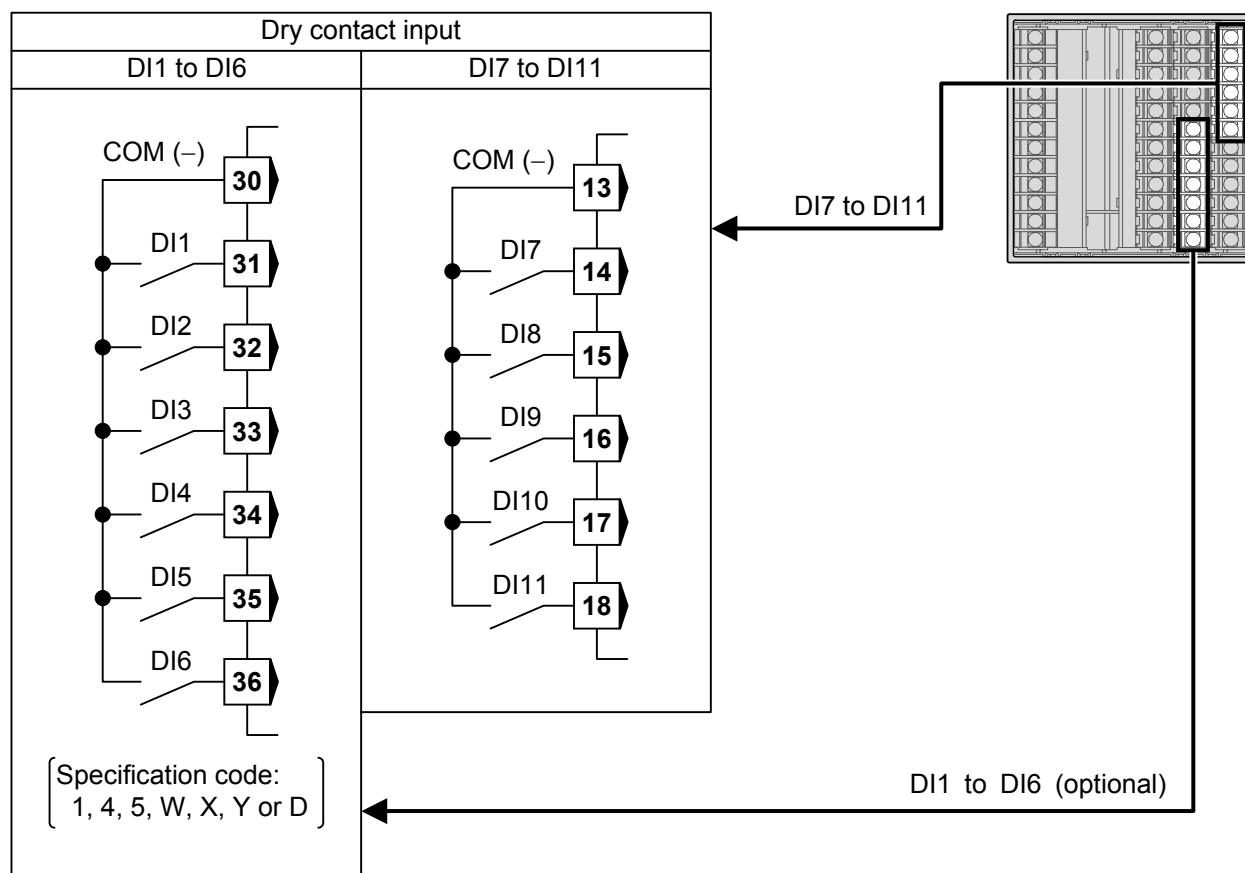
- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should have meet the specifications below.

  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)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

■ 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.

DO1/DO2	DO3/DO4	Wiring example
COM 6 / NO DO2 7 / NO DO1 8	COM 3 / NO DO4 4 / NO DO3 5	COM 3 / Load NO 4 DO2 / Load NO 5 DO1
Specification code: 4 or C	Specification code: 4 or C	
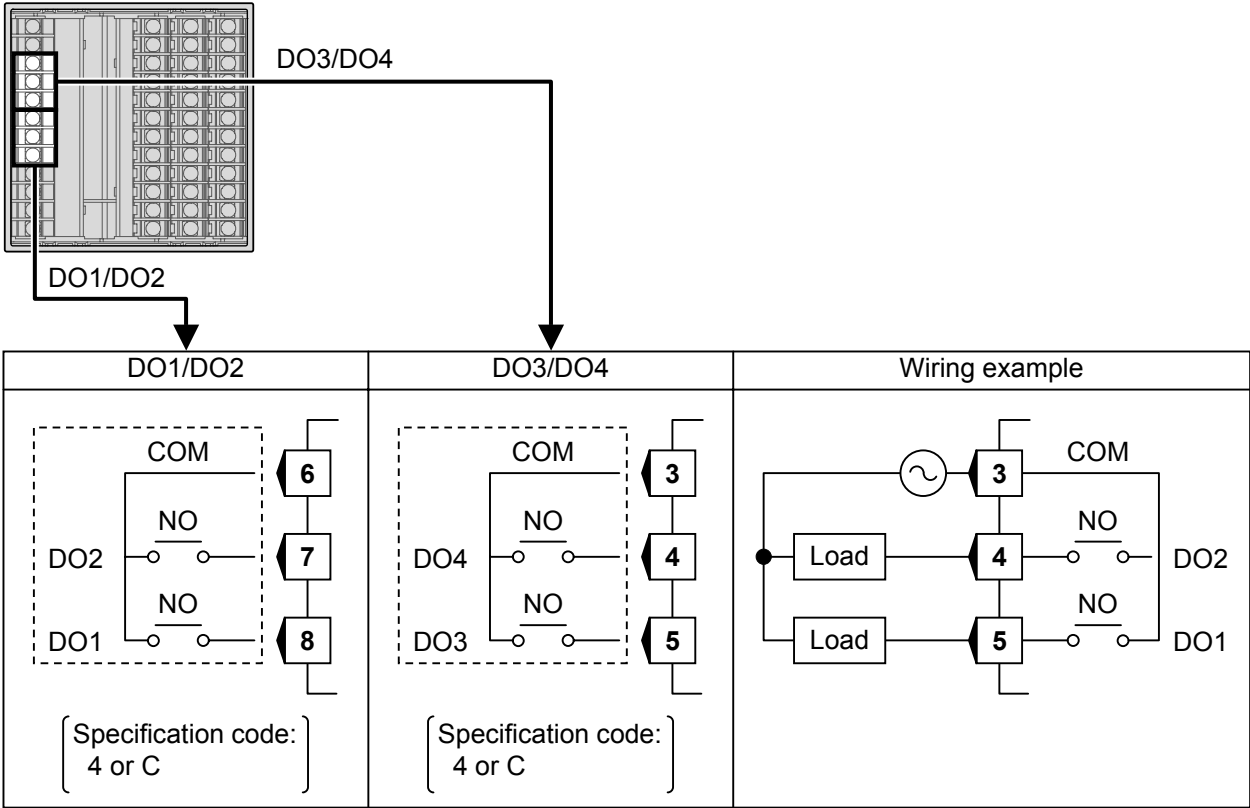
: The dotted box diagram describes the output state of the instrument.

- 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 (⌐do 1) [Refer to P. 4-38.]
DO2	Engineering mode F34.02: DO2 assignment (⌐do2) [Refer to P. 4-38.]
DO3	Engineering mode F34.03: DO3 assignment (⌐do3) [Refer to P. 4-38.]
DO4	Engineering mode F34.04: DO4 assignment (⌐do4) [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.

DO5 to DO8	DO9 to DO12	Wiring example
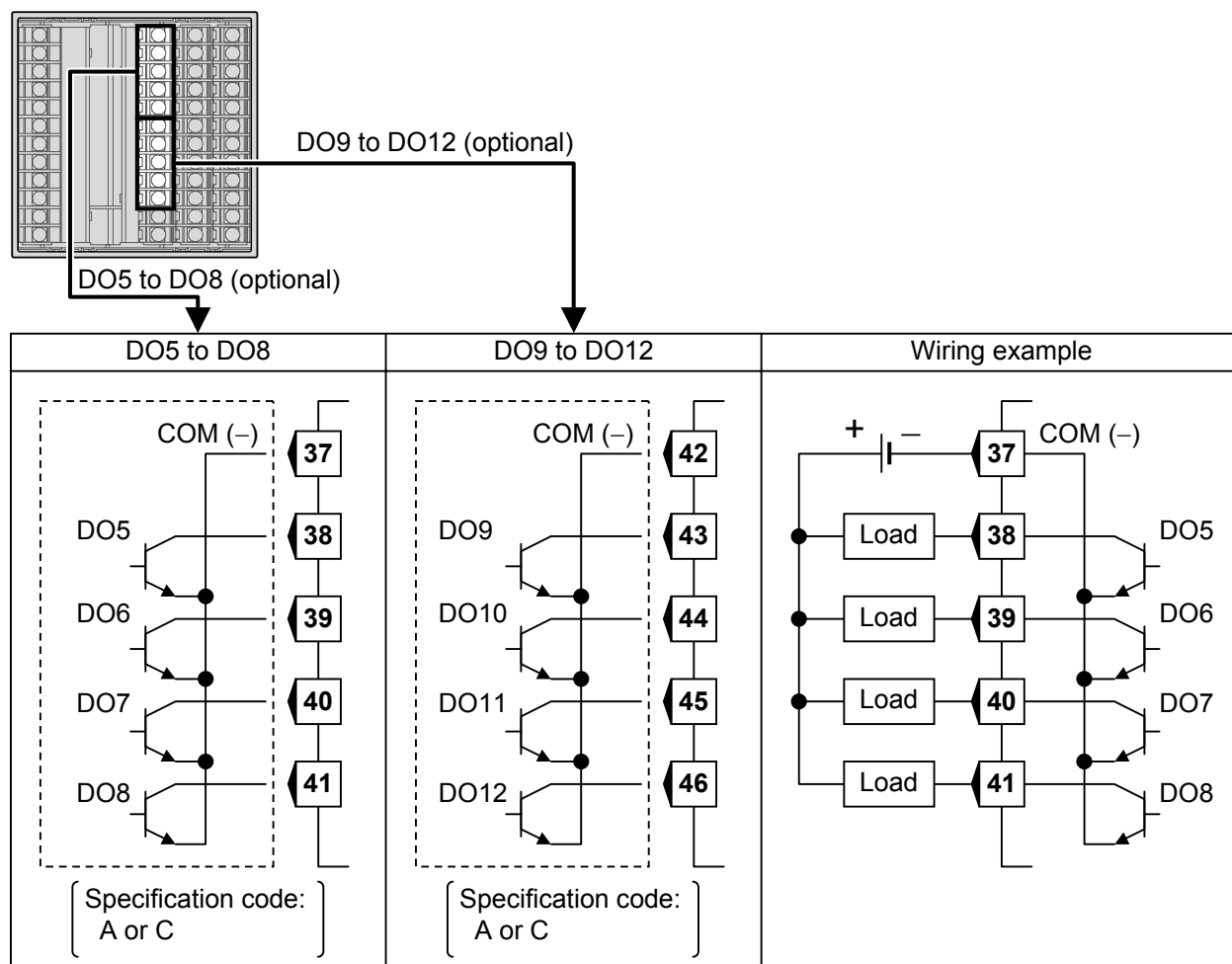
`[___]` : The dotted box diagram describes the output state of the instrument.

- 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 (*L do5*) [Refer to P. 4-38.]
DO6	Engineering mode F34.06: DO6 assignment (*L do6*) [Refer to P. 4-38.]
DO7	Engineering mode F34.07: DO7 assignment (*L do7*) [Refer to P. 4-38.]
DO8	Engineering mode F34.08: DO8 assignment (*L do8*) [Refer to P. 4-38.]
DO9	Engineering mode F34.09: DO9 assignment (*L do9*) [Refer to P. 4-38.]
DO10	Engineering mode F34.10: DO10 assignment (*L do 10*) [Refer to P. 4-38.]
DO11	Engineering mode F34.11: DO11 assignment (*L do 11*) [Refer to P. 4-38.]
DO12	Engineering mode F34.12: DO12 assignment (*L do 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.
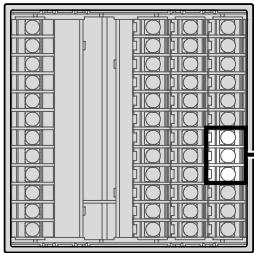
CT1/CT2/FBR (optional)

CT input (1 point)	CT input (2 points)	FBR input
		Allowance resistance: Standard 135 Ω (Availability: 100 Ω to 10 kΩ)
CT1 — 19, 20, 21	COM — 19, CT1 — 20, CT2 — 21	O — 19, W — 20, C — 21
		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 **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

[Communication 1] RS-232C	[Communication 1] RS-422A	[Communication 1] RS-485
SG **25**	SG **25**	SG **25**
SD **26**	T (A) **26**	T/R (A) **26**
RD **27**	T (B) **27**	T/R (B) **27**
	R (A) **28**	
	R (B) **29**	
Specification code: 1 Quick start code 2 (Initial setting code): 1 or 2	Specification code: 4 Quick start code 2 (Initial setting code): 1 or 2	Specification code: 5 Quick start code 2 (Initial setting code): 1 or 2

Communication 1/
Communication 2
(optional)

RS-232C [Communication 1] RS-485 [Communication 2]	RS-485 [Communication 1] RS-485 [Communication 2]	RS-485 [Communication 2]
SG **25**	SG **25**	SG **25**
RS-232C [Communication 1] SD **26**	RS-485 [Communication 1] T/R (A) **26**	
RD **27**	T/R (B) **27**	
RS-485 [Communication 2] T/R (A) **28**	RS-485 [Communication 2] T/R (A) **28**	T/R (A) **28**
T/R (B) **29**	T/R (B) **29**	T/R (B) **29**
Specification code: W Quick start code 2 (Initial setting code): 1 or 2 (Only Communication 1)	Specification code: X Quick start code 2 (Initial setting code): 1 or 2 (Only Communication 1)	Specification code: Y (For Intercontroller communication)

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

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

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.

```
                              ( Power ON )
                                   │
                                   ▼
                    ┌──────────────────────────────┐
                    │  Input type/Input range Display │
                    │        (Refer to P. 4-2)         │
                    └──────────────────────────────┘
                                   │  Automatically
                                   │  (in 4 seconds)
```

Press the [MODE] key while pressing the [SET] key for 2 seconds.

SV setting & monitor mode

Press and hold the [MODE] key for 2 seconds.

Operation mode

Switch between PID and AT, or operation modes (such as Program control, Fixed set point control, Manual control and RESET).
(Refer to P. 4-14)

Set the Segment level or the Segment time in progress, or monitor parameters such as PV, MV and the Remaining time of pattern. Stay in this mode during operation.
(Refer to P. 4-9)

Press the [MONI] key

Press the [MODE] key while pressing the [SET] key.

Press the [MONI] key

Press and hold the [SET] key for 2 seconds.

Parameter setting mode

Create program pattern, set the parameters such as PID and Event, or set the parameters for program setting such as the time signal.
(Refer to P. 4-16)

Press and hold the [SET] key for 2 seconds.

Setup setting mode

Set the parameters such as PV bias, Time proportional cycle time, Heater break alarm (HBA) set value and communication (optional).
(Refer to P. 4-29)

Press the [MONI] key

Press the [MODE] key while pressing the [SET] key for 2 seconds.

Press the [MODE] key while pressing the [SET] key for 2 seconds.

Engineering mode

Initialize the parameters related to input, output and Event to conform to the usage condition in the field.
(Refer to P. 4-32)

Press the [MONI] key

┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ Initial level engineering mode │
│ Refer to the **PF900/PF901** │
│ **Instruction Manual** │
│ **(IMR02L03-E□)** on the CD-ROM. │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘

Press and hold the [▼] key while pressing the [SET] key and the [MODE] key to go to the Initial level engineering mode from the SV setting & monitor mode, the Parameter setting mode or the Setup setting mode. Parameters of the Initial level engineering mode display during the parameter setting of the Engineering mode.

📖 **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

Power ON

PV   *I NP* ← Symbol

SV

    ℃ *K* ← Input type symbol (Refer to table 1)

Unit for input and SV display:
Celsius: °C
Fahrenheit: °F
Voltage/Current: No display

Automatically (in 2 seconds)

PV *RANGE*

SV
-200   1372 ← Input range high
      — Input range low

Automatically (in 2 seconds)

SV setting & monitor mode (PV/SV monitor)

PV   28

M:S   SV
0:00   0
DO
2
3
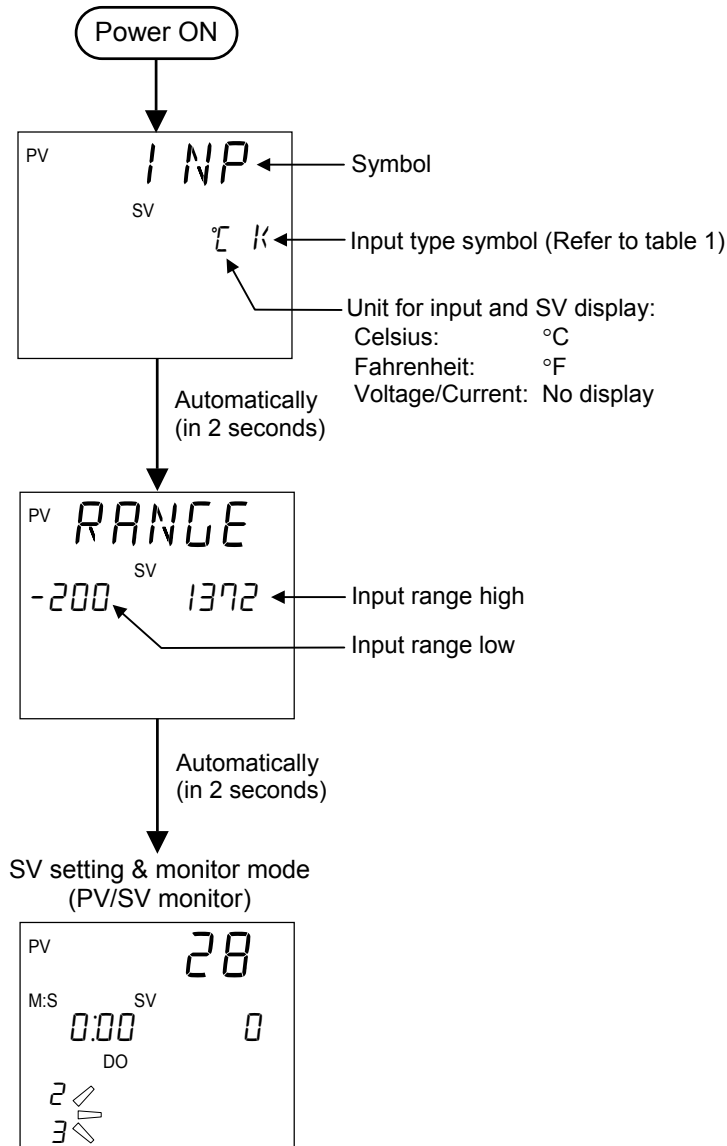
Table 1: Input type symbol table

Symbol	Input type
K	Thermocouple K
J	Thermocouple J
Γ	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
PΓ	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 ⋁ key.

- To store a new value for the parameter, always press the ⑤ᴱᵀ 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).

PV/SV monitor (Before changing)

Parameter symbol

Segment level

Press twice.

Press twice.

Store set value.

Flashing

Shifts flashing place.

Set "2."

Segment level set value

Store set value.

Press twice.

Three times

Segment time

Set "4."

Shifts flashing place.

Flashing

Segment time set value

PV/SV monitor (After changing)
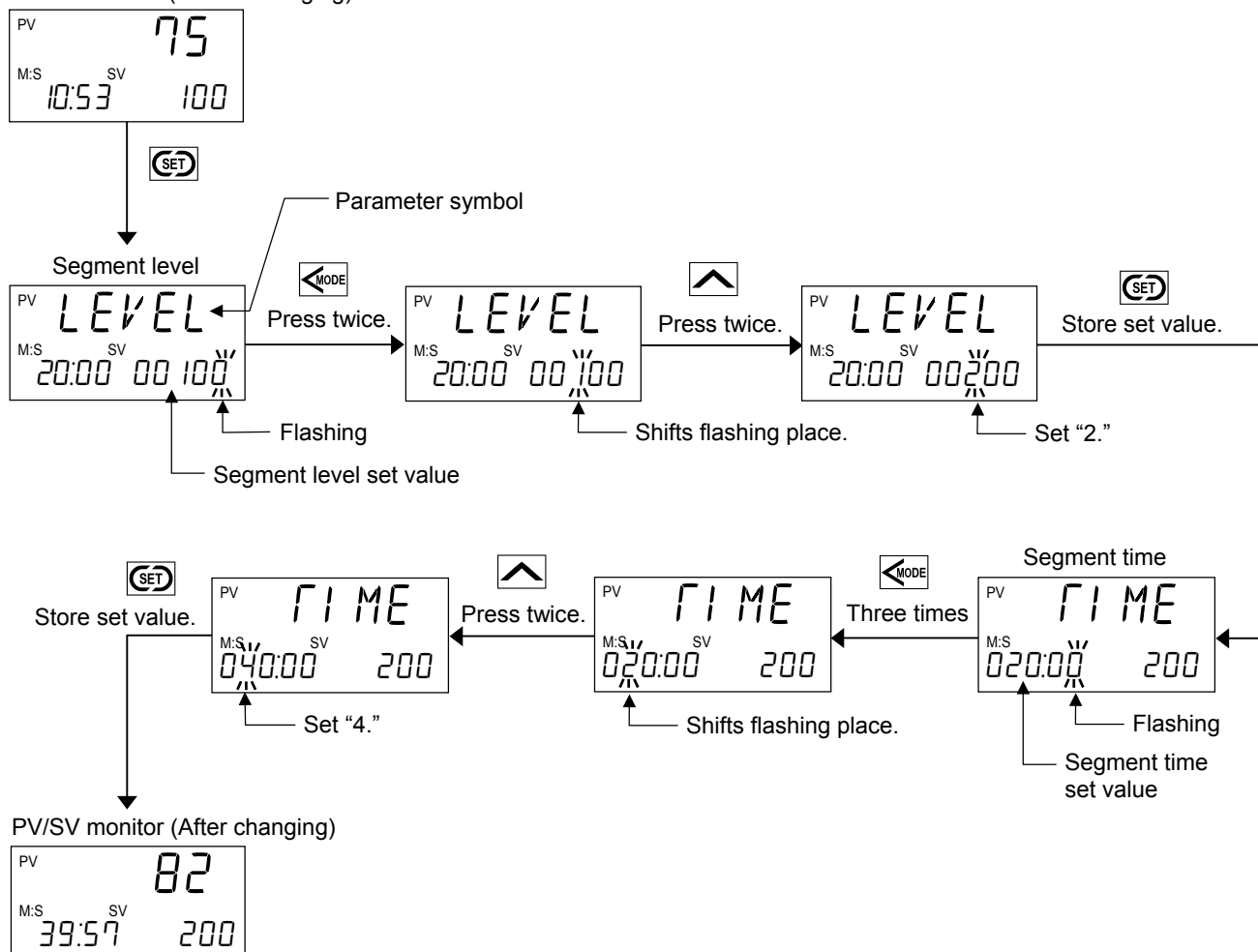
📖 Display returns to the PV/SV monitor display without storing set value being changed if the ⑤ᴱᵀ key is not pressed within 1 minute. The new set values being set will not be stored when returning to the PV/SV monitor display if the ᴹᴼᴺᴵ key is pressed before pressing the ⑤ᴱᵀ key.

• 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.

PV ┌ L E V E L
M:S   SV
0:00 00 199

⟹

PV ┌ L E V E L
M:S   SV
0:00 00200
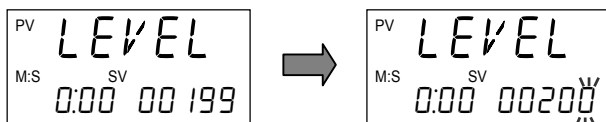
Decrease SV from 200 °C to 190 °C:

1. Press the ⌜MODE⌝ key to flash the tens place.

2. Press the ⌃ key to change to 9.
The display changes to 190.

PV ┌ L E V E L
M:S   SV
0:00 00200

⟹

PV ┌ L E V E L
M:S   SV
0:00 00 190
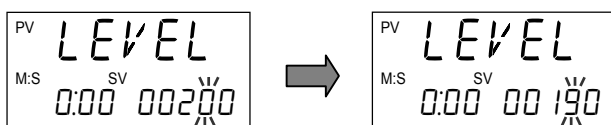
Decrease SV from 200 °C to −100 °C:

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.

PV ┌ L E V E L
M:S   SV
0:00 00200

⟹

PV ┌ L E V E L
M:S   SV
0:00 −0 100
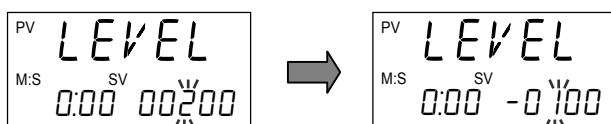
■ Setting item selection

- 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.
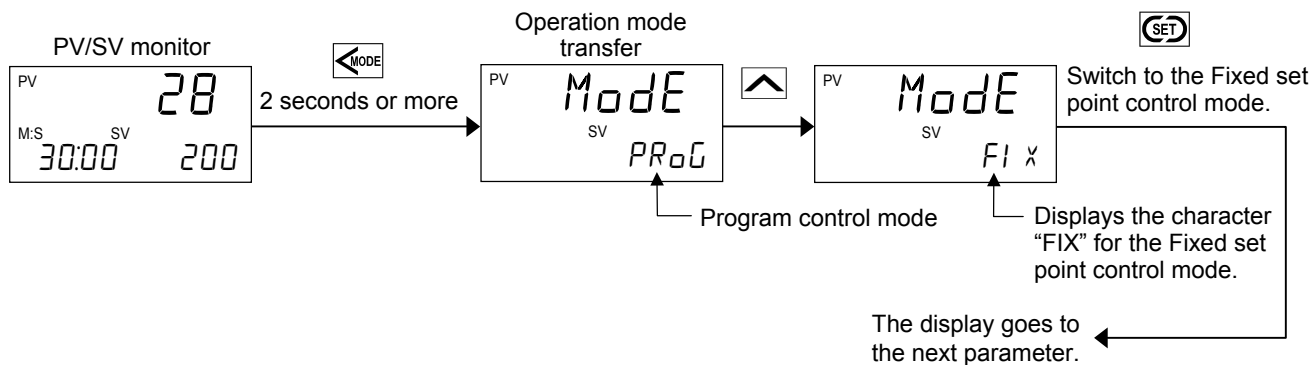
Example 2: Conduct Autotuning (AT).
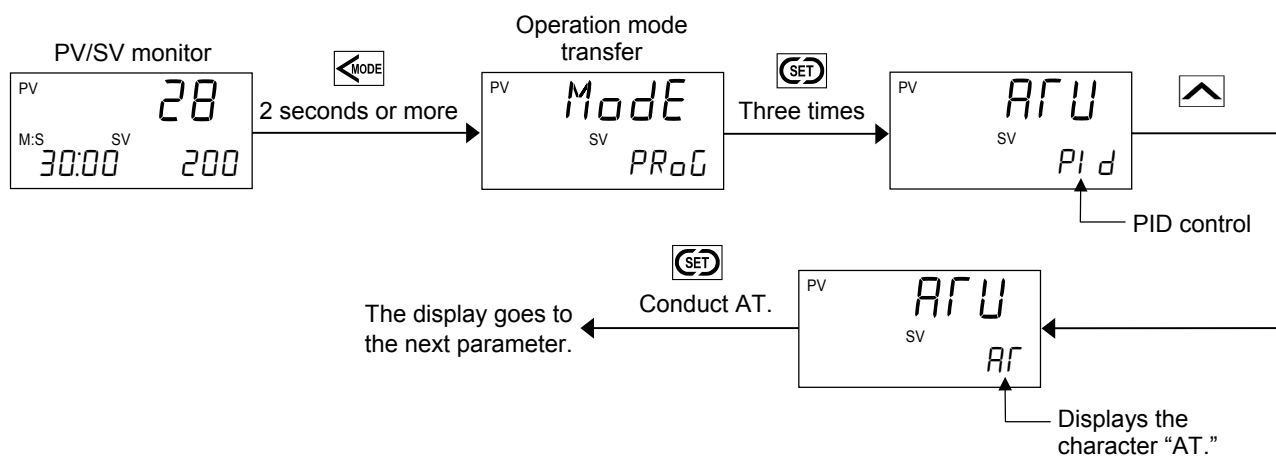
Example 3: Change communication speed 1 in the Setup setting mode.
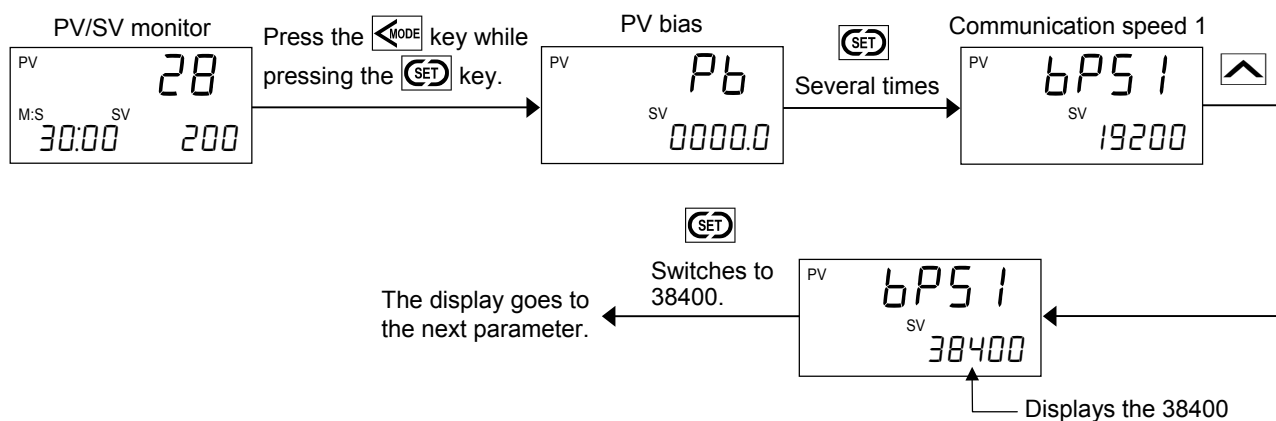
4.3 Operation of the Direct Keys

■ Direct key menu

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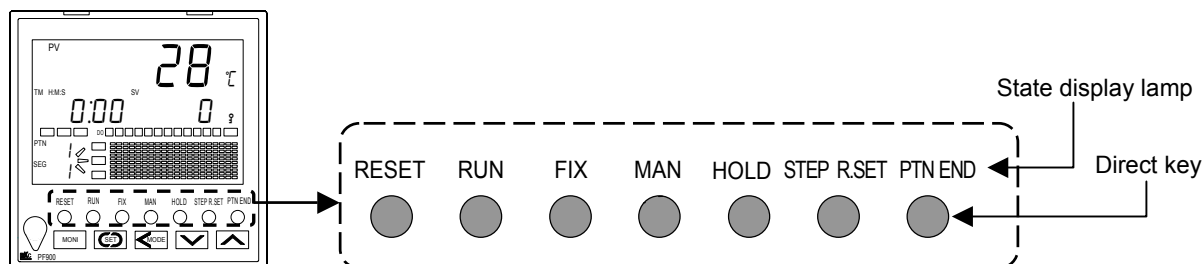
● Operation mode switching

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]	
RUN	Program control mode	RUN lamp lights [Orange]	PV/SV monitor of
FIX	Fixed set point control mode	FIX lamp lights [Orange]	operation mode
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 ⒮ⒺⓉ 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 ⒮ⒺⓉ key to go to the parameter setting display of pattern setting. Press the END key instead of the ⒮ⒺⓉ 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.

● 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

PV/SV monitor

Press the ◄MODE key while pressing the SET key for 2 seconds.

Function block 10 (F10.)

Function block 11 (F11.)

MONI (Return to PV/SV monitor)

Parameter of the F11.02 to F11.06

F11.02: RUN key type
F11.03: FIX key type
F11.04: MAN key type
F11.05: HOLD key type
F11.06: STEP key type

Refer to the data range of the RESET key type to set values for the keys.

RESET key type

Type
00000: Invalidated
00001: Press once
00002: Press twice
00003: Press and hold

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.
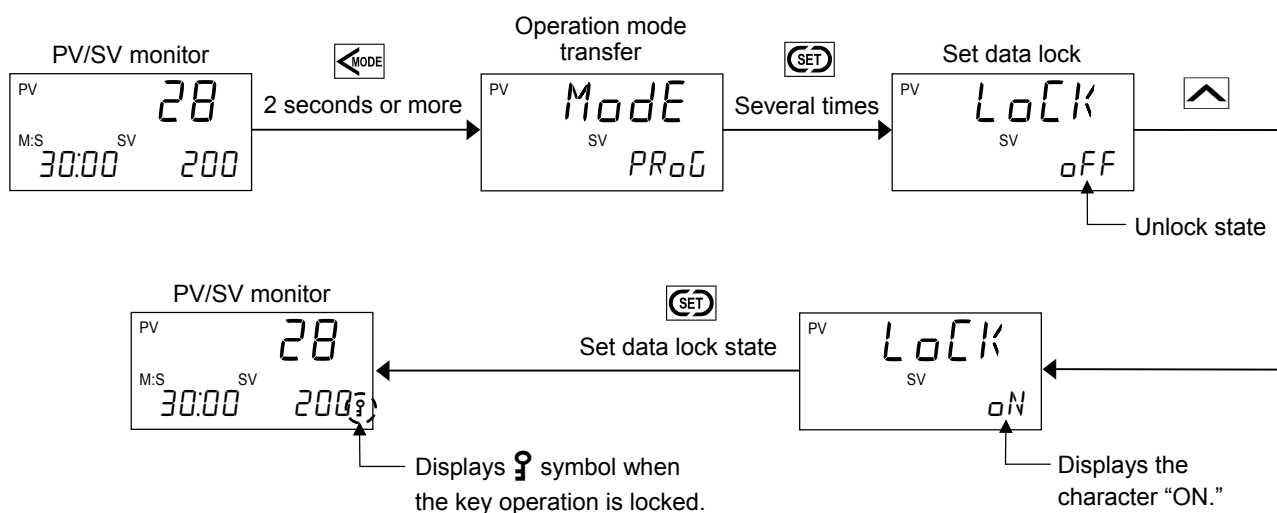
📖   It is possible to monitor set value of parameters.

📖   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** on the CD-ROM.	

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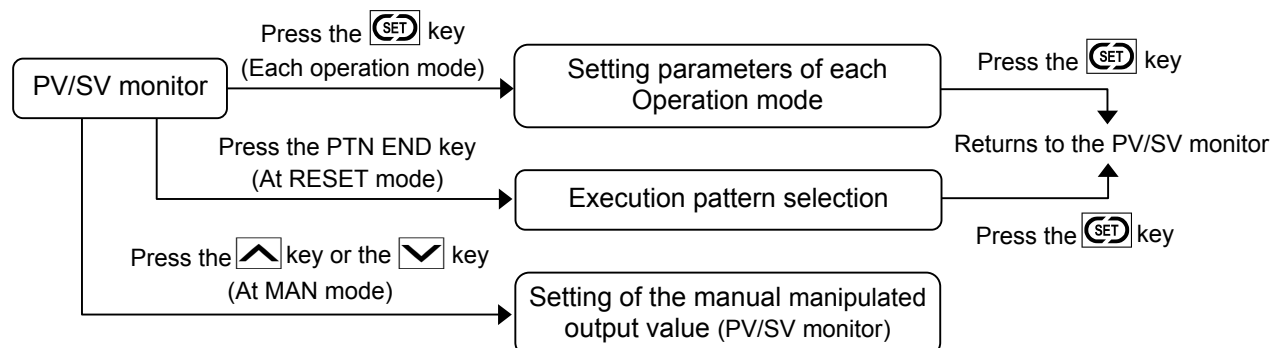
☞   Refer to P. 4-10 and P. 4-11 to switch parameter setting display.

● Parameter list

Name	Symbol	Data range	Factory set value
Reset mode (RESET)			
Set value (SV) in Reset mode	5V	Setting limiter low to Setting limiter high	0
Execution pattern selection	PΓN	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	ΓIME	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0 hour 00 minute
Fixed set point control mode (FIX)			
Set value (SV) in Fixed set point control mode	5V	Setting limiter low to Setting limiter high	0
Manual control mode (MAN)			
Manual manipulated output value	MV	−5.0 to +105.0 %	−5.0
Set value (SV) in Manual control mode	5V	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.
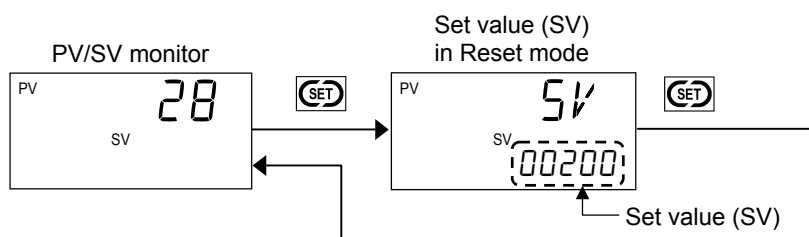
Execution pattern selection

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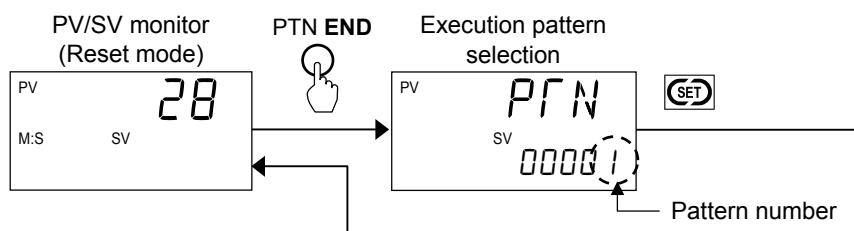
📖   Tag name setting will enable the display to show a tag name instead of the Pattern number.
Refer to **6.12 Tag Function (P. 6-31)** for Tag name.

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.
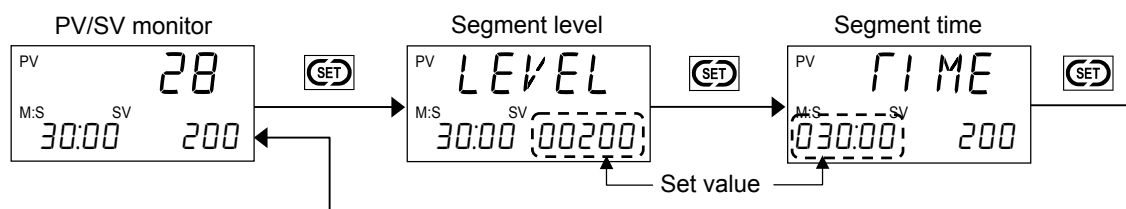
Fixed set point control mode (FIX)

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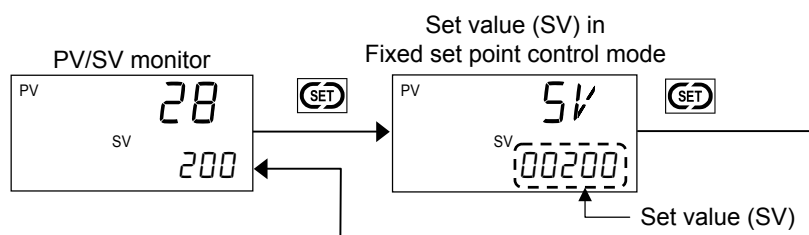
Manual control mode (MAN)

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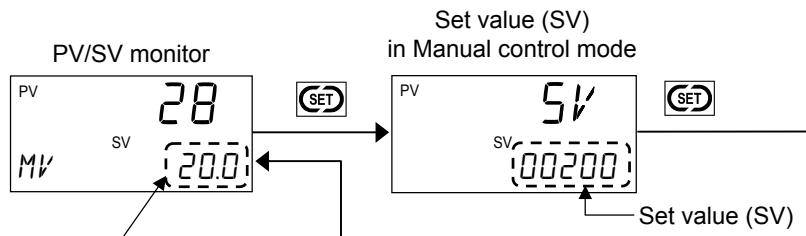
☐ The Set value (SV) set in the previous mode is taken over when switching to the Manual control mode. However, the SV being changed in the Manual control mode is not affected when changing to the other modes.

■ Monitor mode

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

```
                 Press the [MONI] key
┌──────────────┐                      ┌──────────────┐   Press the [MONI] key to
│ PV/SV monitor │ ──────────────────▶ │ Monitor mode │   switch monitor display.
└──────────────┘ ◀─────┐              └──────┬───────┘
       ▲               │                     │
       └───────────────┴─────────────────────┘
```

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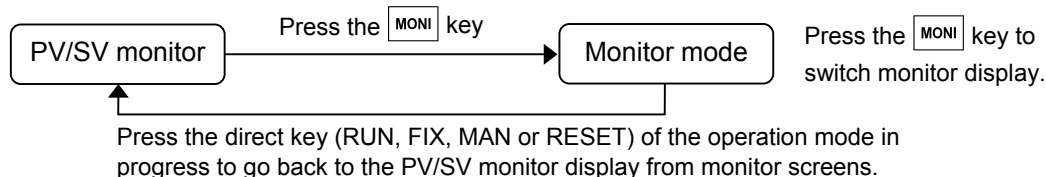
☞ Refer to P. 4-13 to switch parameter setting display.

● Parameter list

Name	Symbol	Data range	Factory set value
Pattern remaining time monitor	PT.N.TM	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□)** on the CD-ROM.

[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.

● Scrolling through parameters

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.

PV/SV monitor

PV **28**
M:S **30:00** SV **200**

[MONI]

Pattern remaining time monitor

PV **28**
M:S **PrN.rM** SV **(53:20)**

— Monitor value
— Parameter symbol
Displays the remaining time including the duration of the Segment repeat.

[MONI]

Segment repeat remaining time/ execution time monitor *

PV **28**
RPr.SG SV **0**

* 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□)** on the CD-ROM.

[MONI]

Pattern repeat remaining time/ execution time monitor *

PV **28**
RPr.PN SV **0**

[MONI]

Total pattern remaining time/ execution time monitor *

PV **28**
RPr.PR SV **0**

[MONI]

Displays the remaining time/execution time including the numbers of Link pattern.

[MONI]

Current transformer 1 (CT1) input value monitor

PV **28**
Cr1 SV **7.0**

[MONI]

Displays only when CT input (optional) is specified.

Time signal state monitor

PV **28**
rS SV **_ _ _ _ □.□**

[MONI]

_ Display: Time signal OFF
□ Display: Time signal ON

Event state monitor

PV **28**
EV SV **_ _ _ _ _ _ □**

[MONI]

_ Display: Event OFF
□ Display: Event ON

Wait condition monitor

PV **28**
WAIr SV **_ _ □**

_ Display: Not in wait state
□ Display: In wait state

Current transformer 2 (CT2) input value monitor

PV **28**
Cr2 SV **6.5**

[MONI]

Displays only when CT input (optional) is specified.

Manipulated output value 1 (MV1) [heat-side] monitor

PV **28**
MV1 SV **20.0**

[MONI]

Manipulated output value 2 (MV2) [cool-side] monitor

PV **28**
MV2 SV **-5.0**

[MONI]

Returns to the PV/SV monitor

Displayed when the Heat/Cool PID control is selected.

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 and hold the [MODE] key for 2 seconds.

PV/SV monitor → Operation mode

Press the [MONI] key or press and hold the [MODE] key for 2 seconds or more.
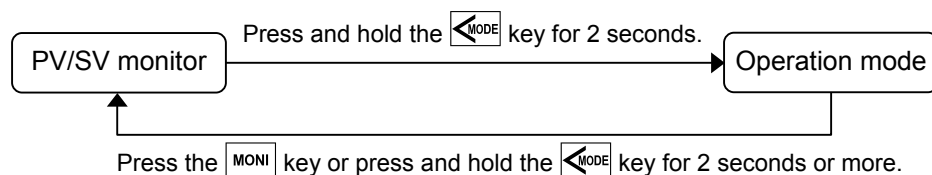
- Press the [SET] key to switch operation screen.
- Press the STEP R.SET key to go back to the previous display.
- Press the STEP R.SET key while pressing the [SET] key to go back to the first parameter setting display (Operation mode transfer).

☞ 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	SARCH	ON: Search start OFF: Search stop Turns OFF automatically when the Search function is completed.	OFF
PID/AT transfer	ATU	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	ATT	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	ILR	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 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.
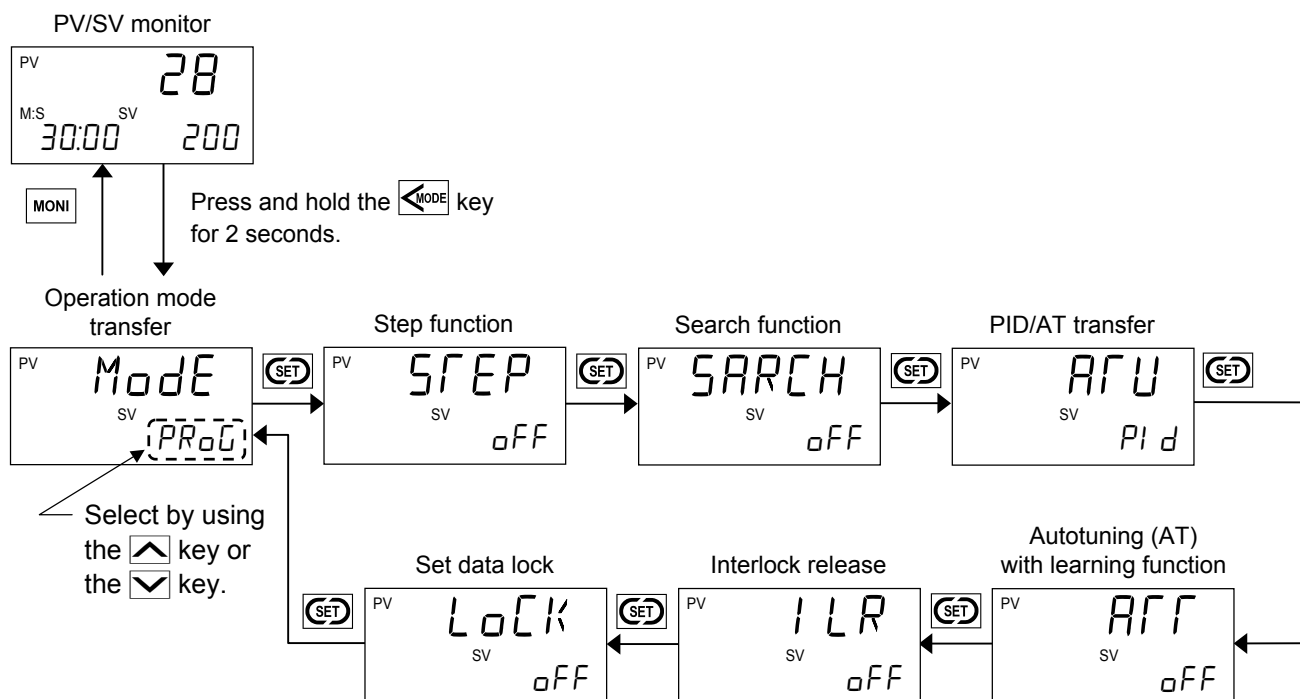
☞   For setting procedure of each function, refer to **6. FUNCTION AND SETTING PROCEDURE** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

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 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)
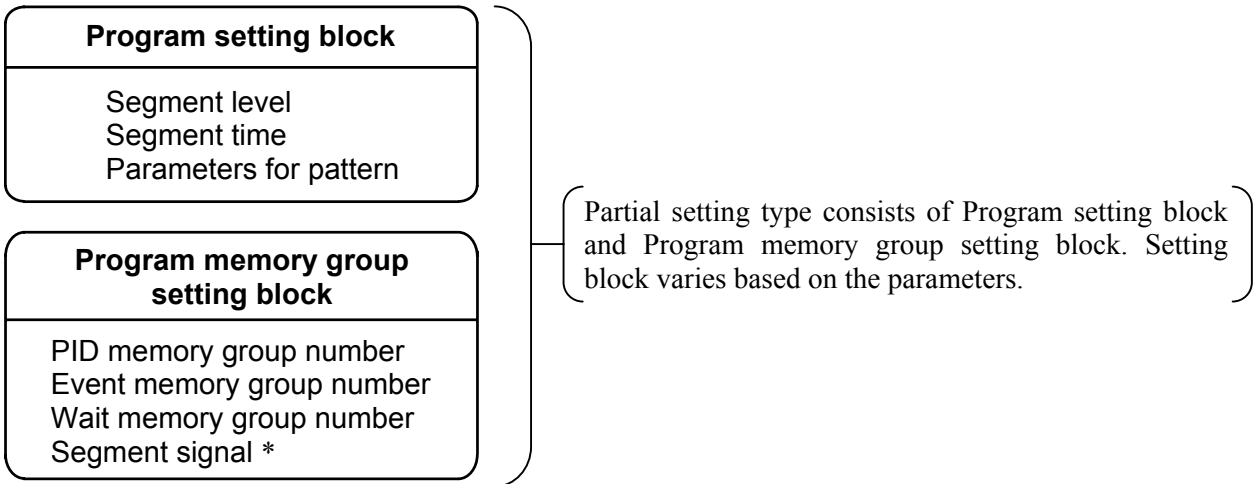
```
┌────────────────────────────┐
│   Program setting block    │
├────────────────────────────┤
│                            │
│   Segment level            │
│   Segment time             │
│   Parameters for pattern   │
└────────────────────────────┘
```

```
┌────────────────────────────┐
│   Program memory group     │
│     setting block          │
├────────────────────────────┤
│   PID memory group number  │
│   Event memory group number│
│   Wait memory group number │
│   Segment signal *         │
└────────────────────────────┘
```

Partial setting type consists of Program setting block and Program memory group setting block. Setting block varies based on the parameters.

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

● Batch setting type
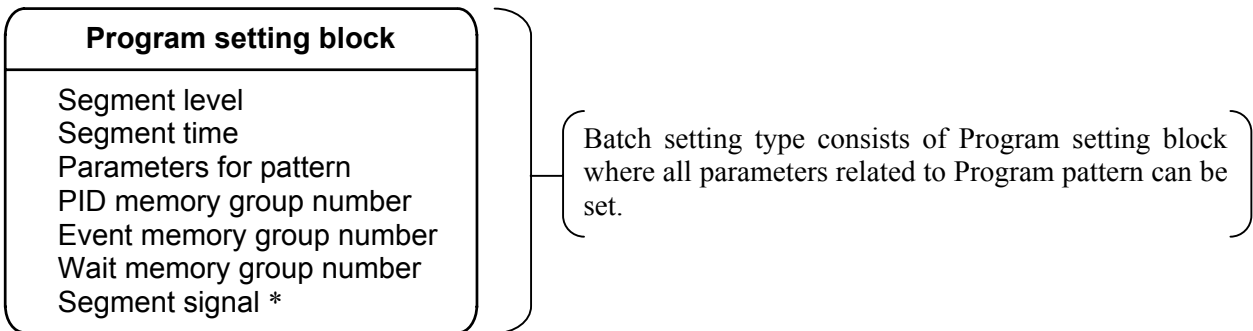
```
┌────────────────────────────┐
│   Program setting block    │
├────────────────────────────┤
│   Segment level            │
│   Segment time             │
│   Parameters for pattern   │
│   PID memory group number  │
│   Event memory group number│
│   Wait memory group number │
│   Segment signal *         │
└────────────────────────────┘
```

Batch setting type consists of Program setting block where all parameters related to Program pattern can be set.

* 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.

☞ 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]
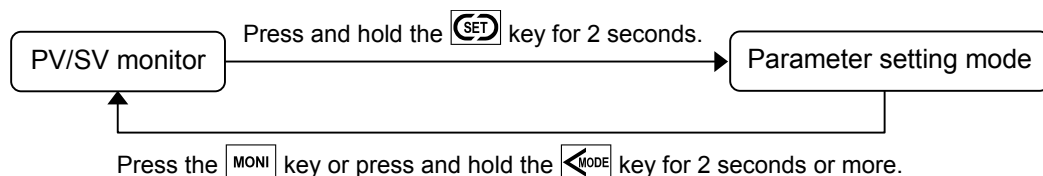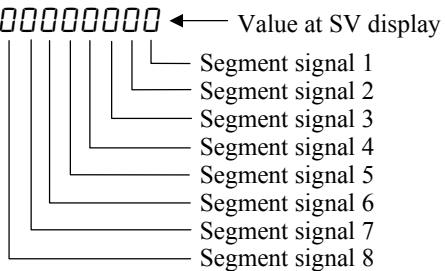
PV/SV monitor → Press and hold the ⟨SET⟩ key for 2 seconds. → Parameter setting mode

Press the |MONI| key or press and hold the ⟨MODE| key for 2 seconds or more.

- 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 hour 00 minute
Segment repeat start/end number	ST-Ed	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 hour 00 minute
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	PI d.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

Continued from the previous page.
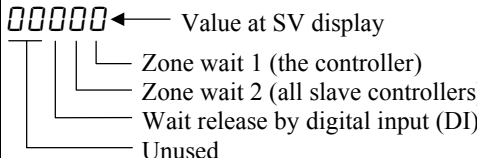
Name	Symbol	Data range	Factory set value
Segment signal [1]	`SI GNL`	0: OFF 1: ON `00000000` ← Value at SV display — Segment signal 1 — Segment signal 2 — Segment signal 3 — Segment signal 4 — Segment signal 5 — Segment signal 6 — Segment signal 7 — Segment signal 8	00000000
PID memory group setting 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.

Continued from the previous page.

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)	EV1	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]	EV1'		−50
Event 2 set value (EV2)	EV2	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]	EV2'	The data range is same as Event 1 set value (EV1') [low].	−50
Event 3 set value (EV3)	EV3	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]	EV3'	The data range is same as Event 1 set value (EV1') [low].	−50
Event 4 set value (EV4)	EV4	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]	EV4'	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	RE.TRG	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).

Continued from the previous page.

Name	Symbol	Data range	Factory set value
Wait time-out set value	⌐M.oUⴖ	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 hour 00 minute
Time signal memory group setting block (⌐M.5I G)			
Time signal memory group number	⌐5.GR	1 to 16	1
Time signal output assignment	O I.oUⴖ	1 to 8: Time signal 1 to 8 0: No assignment	0
Start segment of time signal	O I.5.5N	1 to 99 Within the maximum segment number.	1
Time signal start time	O I.5.⌐M	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0 hour 00 minute
End segment of time signal	O I.E.5N	1 to 99 Within the maximum segment number.	1
Time signal end time	O I.E.⌐M	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0 hour 00 minute
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 I	−5.0 to +105.0 %	−5.0
Output program value 2 [b]	P.MV 2	−5.0 to +105.0 %	−5.0
Output program value 3 [c]	P.MV 3	−5.0 to +105.0 %	−5.0
Level PID setting block (LV.PI d)			
Level PID setting 1	LEVL. I	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 (RE5Eⴖ)			
Set value (SV) in Reset mode	5V	Setting limiter low to Setting limiter high	0
Manipulated output value 1 (MV1) in Reset mode	MV I	−5.0 to +105.0 %	−5.0
Manipulated output value 2 (MV2) in Reset mode	MV 2	−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 (FI x)			
Set value (SV) in Fixed set point control mode	5V	Setting limiter low to Setting limiter high	0
PID memory group number in Fixed set point control mode	PI d.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.

Continued from the previous page.

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 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 ⋁ 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.

　　IMR02L04-E1

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

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

Program setting block

Program memory group setting block

PV **PR.MEM** SV

⟨SET⟩

Setting pattern number

PV **PΓN.No** SV **1**

⟨SET⟩

PID memory group number

PV **PI d.GR** SV **00000**

⟨SET⟩

Event memory group number

PV **EV.GR** SV **00001**

⟨SET⟩

Go to the setting display of the next segment.

After setting parameters of all segments

Segment signal

⟨SET⟩ PV **SI GNL** SV **00000000**

(Displays when the Segment signal is selected.)

Wait memory group number

⟨SET⟩ PV **WΓ.GR** SV **00001**

PID memory group setting block

PV **PI d** SV

⟨SET⟩

PID memory group number

PV **PI d.GR** SV **00001**

⟨SET⟩

Setting parameters in the PID memory group

P:	Proportional band [heat-side]
I :	Integral time [heat-side]
d:	Derivative time [heat-side]
rPΓ:	Control response parameter
Pc:	Proportional band [cool-side]
I c:	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)

⟨SET⟩

Event memory group setting block *

PV **EVENΓ** SV

⟨SET⟩

Event memory group number

PV **EV.GR** SV **00001**

⟨SET⟩

Event 1 set value (EV1) Event 1 set value (EV1) [high]

PV **EV 1** GR. 1 SV **00050**

⟨SET⟩

Event 1 set value (EV1') [low]

PV **EV 1'** GR. 1 SV **-0050**

⟨SET⟩

⟨SET⟩

* Event memory group setting block does not display when types of Event 1 to 4 are all set to "0: None."

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]

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

PV	**WAIT**
SV	

SET

PV	**Wr.GR**
SV	00001

SET

PV	**ZoNE.H**
GR. 1	SV 00000

SET

PV	**ZoNE.L**
GR. 1	SV 00000

SET

Wait time-out set value

Wait release trigger selection

SET

PV	**rM.oUr**
M:S GR. 1	SV 000:00

SET

PV	**RE.rRG**
GR. 1	SV 00000

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.)

PV	**rM.SIG**
SV	

SET

PV	**rS.GR**
SV	00001

SET

01.l.oUr: Time signal output assignment
01.S.SN: Start segment of time signal
01.S.rM: Time signal start time
01.E.SN: End segment of time signal
01.E.rM: Time signal end time

16.E.rM: Time signal end time

Go to the setting display of the next memory number.

SET

After setting memory number 16

Output program memory group setting block *

Output program memory group number

Output program value 1

PV	**PRG.MV**
SV	

SET

PV	**P.MV.GR**
SV	00001

SET

PV	**P.MV 1**
GR. 1	SV -005.0

SET

Output program value 2, Output program value 3

SET

Go to the setting display of Output program 1, 2 and 3 of the next segment.

After setting parameters of all segments

* Displays when Output program value is assigned to OUT1 to OUT3.

Level PID setting block

Level PID setting 1

Level PID setting 7

PV	**LV.PId**
SV	

SET

PV	**LEVL.1**
PId	SV 00000

SET

Level PID setting 2 to Level PID setting 6

SET

PV	**LEVL.7**
PId	SV 00000

SET

Reset mode setting block

Level PID 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.

Reset mode setting block

Set value (SV) in Reset mode

Manipulated output value 1 (MV1) in Reset mode

Manipulated output value 2 (MV2) in Reset mode

PV **RESET** SV

PV **SV** RESET SV 00000

PV **MV1** RESET SV -005.0

PV **MV2** RESET SV -005.0

Displays when the control method is Heat/Cool PID control.

Event memory group number in Reset mode

PV **EV.GR** RESET SV 00001

Fixed set point control mode setting block

Set value (SV) in Fixed set point control mode

PID memory group number in Fixed set point control mode

Event memory group number in Fixed set point control mode

PV **FIX** SV

PV **SV** FIX SV 00000

PV **PId.GR** FIX SV 00000

PV **EV.GR** FIX SV 00001

Manual control mode setting block

PID memory group number in Manual control mode

Event memory group number in Manual control mode

PV **MAN** SV

PV **PId.GR** MAN SV 00001

PV **EV.GR** MAN SV 00001

Editing block

Pattern copy *

Data clear *

PV **EdIT** SV

PV **CoPY** SV 00:00

PV **CLR** SV 00000

Copy destination number
Copy source number

Make the copy destination number editable by pressing the SET key after setting the copy source pattern number.

* Settable only in the Reset mode (RESET)

First Program setting block

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

■ Parameter list [Batch setting type]
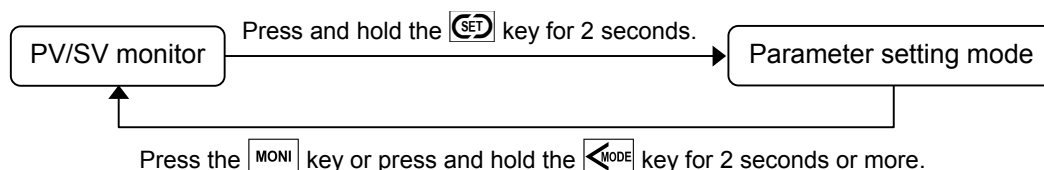
PV/SV monitor → Press and hold the ⎘ key for 2 seconds. → Parameter setting mode

Press the MONI key or press and hold the MODE key for 2 seconds or more.

- Press the ⎘ 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 ⎘ 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 hour 00 minute
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 *	*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
Segment repeat start/end number	*ST+Ed*	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 hour 00 minute
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
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.			

* 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 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.

Return to the Program setting block (PRoG)

Segment repeat start/end number

PV *Sr›Ed*
SV *01›01*

(SET)

End number
Start number

After setting the Segment repeat start number, press the (SET) key to set the Segment repeat end number.

Segment repeat execution time

PV *RPr.SG*
SV *00001*

(SET)

Link pattern number

(SET) PV *LNK.PN*
SV *00000*

(SET)

Pattern repeat execution time

PV *RPr.PN*
SV *00001*

Pattern end output duration

PV *ENd.rM*
M:S SV *000:00*

(SET)

Time signal memory group number

PV *rS.GR*
SV *00001*

(SET)

Output program memory group number

(SET) PV *P.MV.GR*
SV *00000*

PID memory group setting block

PV *PId*
SV

(SET)

For parameter setting item, refer to the parameter switching diagram of the Partial setting type.

Refer to the parameter switching diagram of the Partial setting type for the latter setting blocks.

IMR02L04-E1

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 [MODE] key while pressing the [SET] key.
  ┌─────────────┐                                                    ┌──────────────────┐
  │ PV/SV monitor │ ─────────────────────────────────────────────> │ Setup setting mode │
  └─────────────┘                                                    └──────────────────┘
         ↑  └──────────────────────────────┘
         │
```

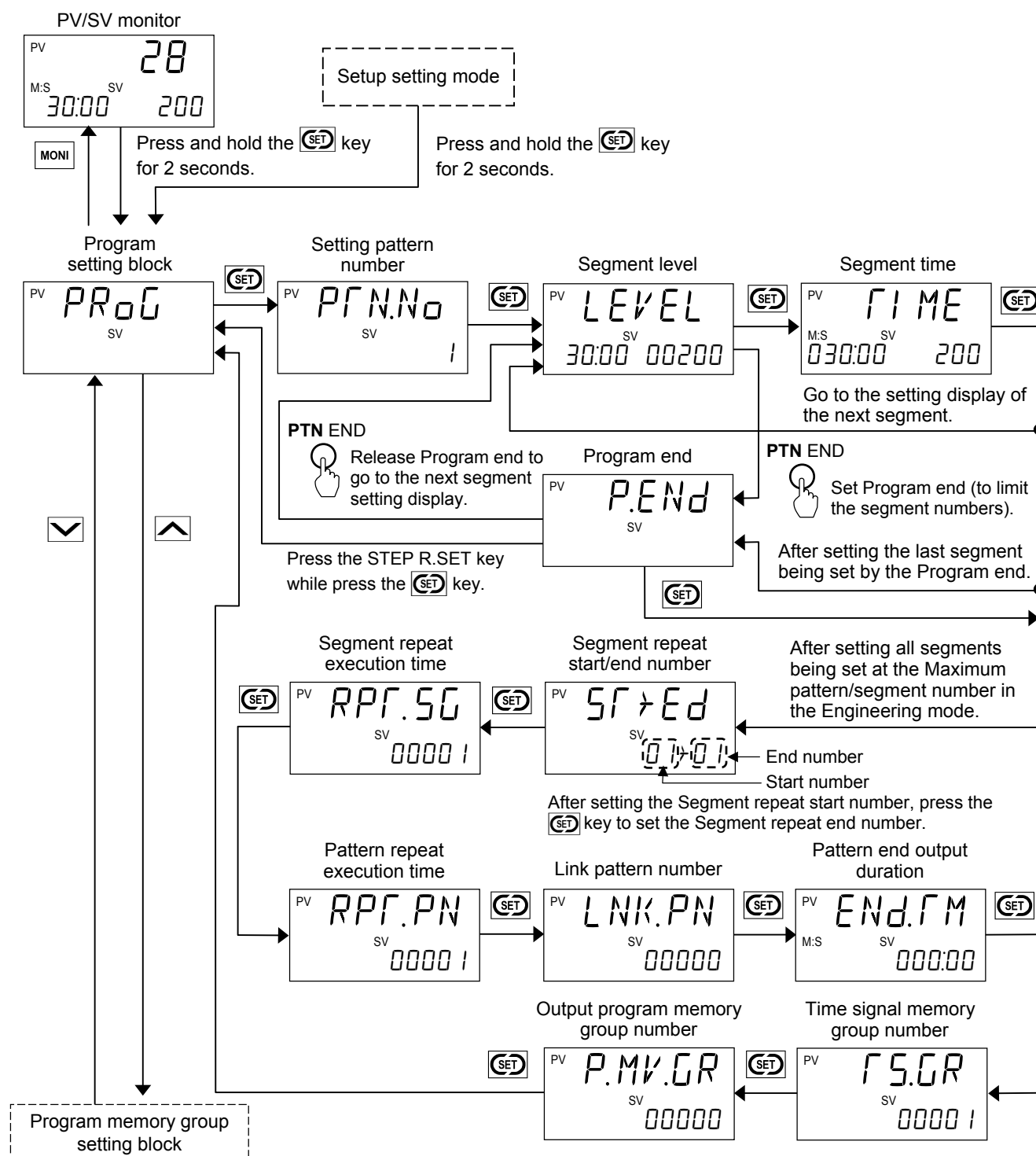Press the [MONI] key

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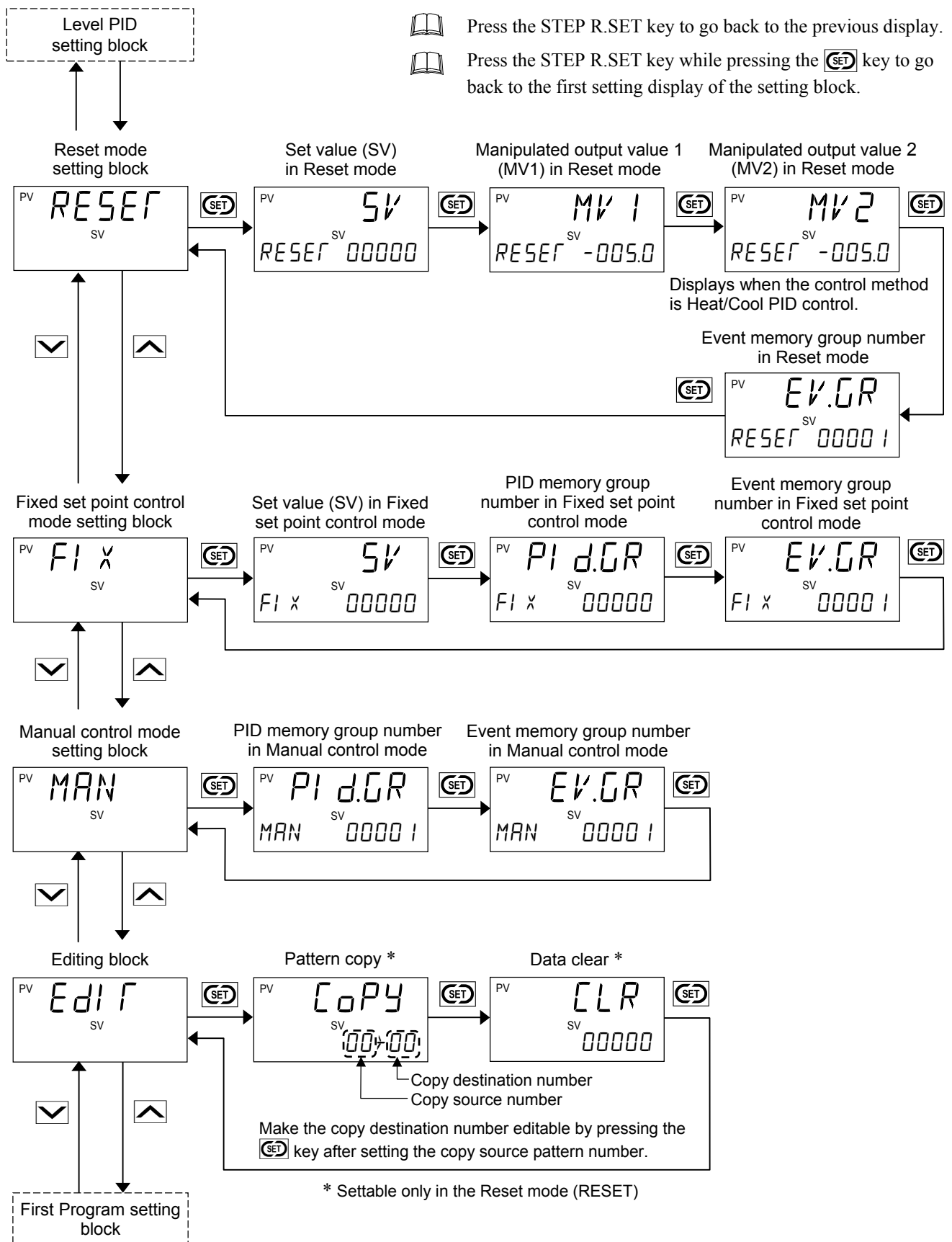- Press the STEP R.SET key while pressing the [SET] key to go back to the first parameter setting display (PV bias).

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

📖 Some parameters in the Setup setting 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	1.000 to 9.999	1.000
PV low input cut-off [1]	$L-CUr$	0.00 to 25.00 % of Input span	0.00
OUT1 proportional cycle time [2]	$r1$	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]	$r2$		M: 20.0 V/T/D: 2.0 Factory set value No output: 2.0
OUT3 proportional cycle time [2]	$r3$		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	0.0
Heater break alarm 2 (HBA2) set value [3]	$HbA2$	CTL-12-S56-10L-N: 0.0 to 100.0 A 0.0: Unused (Current value monitoring still available)	0.0
SV selection at Program start	$Sr.Sv$	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

[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 from the previous page.

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]	Add 1	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
		8N1 * 8N2 * 8E1 * 8E2 * 8o1 8o2 7N1 7N2 7E1 7E2 7o1 7o2	8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 7 bit 7 bit 7 bit 7 bit 7 bit 7 bit	Without Without Even Even Odd Odd Without Without Even Even Odd Odd	1 bit 2 bit 1 bit 2 bit 1 bit 2 bit 1 bit 2 bit 1 bit 2 bit 1 bit 2 bit	
		* Available for only Modbus				
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.

PV/SV monitor

PV	28
M:S SV	
30:00	200

MONI   Press the ⬅MODE key while pressing the SET key.

PV bias	PV digital filter	PV ratio	PV low input cut-off
PV Pb	PV dF	PV PR	PV L-CUr
SV 0000.0	SV 0000.0	SV 0 1.000	SV 000.00

Heater break alarm 1 (HBA1) set value	OUT3 proportional cycle time	OUT2 proportional cycle time	OUT1 proportional cycle time
PV HbA1	PV r3	PV r2	PV r1
SV 0000.0	SV 0002.0	SV 0020.0	SV 0020.0

Heater break alarm 2 (HBA2) set value	SV selection at Program start	Control start at Pattern end	Device address 1
PV HbA2	PV Sr.SV	PV ENd.P	PV Add1
SV 0000.0	SV 00002	SV 00000	SV 00000

Device address 2	Interval time 1	Data bit configuration 1	Communication speed 1
PV Add2	PV I Nr1	PV b1 r1	PV bPS1
SV 00000	SV 000 10	SV 8N 1	SV 19200

Communication speed 2

PV bPS2
SV 19200

SET → Return to the first parameter (PV bias)

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

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 ◁MODE key while pressing the
SET key for 2 seconds.

PV/SV monitor (RESET mode) → Engineering mode

Press the MONI key

- 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.

☞

■ 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	ddrP	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

Continued from the previous page.

Name	Symbol	Data range	Factory set value
ALM lamp light condition 2	⌐L⌐2	0: No lighting 1: Lighting ⌐⌐⌐⌐⌐◄—— Value at SV display 　└— HBA1 　└— HBA2 　└— LBA 　└— Self-diagnostic error 　└— Unused	0011
ALM lamp light condition 3	⌐L⌐3	0: No lighting 1: Lighting ⌐⌐⌐⌐⌐◄—— 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	⌐S⌐1	0: No lighting 1: Lighting ⌐⌐⌐⌐⌐◄—— Value at SV display 　└— TS1 　└— TS2 　└— TS3 　└— TS4 　└— Unused	1111
TS lamp light condition 2	⌐S⌐2	0: No lighting 1: Lighting ⌐⌐⌐⌐⌐◄—— Value at SV display 　└— TS5 　└— TS6 　└— TS7 　└— TS8 　└— Unused	1111
Power saving mode duration	oFF⌐M	0 to 60 minutes (0: Lights at all times)	0
Function block 11 (F11.01 to F11.06)			
RESET key type	K⌐YP1	0: Invalid	1
RUN key type	K⌐YP2	1: Press once 2: Press twice	1
FIX key type	K⌐YP3	3: Press and hold	1
MAN key type	K⌐YP4		1
HOLD key type	K⌐YP5	Key type is not available for the PTN END key.	1
STEP key type	K⌐YP6		3
Function block 21 (F21.01 to F21.15)			
Input type	I NP	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

Continued from the previous page.

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 **3.3 Wiring of Each Terminal (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)	Input range high + (5 % of Input span)
Input error determination point (low)	PUN	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 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.

Continued from the previous page.

Name	Symbol	Data range	Factory set value
Function block 23 (F23.01, F23.02)			
Digital input (DI) assignment	dI SL	0 to 5 DI1 to DI6 (Optional) _see sub-table below_ DI7 to DI11 (Standard) _see sub-table below_ PTN1 to PTN64: Pattern number switch P.SET: Pattern set WAIT: Wait state release RESET, RUN: Switch Operation mode HOLD, STEP: Conduct Hold action or Step action D/R: Direct/Reverse action switching PTN_INC: Pattern increment	Based on model code. When not specifying: 0

Pattern input method of Digital input (DI)	dI PTN	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 the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.
			0

Function block 30 (F30.01 to F30.08)			
OUT2, OUT3 Energized/De-energized	E˟oUr	0: Energized 1: De-energized 00000 ◄—— Value at SV display └── OUT2 └── OUT3 └── Unused	00
DO1 to DO4 Energized/De-energized	E˟do1	0: Energized 1: De-energized 00000 ◄—— Value at SV display └── DO1 └── DO2 └── DO3 └── DO4 └── Unused	0000
DO5 to DO8 Energized/De-energized	E˟do2	0: Energized 1: De-energized 00000 ◄—— Value at SV display └── DO5 └── DO6 └── DO7 └── DO8 └── Unused	0000

DI1 to DI6 (Optional)

	DI1	DI2	DI3	DI4	DI5	DI6
0	PTN1	PTN2	PTN4	PTN8	PTN16	P.SET
1	PTN1	PTN2	PTN4	PTN8	PTN16	P.SET
2	WAIT	WAIT	WAIT	WAIT	WAIT	WAIT
3	WAIT	WAIT	WAIT	WAIT	WAIT	WAIT
4	WAIT	WAIT	WAIT	WAIT	WAIT	WAIT
5	WAIT	WAIT	WAIT	WAIT	WAIT	WAIT

DI7 to DI11 (Standard)

	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	D/R
5	RESET	RUN	STEP	HOLD	PTN_INC

Continued from the previous page.

Name	Symbol	Data range	Factory set value
DO9 to DO12 Energized/De-energized	E×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	LoGC1	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	LoGC2	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 (vary 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

Continued from the previous page.

Name	Symbol	Data range	Factory set value
OUT2 assignment (A continuance)	LoGC2	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 (vary 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	LoGC3	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 (vary 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 transmissionoutput scal high.	

Continued from the previous page.

Name	Symbol	Data range	Factory set value
OUT3 transmission output scale low	⌐L53	Varies with OUT3 assignment. The data range is the same as the OUT2 transmissionoutput scal low.	
Function block 34 (F34.01 to F34.12)			
DO1 assignment	L do 1	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	L do2		
DO3 assignment	L do3		
DO4 assignment	L do4		
DO5 assignment	L do5		When specifying 12 points of DO at ordering: DO5 to DO12: 1 to 8
DO6 assignment	L do6		
DO7 assignment	L do7		
DO8 assignment	L do8		
DO9 assignment	L do9		When specifying 4 points of DO at ordering: DO5 to DO12: 0
DO10 assignment	L do 10		
DO11 assignment	L do 11		
DO12 assignment	L do 12		
Function block 41 (F41.01 to F41.08)			
Event 1 type	ES 1	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	EHo 1	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	EH 1	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	Ebo 1	0 to 4	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

Name	Symbol	Data range	Factory set value
Event 1 timer	EvⲄ 1	0.0 to 600.0 seconds	0.0

Continued from the previous page.

Name	Symbol	Data range	Factory set value
Event 1 interlock	E I L I	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	E IoN	0.0 to 600.0 seconds	0.0
Event 1 minimum OFF time	E IoFF	0.0 to 600.0 seconds	0.0
Function block 42 (F42.01 to F42.08)			
Event 2 type	E52	The data range is same as Event 1 type.	Based on model code. When not specifying: 2
Event 2 hold action	EHo2	The data range is same as Event 1 hold action.	Based on model code. When not specifying: 1
Event 2 differential gap	EH2	The data range is same as Event 1 differential gap.	
Event 2 output action at input error	Ebo2		
Event 2 timer	EVT2		
Event 2 interlock	E I L2		
Event 2 minimum ON time	E2oN		
Event 2 minimum OFF time	E2oFF		
Function block 43 (F43.01 to F43.08)			
Event 3 type	E53	The data range is same as Event 1 type.	Based on model code. When not specifying: 0
Event 3 hold action	EHo3	The data range is same as Event 1 hold action.	Based on model code. When not specifying: 0
Event 3 differential gap	EH3	The data range is same as Event 1 differential gap.	
Event 3 output action at input error	Ebo3		
Event 3 timer	EVT3		
Event 3 interlock	E I L3		
Event 3 minimum ON time	E3oN		
Event 3 minimum OFF time	E3oFF		
Function block 44 (F44.01 to F44.08)			
Event 4 type	E54	The data range is same as Event 1 type.	Based on model code. When not specifying: 0
Event 4 hold action	EHo4	The data range is same as Event 1 hold action.	Based on model code. When not specifying: 0
Event 4 differential gap	EH4	The data range is same as Event 1 differential gap.	
Event 4 output action at input error	Ebo4		
Event 4 timer	EVT4		
Event 4 interlock	E I L4		
Event 4 minimum ON time	E4oN		
Event 4 minimum OFF time	E4oFF		

Continued from the previous page.

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.

Continued from the previous page.

Name	Symbol	Data range	Factory set value
Function block 50 (F50.01 to F50.14)			

Control action	o5	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 at ordering: 5 When 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	0
Action (low) at input error	AUNE	1: Manipulated output value at input error	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 *	Γ1	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	o1.ΓM	0 to 1000 ms	0
OUT2 proportional cycle time *	Γ2	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.ΓM	0 to 1000 ms	0
OUT3 proportional cycle time *	Γ3	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.ΓM	0 to 1000 ms	0
Function block 52 (F52.01 to F52.07)			
AT bias	AΓb	−Input span to +Input span (The unit is the same as input value)	0
AT differential gap time	AΓHS	0.0 to 100.0 seconds	10.0
AT time signal action	AΓΓS	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.

Continued from the previous page.

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	ATT.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	0 to 99 1 to 99 at Modbus	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	(see table below)	8N1
Interval time 1 *	INT1	0 to 250 ms	10

Symbol	Data bit	Parity bit	Stop bit
8N1 *	8 bit	Without	1 bit
8N2 *	8 bit	Without	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	Without	1 bit
7N2	7 bit	Without	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

* 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.

Continued from the previous page.

Name	Symbol	Data range	Factory set value
Function block 61 (F61.01 to F61.06)			
Slave controller	SLV.SL	0: FB series 1: RB series 2: PF900/PF901	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.ER.TM	0 to 600 seconds 0: Unused	10
Intercontroller communication error judgment time	C.ER.TM	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	PR.TYP	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 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.

PV/SV monitor

Parameter setting mode

Setup setting mode

Press the ◁MODE key while pressing the SET key for 2 seconds.

Function block 10 (F10.)

PV flashing display at input error

Setting parameters from F10.02 to F10.10

F10.02: Dot monitor type
F10.03: Dot monitor scale high
F10.04: Dot monitor scale low
F10.05: ALM lamp light condition 1
F10.06: ALM lamp light condition 2
F10.07: ALM lamp light condition 3
F10.08: Dot monitor at ALM lamp light
F10.09: TS lamp light condition 1
F10.10: TS lamp light condition 2

Power saving mode duration

Function block 11 (F11.)

RESET key type

Setting parameters from F11.02 to F11.05

F11.02: RUN key type
F11.03: FIX key type
F11.04: MAN key type
F11.05: HOLD key type

STEP key type

Function block 21 (F21.)

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 11
(F11.)

Function block 21
(F21.)

PV **F21.**
SV **INP**

SET

Input type

PV **INP**
SV **F21.01 00001**

SET

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

SET

PV low input cut-off

SET

PV **L-CUT**
SV **F21.15 000.00**

Function block 23
(F23.)

PV **F23.**
SV **dI**

SET

Digital input (DI) assignment

PV **dI SL**
SV **F23.01 00000**

SET

Pattern input method of Digital input (DI)

PV **dI PrN**
SV **F23.02 00000**

SET

Function block 30
(F30.)

PV **F30.**
SV **oUT**

SET

OUT2, OUT3 Energized/De-energized

PV **ExoUT**
SV **F30.01 00000**

SET

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

SET

Event action at Pattern end

SET

PV **P.Ed.EV**
SV **F30.08 00000**

Function block 31
(F31.)

PV **F31.**
SV **oUT1**

SET

OUT1 assignment

PV **LoGC1**
SV **F31.01 00000**

SET

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.)

PV	F45.
	SV HbA1

CT1 ratio

PV	CTR1
F45.01	SV 00800

CT1 assignment

PV	CTA1
F45.02	SV 00001

Number of heater break alarm 1 (HBA1) delay times

PV	HbC1
F45.03	SV 00005

Heater break alarm 1 (HBA1) interlock

PV	HbIL1
F45.05	SV 00000

Heater break alarm 1 (HBA1) set value

PV	HbA1
F45.04	SV 0000.0

Function block 46
(F46.)

PV	F46.
	SV HbA2

HBA2
(The setting parameter is same as HBA1.)

Function block 47
(F47.)

PV	F47.
	SV LbA

Control loop break alarm (LBA) selection

PV	LbASL
F47.01	SV 00000

Control loop break alarm (LBA) interlock

PV	LbIL
F47.02	SV 00000

Function block 50
(F50.)

PV	F50.
	SV CoNTR

Control action

PV	oS
F50.01	SV 00001

Setting parameters from F50.02 to F50.13

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

OUT3 minimum ON/OFF time of proportioning cycle

PV	o3.TM
F50.14	SV 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 ⓈⒺⓉ key to go back to the first setting display of the function block.

Function block 52
(F52.)

PV		
F52.		
SV	AT	

ⓈⒺⓉ

AT bias

PV		
	ATb	
F52.01	SV	00000

ⓈⒺⓉ

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

ⓈⒺⓉ

AT with learning function at ramp segment

ⓈⒺⓉ

PV		
	ATT.R	
F52.07	SV	00000

Function block 53
(F53.)

PV		
F53.		
SV	VALVE	

ⓈⒺⓉ

Action at feedback resistance (FBR) input error

PV		
	YbR	
F53.01	SV	00000

ⓈⒺⓉ

Feedback adjustment

PV		
	PoS	
F53.02	SV	Adj

ⓈⒺⓉ

Control motor time

PV		
	MoT	
F53.03	SV	00010

ⓈⒺⓉ

Valve action in Reset mode

ⓈⒺⓉ

PV		
	VAL	
F53.05	SV	00000

ⓈⒺⓉ

Integrated output limiter

PV		
	oLA	
F53.04	SV	0150.0

Function block 60
(F60.)

PV		
F60.		
SV	SCI.1	

ⓈⒺⓉ

Communication 1 protocol

PV		
	CMP1	
F60.01	SV	00000

ⓈⒺⓉ

Device address 1

PV		
	Add1	
F60.02	SV	00000

ⓈⒺⓉ

Communication speed 1

PV		
	bPS1	
F60.03	SV	19200

ⓈⒺⓉ

Interval time 1

ⓈⒺⓉ

PV		
	INT1	
F60.05	SV	00010

ⓈⒺⓉ

Data bit configuration 1

PV		
	biT1	
F60.04	SV	8N1

Function block 61
(F61.)

PV		
F61.		
SV	SCI.2	

ⓈⒺⓉ

Slave controller

PV		
	SLV.SL	
F61.01	SV	00000

ⓈⒺⓉ

Number of slave unit

PV		
	SLV.No	
F61.02	SV	00000

ⓈⒺⓉ

Device address 2

PV		
	Add2	
F61.03	SV	00000

ⓈⒺⓉ

Intercontroller communication error judgment time

ⓈⒺⓉ

PV		
	C.ER.TM	
F61.06	SV	00010

ⓈⒺⓉ

Host communication error judgment time

PV		
	H.ER.TM	
F61.05	SV	00010

Communication speed 2

PV		
	bPS2	
F61.04	SV	19200

Function block 71
(F71.)

Function block 61
(F61.)

📖 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 71
(F71.)

Setting limiter high

Setting limiter low

```
PV  F71.
      SV
         SCALE
```
[SET]

```
PV      SLH
      SV
F71.01  01372
```
[SET]

```
PV      SLL
      SV
F71.02  00000
```
[SET]

Function block 80
(F80.)

SV selection at
Program start

Setting parameters from F80.02 to F80.05

```
PV  F80.
      SV
         PRoG
```
[SET]

```
PV     Sr.SV
      SV
F80.01  00002
```
[SET]

F80.02: Wait memory group number at Program start
F80.03: Program setting type
F80.04: Signal type
F80.05: Set time unit

[SET]

Maximum segment
number

Maximum pattern
number

[SET]

```
PV   PN*SN
      SV
F80.07  32*32
```

[SET]

```
PV   PN*SN
      SV
F80.06  32*32
```

First Function block
10 (F10.)

Set maximum number
of segment

Set maximum number
of pattern

📖 **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]

IMR02L04-E1

Continued from the
previous parameter

Decimal point position

```
PV  PGdP
    F21.03  00000
SV
```

Check Decimal point position.
0000: No decimal place

Input scale high

```
PV  PGSH
    F21.04  00400
SV
```

Check Input scale high.
00400: 400 °C

Input scale low

```
PV  PGSL
    F21.05  00000
SV
```

Check Input scale low.
00000: 0 °C

Burnout direction

```
PV  boS
    F21.08  00000
SV
```

Select Burnout direction.
00000: Upscale (Factory set value)
00001: Downscale

Input error determination point (low)

```
PV  PUN
    F21.07  -0020
SV
```

Check Input error determination point (low).
−0020: −20 °C

Input error determination point (high)

```
PV  PoV
    F21.06  00420
SV
```

Check Input error determination point (high).
00420: 420 °C

Square root extraction

```
PV  SQR
    F21.09  00000
SV
```

Select Square root extraction.
00000: Unused (Factory set value)
00001: Used

Power supply frequency

```
PV  PFRQ
    F21.10  00000
SV
```

Select Power supply frequency.
00000: 50 Hz (Factory set value)
00001: 60 Hz

Sampling cycle

```
PV  SMP
    F21.11  00001
SV
```

Select Sampling cycle.
00000: 50 ms
00001: 100 ms (Factory set value)
00002: 250 ms

```
Return to
Function block 21
(F21.)
```

F21.12:   PV bias
F21.13:   PV digital filter
F21.14:   PV ratio
F21.15:   PV low input cut-off
The parameters above may be set in the
Setup setting mode.

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

Function block 71 (F71.)

```
PV  F71.
SV      SCALE
```

Setting limiter high

```
PV  SLH
    F71.01  00400
SV
```

Check Setting limiter high.
00400: 400 °C
[Range: Setting limiter low to
        Input range high]

Setting limiter low

```
PV  SLL
    F71.02  00000
SV
```

Check Setting limiter low.
00000: 0 °C
[Range: Input range low to
        Setting limiter high]
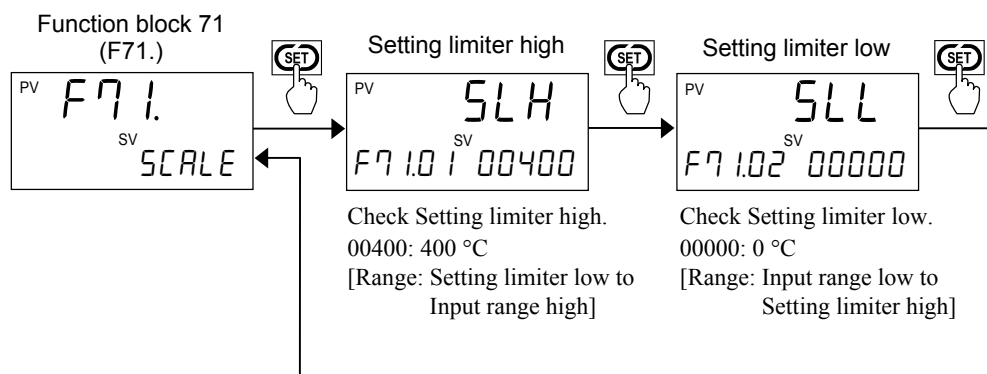
5.1.2 Check the parameter related to the event action

Parameter settings related to event action can be checked 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

ON   OFF   ON → PV
Low   High
(▲: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 (EXDO1)]. (Factory set value: Energized)

Function block 21 (F21.)

PV **F21.**
SV **INP**

Press the ∧ key until F34 displays.

Function block 34 (F34.)

PV **F34.**
SV **do**

DO1 assignment

PV **Ldo1**
F34.01 00009

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.)

PV **F41.**
SV **EV1**

Event 1 type

PV **ES1**
F41.01 00003

Check Event 1 type.
00003: Deviation high/low

Event 1 hold action

PV **EHo1**
F41.02 00001

Check Event 1 hold action.
00001: Hold action ON

Event 1 differential gap

PV **EH1**
F41.03 00002

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

Event 1 output action at input error

PV **Ebo1**
F41.04 00000

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

PV **EVr1**
F41.05 0000.0

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

Event 1 Minimum OFF time

PV **E1oFF**
F41.08 0000.0

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

Event 1 Minimum ON time

PV **E1oN**
F41.07 0000.0

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

Event 1 Interlock

PV **EIL1**
F41.06 00001

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

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 in Engineering mode.
Parameters which are not specified when ordering must be set before use.

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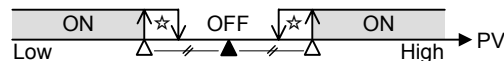Control action: PID control (reverse action) [Suffix code: F]
Control output: OUT1, Relay contact output, Proportional cycle time: 20 seconds

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

Function block 41 (F41.)

PV **F41.**
SV **EV1**

Press the ⌄ key until F31 displays.

Function block 31 (F31.)

PV **F31.**
SV **oUT1**

OUT1 assignment

PV **LoGC1**
SV F31.01 00000

Check OUT1 assignment.
00000: Manipulated output value 1 (MV1)

Press the ⌃ key until F50 displays.

Function block 50 (F50.)

PV **F50.**
SV **CoNTR**

Control action

PV **oS**
SV F50.01 00001

Check Control action.
00001: PID control (reverse action)

Action (high) at input error

PV **AoVE**
SV F50.04 00000

Select Action (high) at input error.
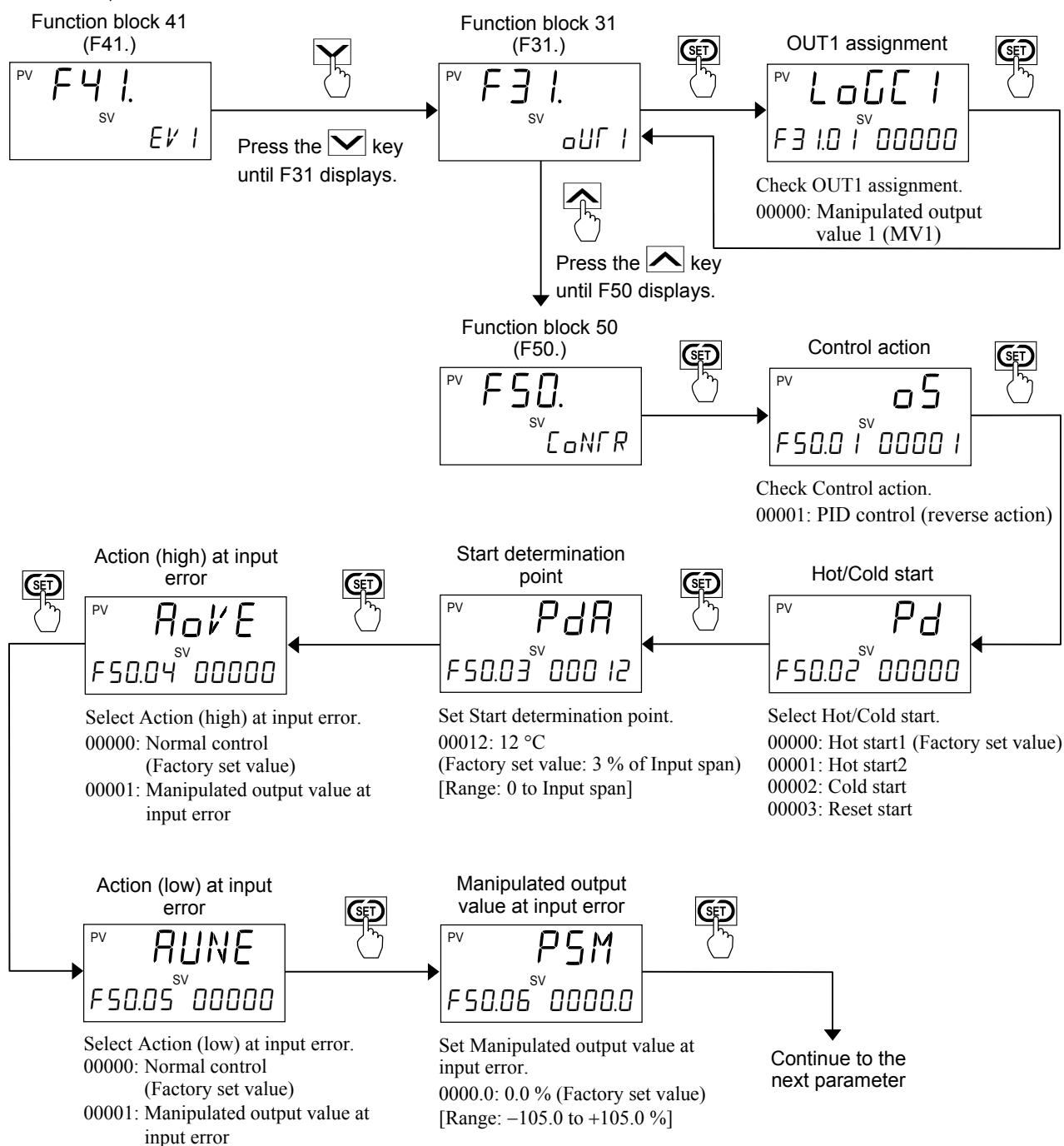00000: Normal control (Factory set value)
00001: Manipulated output value at input error

Start determination point

PV **PdA**
SV F50.03 00012

Set Start determination point.
00012: 12 °C
(Factory set value: 3 % of Input span)
[Range: 0 to Input span]

Hot/Cold start

PV **Pd**
SV F50.02 00000

Select Hot/Cold start.
00000: Hot start1 (Factory set value)
00001: Hot start2
00002: Cold start
00003: Reset start

Action (low) at input error

PV **AUNE**
SV F50.05 00000

Select Action (low) at input error.
00000: Normal control (Factory set value)
00001: Manipulated output value at input error

Manipulated output value at input error

PV **PSM**
SV F50.06 0000.0

Set Manipulated output value at input error.
0000.0: 0.0 % (Factory set value)
[Range: −105.0 to +105.0 %]

Continue to the next parameter

Continued from the
previous parameter

Control action at
Pattern end

```
PV    ENd.P
      SV
F50.07 00000
```

Select Control state at pattern end.
PID control or Heat/Cool PID control,
Position proportioning PID control (with FBR input):
   00000: Control continued (Factory set value)
   00001: Control stop
Setting is still effective when using Output program function.

Position proportioning PID control (without FBR input or at
FBR burnout):
   00000: Control continued (Factory set value)
   00001: Open-side output OFF, Close-side output OFF
   00002: Open-side output OFF, Close-side output ON
   00003: Open-side output ON, Close-side output OFF

Intensity factor of
ramp/soak stabilizer

```
PV    RSS.AJ
      SV
F50.08 0000.5
```

Set the Intensity factor of ramp/soak
stabilizer.

0000.5: 0.5 (Factory set value)
[Range: 0.0 to 1.0]

F50.11:
OUT2 proportional cycle time
F50.12:
OUT2 minimum ON/OFF
time of proportioning cycle
F50.13:
OUT3 proportional cycle time
F50.14:
OUT3 minimum ON/OFF
time of proportioning cycle
(Not used for this example)

OUT1 minimum
ON/OFF time of
proportioning cycle

```
PV    o1.ΓM
      SV
F50.10 00000
```

Set OUT1 minimum ON/OFF
time of proportioning cycle.
00000: 0 (Factory set value)
[Range: 0 to 1000 ms]

OUT1
proportional cycle time

```
PV    Γ1
      SV
F50.09 0020.0
```

Set OUT1 proportional cycle
time.
0020.0: 20.0 (Factory set value)
[Range: 0.1 to 100.0 seconds]

Return to
Function block 50
(F50.)

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

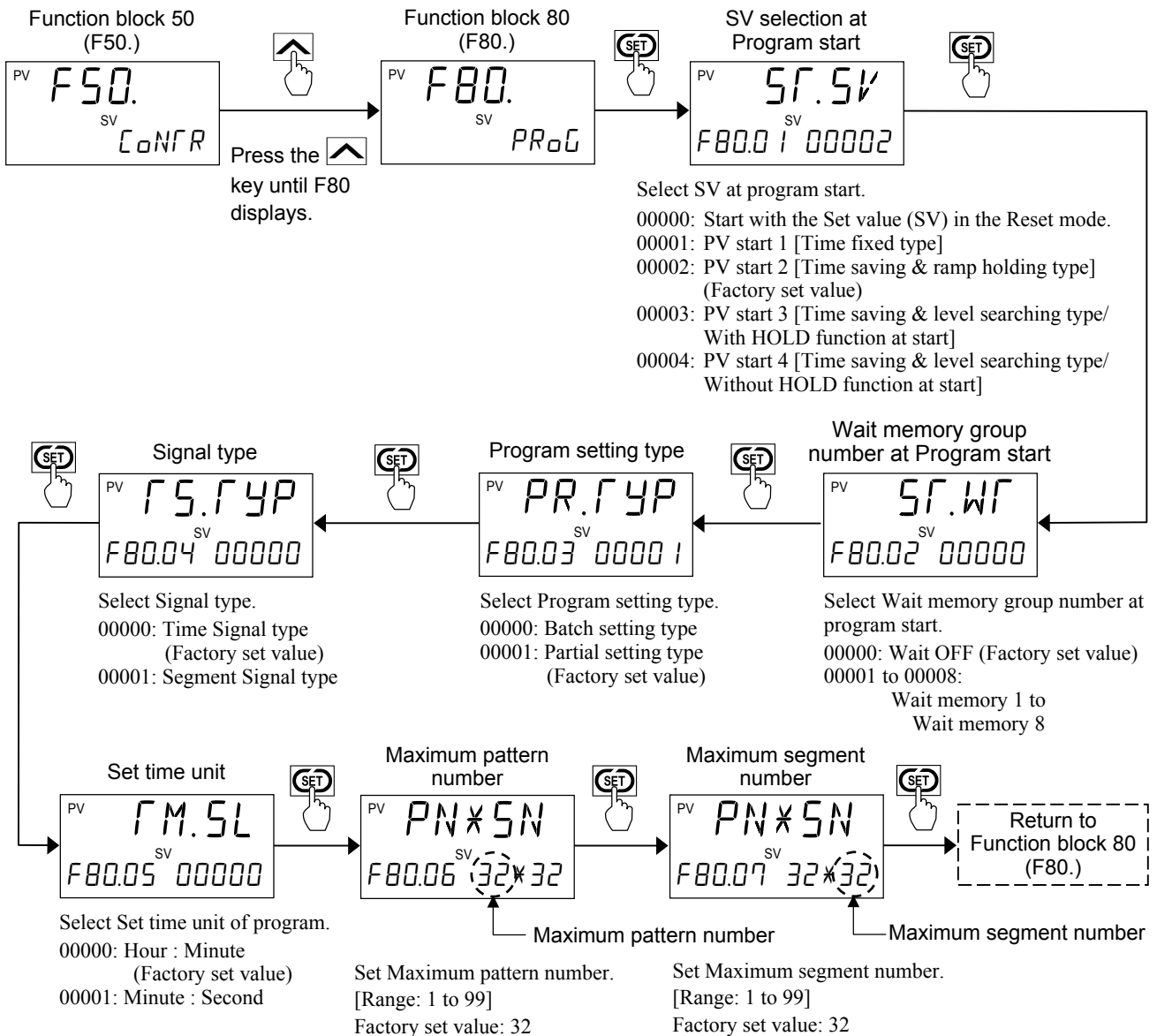## 5.1.4 Check set value of parameter for program control operation

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.

Function block 50 (F50.)

PV	F50.
SV	CoNTR

Press the ⋀ key until F80 displays.

Function block 80 (F80.)

PV	F80.
SV	PRoG

SV selection at Program start

PV	ST.SV
F80.01	00002

Select SV at program start.

00000: Start with the Set value (SV) in the Reset mode.
00001: PV start 1 [Time fixed type]
00002: PV start 2 [Time saving & ramp holding type] (Factory set value)
00003: PV start 3 [Time saving & level searching type/ With HOLD function at start]
00004: PV start 4 [Time saving & level searching type/ Without HOLD function at start]

Signal type

PV	TS.TYP
F80.04	00000

Select Signal type.
00000: Time Signal type (Factory set value)
00001: Segment Signal type

Program setting type

PV	PR.TYP
F80.03	00001

Select Program setting type.
00000: Batch setting type
00001: Partial setting type (Factory set value)

Wait memory group number at Program start

PV	ST.WT
F80.02	00000

Select Wait memory group number at program start.
00000: Wait OFF (Factory set value)
00001 to 00008: Wait memory 1 to Wait memory 8

Set time unit

PV	TM.SL
F80.05	00000

Select Set time unit of program.
00000: Hour : Minute (Factory set value)
00001: Minute : Second

Maximum pattern number

PV	PN✳SN
F80.06	32✳32

└ Maximum pattern number

Set Maximum pattern number.
[Range: 1 to 99]
Factory set value: 32

Maximum segment number

PV	PN✳SN
F80.07	32✳32

└ Maximum segment number

Set Maximum segment number.
[Range: 1 to 99]
Factory set value: 32

Return to Function block 80 (F80.)

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.

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

■ 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.
       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 or Action (low) at input error 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 the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

■ 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.
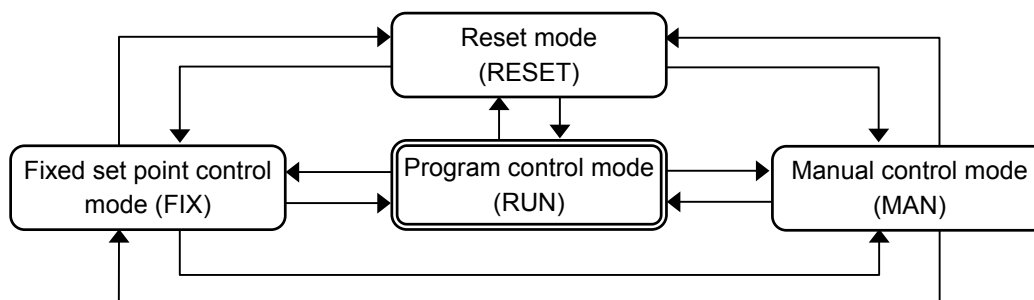
☞   For Hot/Cold start, refer to **6.5.5 Start action at recovering power failure** in the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

5.3 Type and Switching Procedures of Operation Mode

5.3.1 Type of Operation mode

PF900/PF901 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.

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

[1] Once Program control mode is restarted, the program state will return as it was before switched to the Fixed 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
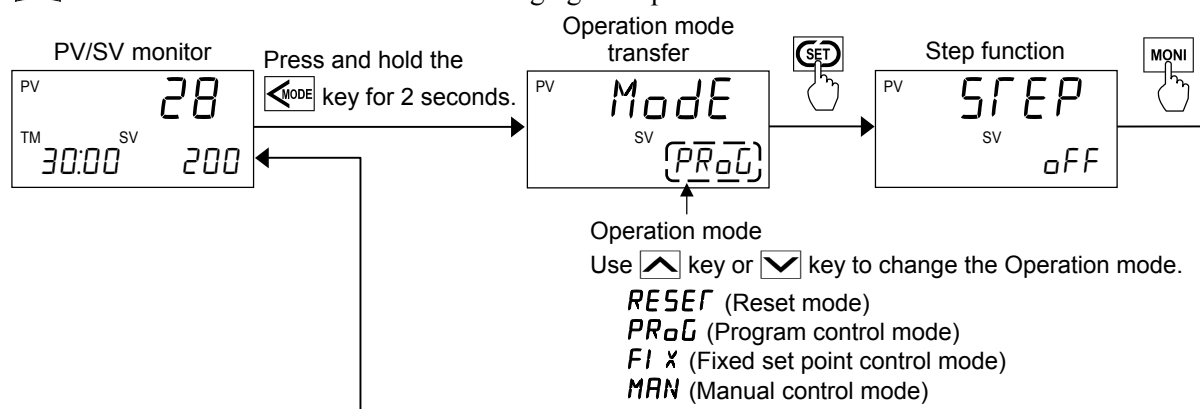
📖 **NOTE**

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.

Operation mode
Use ⏶ key or ⏷ key to change the Operation mode.
RESET (Reset mode)
PRoG (Program control mode)
FI X (Fixed set point control mode)
MAN (Manual control mode)

● When switching by the Direct key

Use the front direct key.

State display lamp
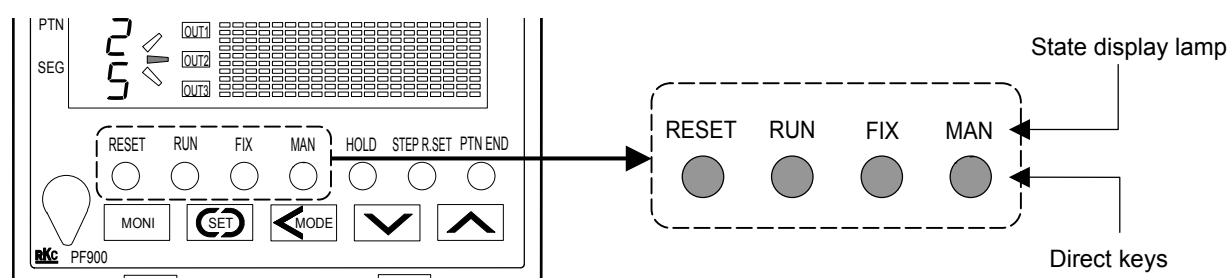
Direct keys

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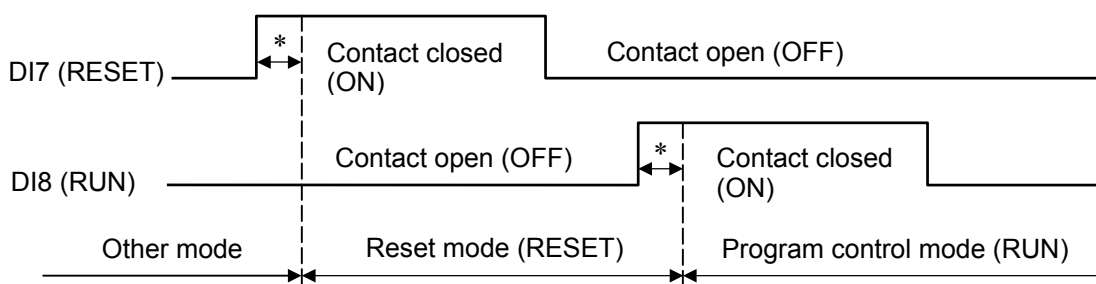
* Detects edge at start-up and judges that DI is validated when the contact is in ON state for at least 200 ms + 1 sampling cycle.

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

● 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	41	0029	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]** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.
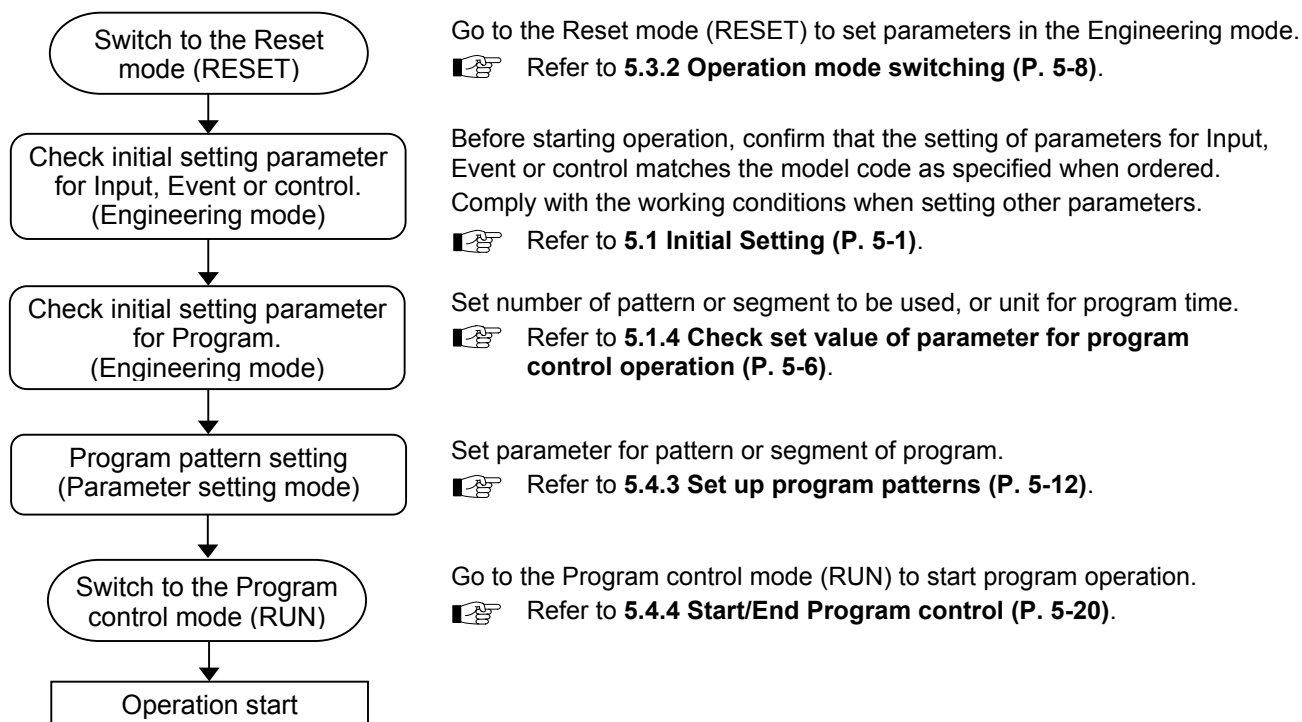
5.4 Program Control Operation

5.4.1 Program control mode display

Segment remaining time

PV/SV monitor

Measured value (PV)
(Displays character of parameter at setting.)

Program time unit

Input unit display

Segment level set value

Lights when the settings are locked.

Lights when time signal is turned on.

Lights conforming to Alarm lamp light condition.

Lights during AT.

Displays pattern number and segment number.

Lights conforming to DO state.

Gradient state lamp
(Lights the lamp of the gradient in process.)

Program pattern display *

Displays segment level of pattern (up to 20 segments). The level of each dot is one tenth of the value between Dot monitor scale low to Dot monitor scale high.

Lights when the output (OUT1 to OUT3) corresponding to each lamp is ON.

20 segments

Dot monitor scale high

Dot monitor scale low

Segment in progress flashes at RUN state.

Level of dot:
One tenth of the value between Dot monitor scale low to Dot monitor scale high

* To display Program pattern, select Program pattern type at Dot monitor type ($dd\Gamma P$) of F10.02 in the Engineering mode (Factory set value: Program pattern type).
(Factory set value: Program pattern type)

📖 Set Alarm lamp light condition at F10 in the Engineering mode.

📖 Set DO type at F34 in the Engineering mode.

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

☞ For Program pattern display, refer to the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

☞ 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

Switch to the Reset mode (RESET)	Go to the Reset mode (RESET) to set parameters in the Engineering mode. ☞ Refer to **5.3.2 Operation mode switching (P. 5-8)**.
Check initial setting parameter for Input, Event or control. (Engineering mode)	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)**.
Check initial setting parameter for Program. (Engineering mode)	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)**.
Program pattern setting (Parameter setting mode)	Set parameter for pattern or segment of program. ☞ Refer to **5.4.3 Set up program patterns (P. 5-12)**.
Switch to the Program control mode (RUN)	Go to the Program control mode (RUN) to start program operation. ☞ Refer to **5.4.4 Start/End Program control (P. 5-20)**.
Operation start	

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)**.
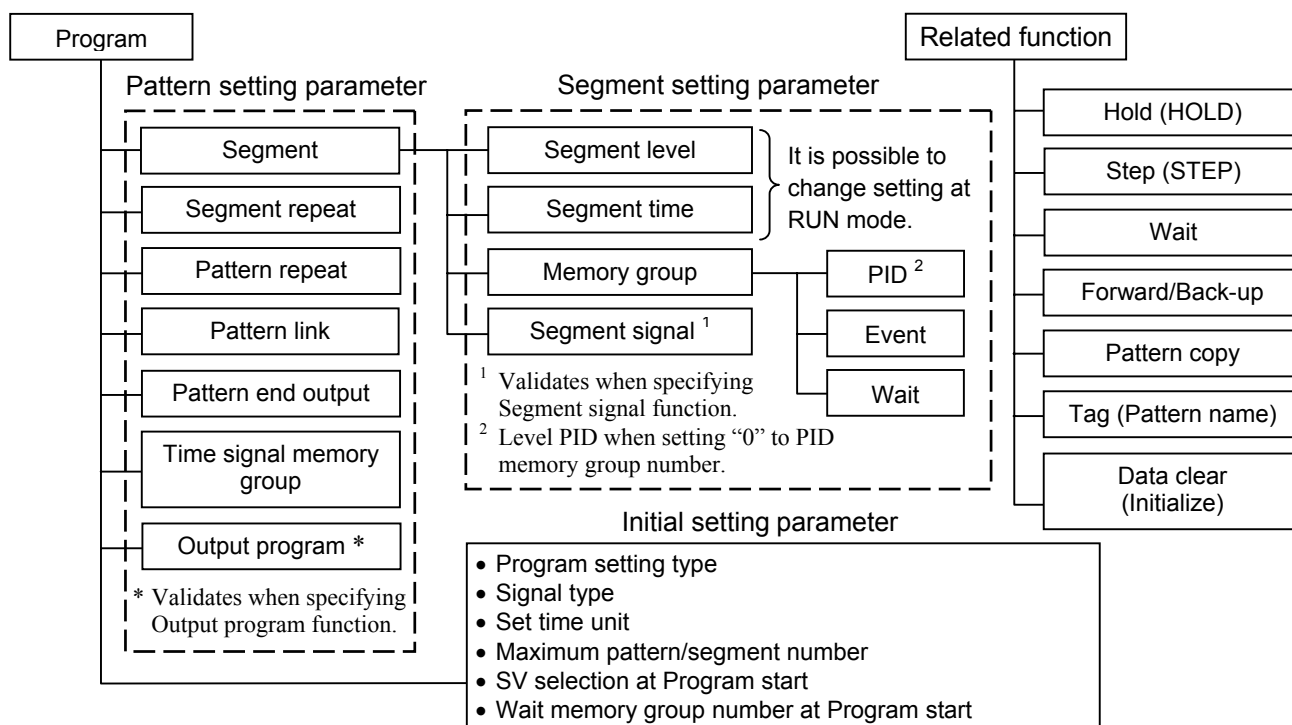
■ Setting example of program pattern

- 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)**.
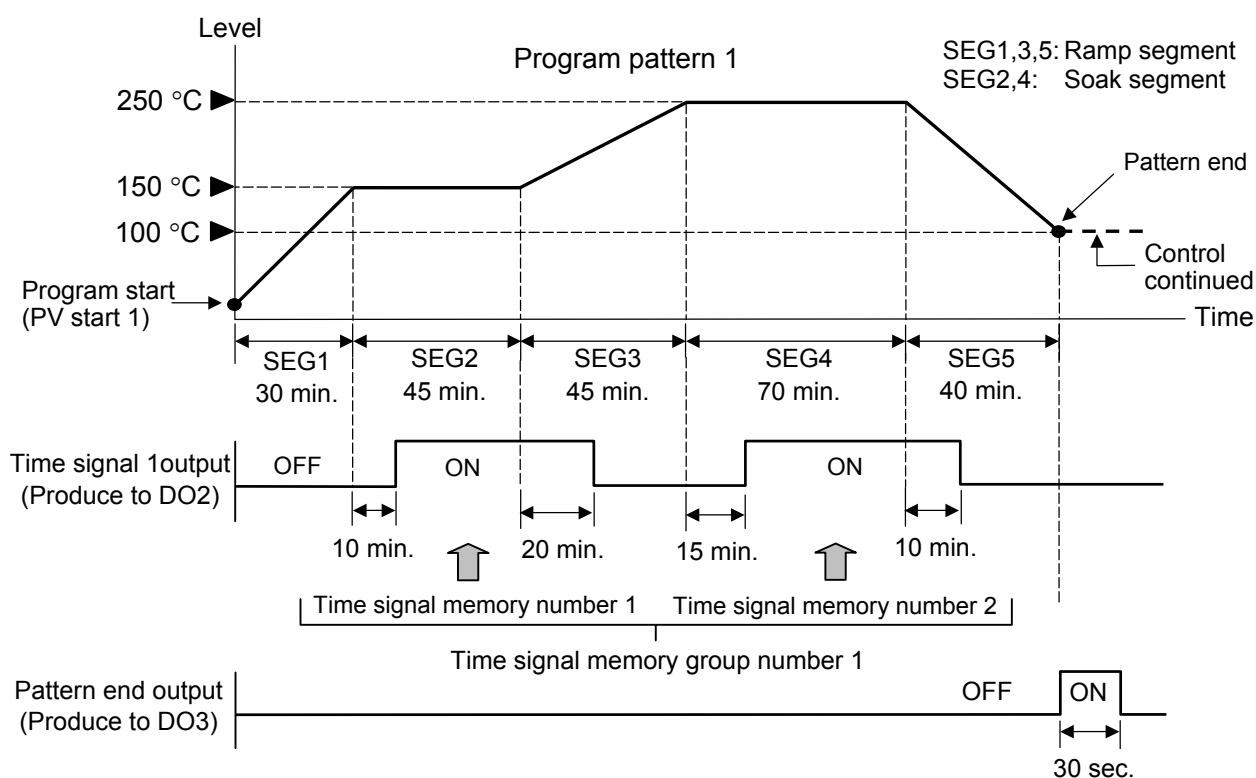
■ Setting procedure for program pattern

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. 4-26)**.

Go to the setting display of the next parameter setting

To Segment setting

Program end

PV P.ENd
SV
(5)
└── Displays the End segment number.

[SET]

Segment repeat
Start/End number

PV 5r→Ed
SV (01)→01
5
└── Start number

[SET]

Segment repeat
Start/End number

PV 5r→Ed
SV 01→(01)
5
End number ──┘

(When Segment repeat function is not used, the start number and the end number remain the factory set value.)

[SET]

Link pattern number

PV LNK.PN
SV 0000(0)
5
Set "0" when not using Pattern link.

[SET]

Pattern repeat
execution time

PV RPr.PN
SV 0000(2)
5
Set "2" to conduct Pattern repeat once.

[SET]

Segment repeat
execution time

PV RPr.SG
SV 0000(1)
5
Set "1" when not using Segment repeat.

Pattern end output
duration

PV ENd.rM
M:S SV 000(30)
5
Set 30 seconds for Pattern end output duration.

[SET]

Time signal memory
group number

PV rS.GR
SV 0000(1)
5
Set "1" for Time memory group number.

[SET] Two times

Program setting block

PV PRoG
SV

1
Pattern setting is completed: Return to the Program setting block.

[∧]

Program memory
group setting block

PV PR.MEM
SV

1

[∨] [∧]

┌─────────────────┐
│ PID memory group │
│ setting block   │
└─────────────────┘

[SET]

Setting pattern number

PV PrN.No
SV 1
(5)
└── Displays End segment number.

[SET]

PID memory group
number

PV PId.GR
SV 0000(1)
1
Set "1" for PID memory group number.
[0: Level PID (Factory set value)]

[SET]

Event memory group
number

PV EV.GR
SV 0000(1)
1
Set "1" for Event memory group number.

[SET]

Wait memory group
number

PV Wr.GR
SV 0000(1)
1
Set "1" for Wait memory group number.

[SET]

┌──────────────────────────┐
│ Follow the same setting   │
│ procedure for memory   │
│ group numbers 2 to 5 as   │
│ the first segment.   │
└──────────────────────────┘

☞ 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

Program group
setting block

PV **PR.MEM**
SV

Press the ⋀ key at the Program setting block screen to go to the PID memory group setting block.

PID memory group
setting block

PV **PI d**
SV

PID memory
group number

PV **PI d.GR**
SV **0000 I**

Set PID memory group number.

Proportional band
[heat-side]

Unit display

PV **Pc**
GR. I SV **00030**

Displays Group number being set.

Set Proportional band [heat-side]

Derivative time
[heat-side]

PV **d**
GR. I SV **00060**

Set Derivative time [heat-side].

Integral time
[heat-side]

PV **I**
GR. I SV **00240**

Set Integral time [heat-side].

For PID memory group setting, set P, I, D and the following parameters complying with the working condition.
Parameter displays based on the control type or the function.

Event memory
group setting

rPr:	Control response parameter	oLL:	Output limiter low (MV1)
Pc:	Proportional band [cool-side]	oLH2:	Output limiter high (MV2)
Ic:	Integral time [cool-side]	oLL2:	Output limiter low (MV2)
dc:	Derivative time [cool-side]	oHH:	ON/OFF action differential gap (upper)
db:	Overlap/Deadband	oHL:	ON/OFF action differential gap (lower)
Ydb:	Open/Close output neutral zone	LbA:	Control loop break alarm (LBA) time
MR:	Manual reset	Lbd:	LBA deadband (LBD)
oLH:	Output limiter high (MV1)		

- 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** in the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

● Parameter setting for Event memory group

Set the Event memory group after PID memory group.

To go back to the first Event memory group setting block at the end of the setting, press the STEP R.SET direct key while pressing the [SET] key.
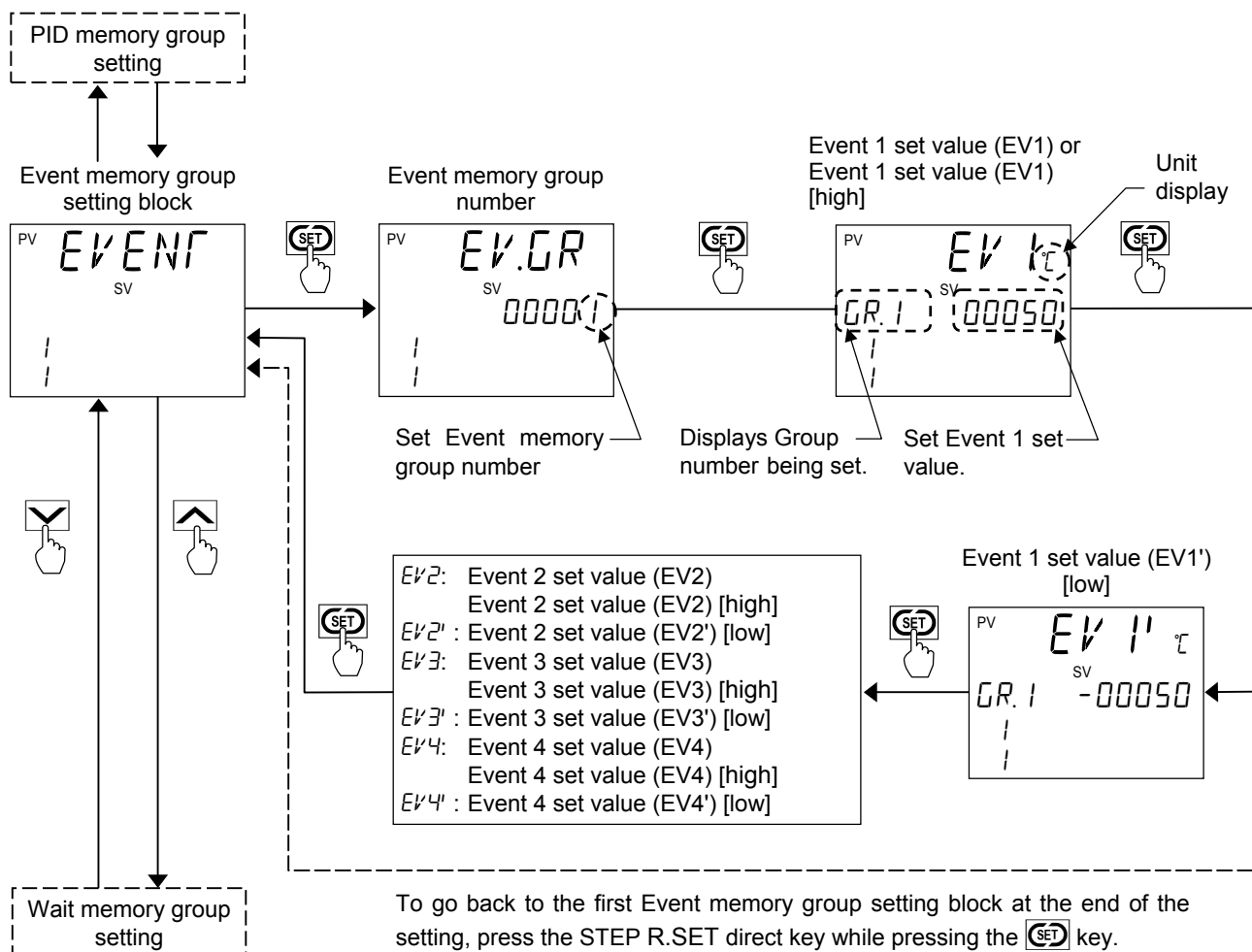
📖 Event set value from 1 to 4 (EV1 to 4) [high] and Event set value from 1 to 4 (EV1' to 4') [low] display when selecting Deviation high/low (High/Low individual setting) or Band (High/Low individual setting) at function blocks from 41 (F41.) to 44 (F44.) in the Engineering mode.

📖 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□)** on the CD-ROM.

● Parameter setting for Wait memory group

Set the Wait memory group after Event memory group.

PID memory group setting

Wait memory group setting block

Wait memory group number

Wait zone high

Set Wait memory group number.

Displays Group number being set.

Set Wait zone high to 10 °C.

Wait release trigger selection

Wait zone low

Set Wait release trigger to 00001.
[00001: Zone wait 1 (the controller)]

Set Wait zone low to −10 °C.

Time signal memory group setting

Wait time-out set value

Wait time-out set value is not specified in this setting example (set 000:00).

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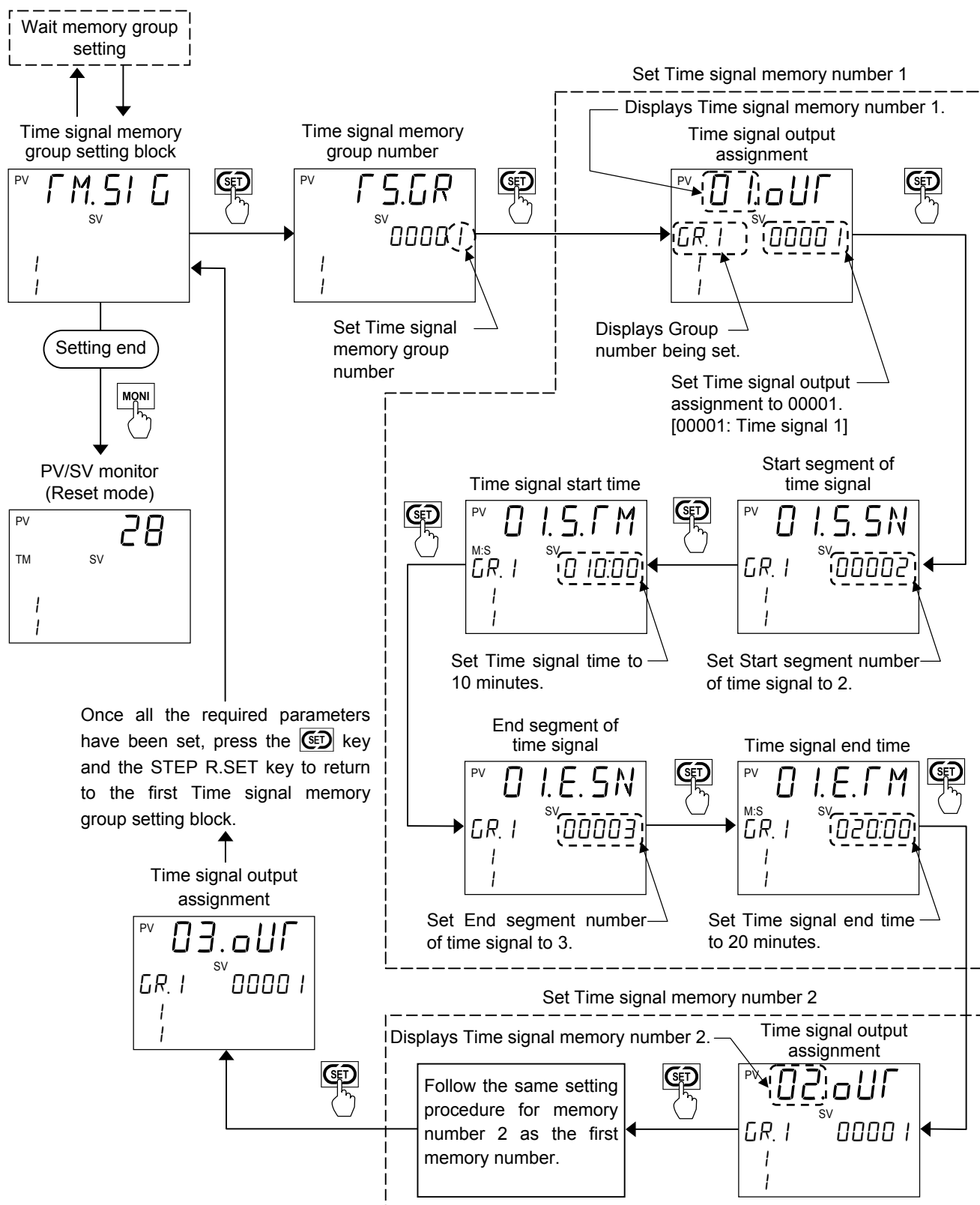
☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

☞ 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.
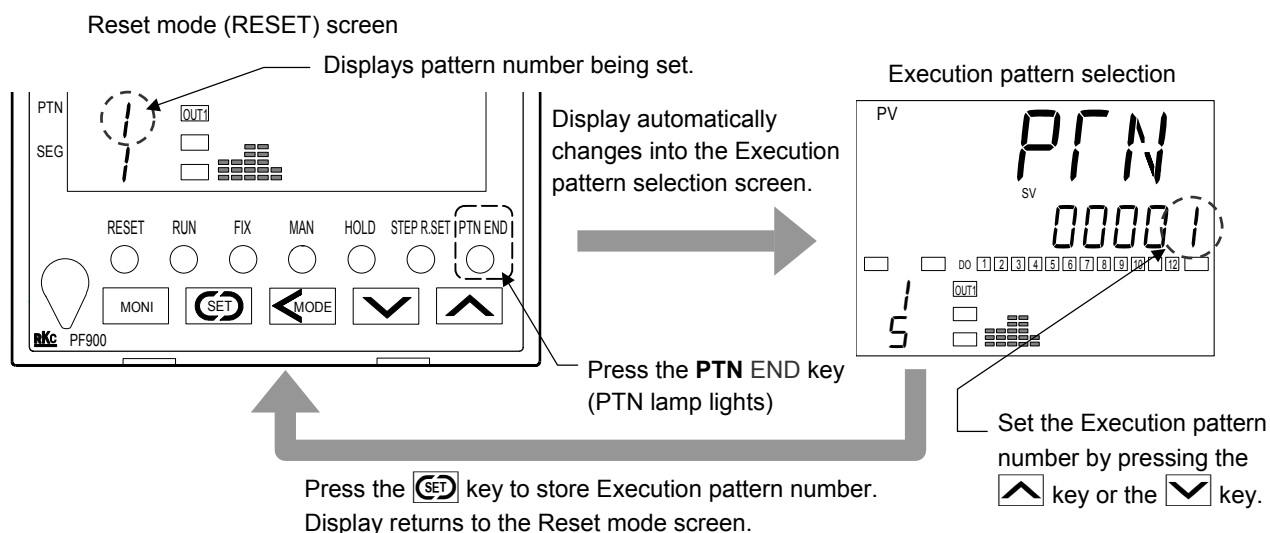
Reset mode (RESET) screen

Displays pattern number being set.

Display automatically changes into the Execution pattern selection screen.

Execution pattern selection

Press the **PTN** END key (PTN lamp lights)

Set the Execution pattern number by pressing the ∧ key or the ∨ key.

Press the SET key to store Execution pattern number. Display returns to the Reset mode screen.

📖 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).

Reset mode (RESET) screen

Display automatically changes into the PV/SV monitor screen at the Program control mode.

PV/SV monitor
Program control mode (RUN)

Press the RUN key (RUN lamp lights: Orange)
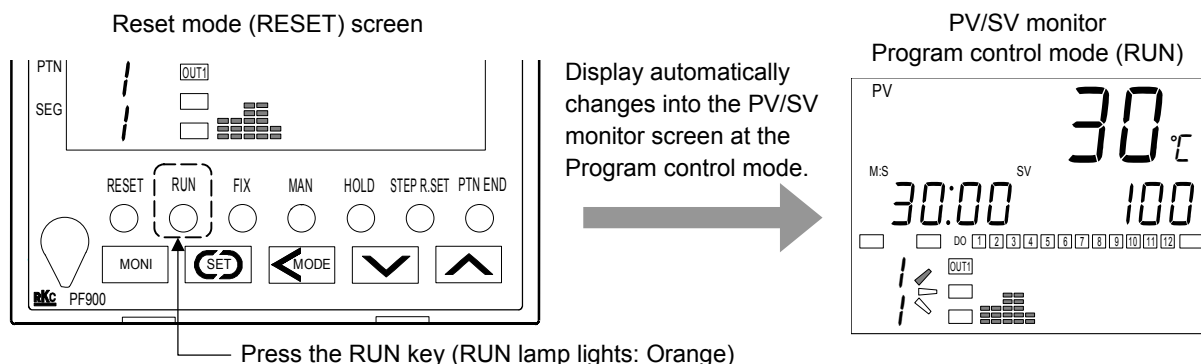
● Action at switching to the Program control mode

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

Operation mode after switching	Operation mode before switching			
	Reset mode (RESET)	Program control mode (RUN)	Fixed set point control (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 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).
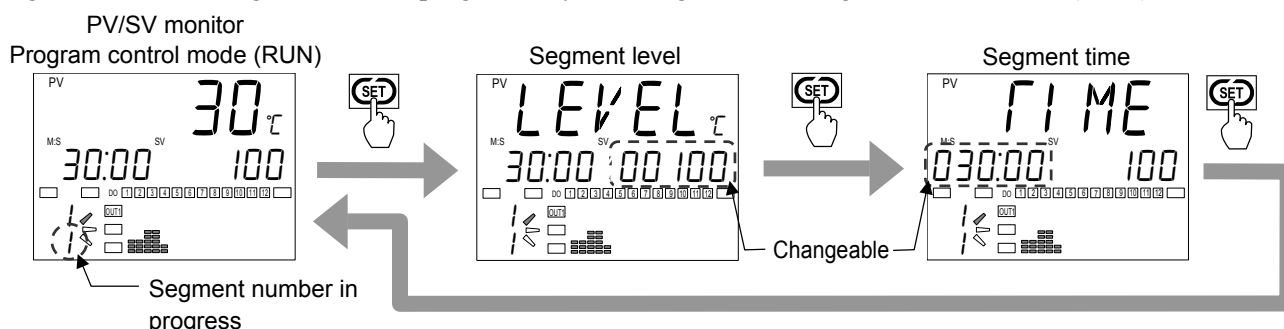
☞ Refer to the following pages for the functions related to the Program control operation.

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

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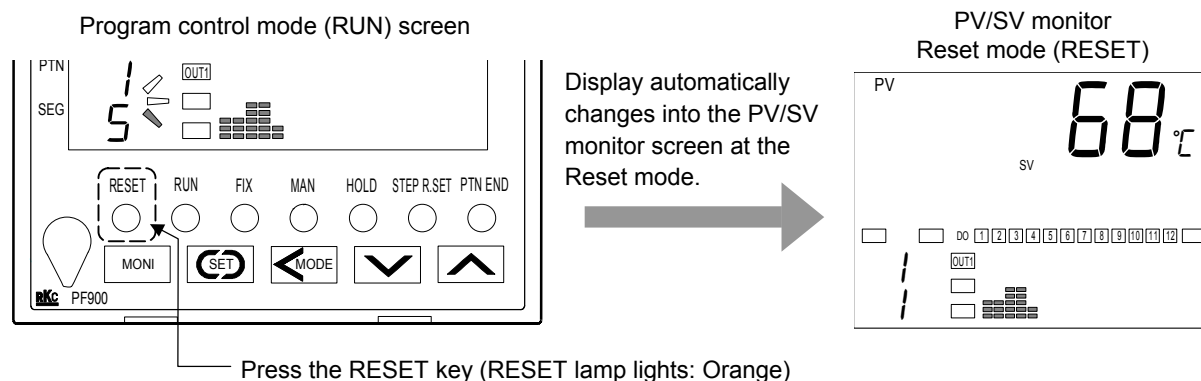
☞ For data range of parameter, refer to **4.5.3 Parameter setting mode (P. 4-16)**.

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])

PV/SV monitor (Reset mode*)

PV **28** SV

Press and hold the SET key for 2 seconds or more to go to the Parameter setting mode.

Parameter setting mode Program setting block

PV **PRoG** SV

SET

Setting pattern number

PV **PrN.No** SV **00001**
5

Set the pattern number to be released.

Displays the End segment number.

Press the SET key until Program end display is displayed.

Segment time

SET PV **TIME** SV **010:00   50**
1
6

Set Segment time of segment 6.

SET

Segment level

PV **LEVEL** SV **0:00 00050**
1
6

Set Segment level of segment 6.

PTN **END**

Program end

PV **P.ENd** SV
5

Displays the End segment number.

Program end state release:
The Segment level and the Segment time of segment 5 or subsequent segment numbers can be changed after releasing the Program end state by pressing the PTN END key.

Reset the Program end state.

Segment level

PV **LEVEL** SV **0:00 00000**
1
7

PTN **END**

Program end

PV **P.ENd** SV
6

The End segment is set to segment 6.

* To release the Program end state in the Program control mode (RUN), the Fixed set point mode (FIX), or the Manual 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:

Program end

PV **P.ENd** SV
6

Segment 6

PTN **END**

Segment level

PV **LEVEL** SV **0:00 00050**
1
6

Release Program end state.

STEP **R.SET**

Press the STEP R.SET key repeatedly until segment 4 displays at the segment level display.

Segment level

PV **LEVEL** SV **15:00 00200**
1
4

Segment level display of the segment following the End segment

PTN **END**

Program end

PV **P.ENd** SV
3

The End segment is set to segment 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. 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**

Soak segment

The duration of the time progress of program is held during AT is added to the Segment time.

Segment time
1 hour 30 minutes

AT starts at 1 hour and 29 minutes before the end of the Segment time.
(Progress of program is held.)

AT completion
The program restarts at 1 hour and 29 minutes before the end of Segment time.
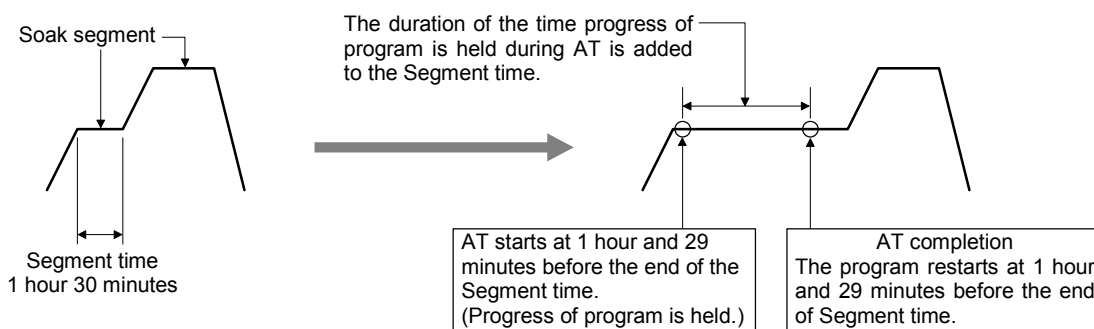
● **When conduct AT at a ramp segment**

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.

Ramp segment

Segment level (90 °C) when AT started

Segment time: 1 hour 30 minutes
Segment level: 180 °C

AT starts at 45 minutes before the end of the Segment time.
(Progress of program is held.)

AT completion
The program restarts at 45 minutes before the end of Segment time.

The duration of the time progress of program is held during AT is added to the Segment time.

■ Operation procedure

Switch to the Reset mode (RESET).	Press the RESET key to go to the Reset mode (RESET).
Confirm AT start condition.	☞ Refer to ■ **Requirements for AT start (P. 5-25)**.
Select Program pattern.	Select Program pattern to conduct AT. ☞ Refer to ● **Execution pattern selection (P. 5-20)**.
Start control.	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.
Wait until the Measured value (PV) reaches the temperature of the segment to conduct AT.	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.
Start Autotuning.	☞ To start Autotuning (AT), refer to ■ **Setting procedure (P. 5-26)**.
AT end	
Confirm PID values.	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 [ΑΓ⊔] 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

Reset mode
PV/SV monitor

RUN

Segment number
Pattern number

Press the RUN key to switch to the Program control mode.

Program control mode
PV/SV monitor

Wait until the segment number 2 displays.

Program control mode
PV/SV monitor

2 seconds or more

Operation mode
Operation mode transfer

Tree times

Operation mode
PID/AT transfer

Press the ∧ key to display AT.

PID/AT transfer

Press the SET key to start AT.

Autotuning (AT) with learning function

AT lamp flashes when AT starts.

📖   To conduct AT in the Fixed set 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 PF900/PF901 setting tool (WinUCI-PF900) for parameter setting by loader communication. It is possible to use loader communication for the instrument without communication function (optional).

Loader communication port
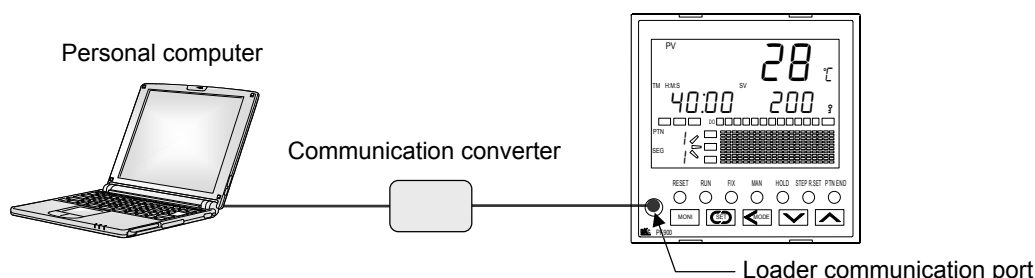
📖 **NOTE**

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 conventional COM-K 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-K-□
    └─3: W-BV-03 loader communication cable (for connecting to the loader communication port in front.)
        1: W-BV-01 loader communication cable (for connecting to the loader communication port at the bottom.)

- 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-K-□)
- Setting tool (WinUCI-PF900)
- USB driver for COM-K

5.6.2 Instructions for use

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

Install the Setting tool and the USB driver
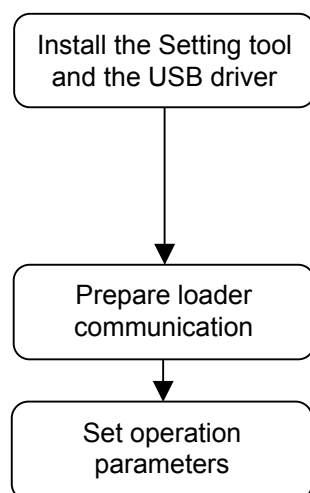
When using the loader communication, Communication Setup Tool and USB driver for COM-K must be installed on the personal computer. The Communication Setup Tool and the USB driver for COM-K and can be downloaded from the official RKC website: http://www.rkcinst.com/.

☞ For the Setting tool, refer to **WinUCI-PF900 Instruction Manual (IMT01D09-E□)**.

☞ For COM-K, refer to **COM-K Instruction Manual (IMR01Z01-E□)**.

Prepare loader communication

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

Set operation parameters

☞ 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/PF901, COM-K 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: Without
  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-K communication converter and W-BV-03 loader communication cable.

> 📖 **NOTE**
>
> **Turn ON the PF900/PF901 first when using the loader communication port in front.**
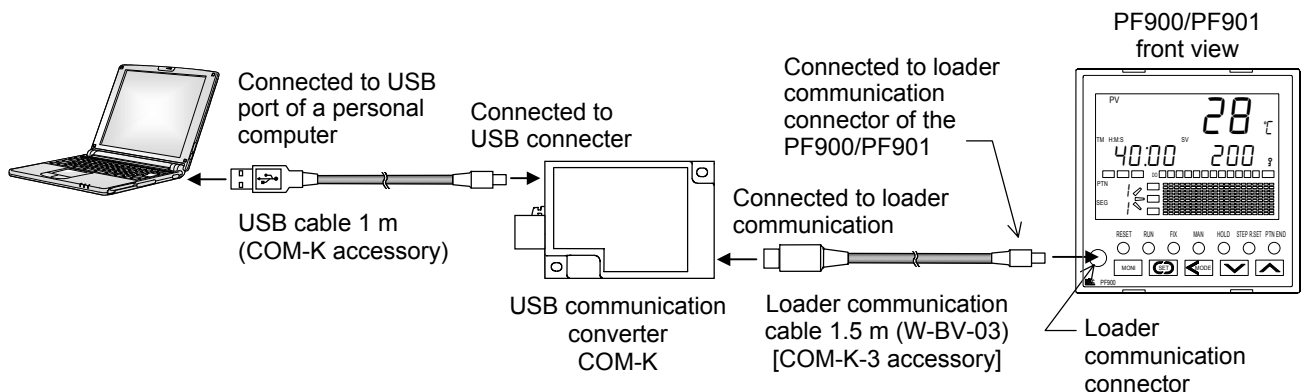
■ When using the loader communication port at the bottom

Use COM-K communication converter and W-BV-01 loader communication cable.

> 📖   PF900/PF901 may be OFF when using the loader communication port at the bottom.
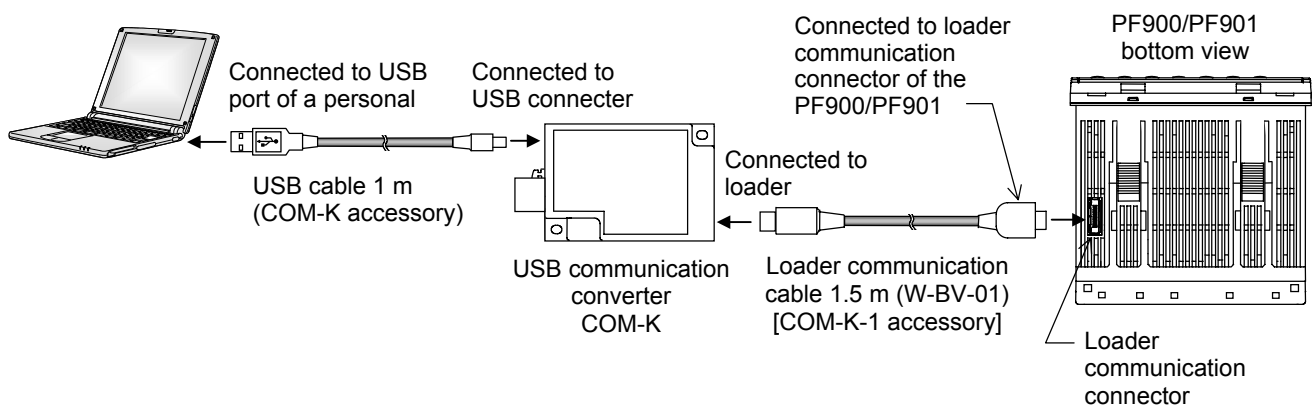
5.6.4 Parameter setting

Start the WinUCI-PF900 (setting tool) and select the Direct mode or the File mode at the opening display.

📖 To use the setting tool, refer to **WinUCI-PF900 Instruction Manual (IMT01D09-E□)**.

Opening display

Direct mode

File mode

Open the Set value file (cvs format)

Click OK after setting Communication port number and check "Use Loader port."
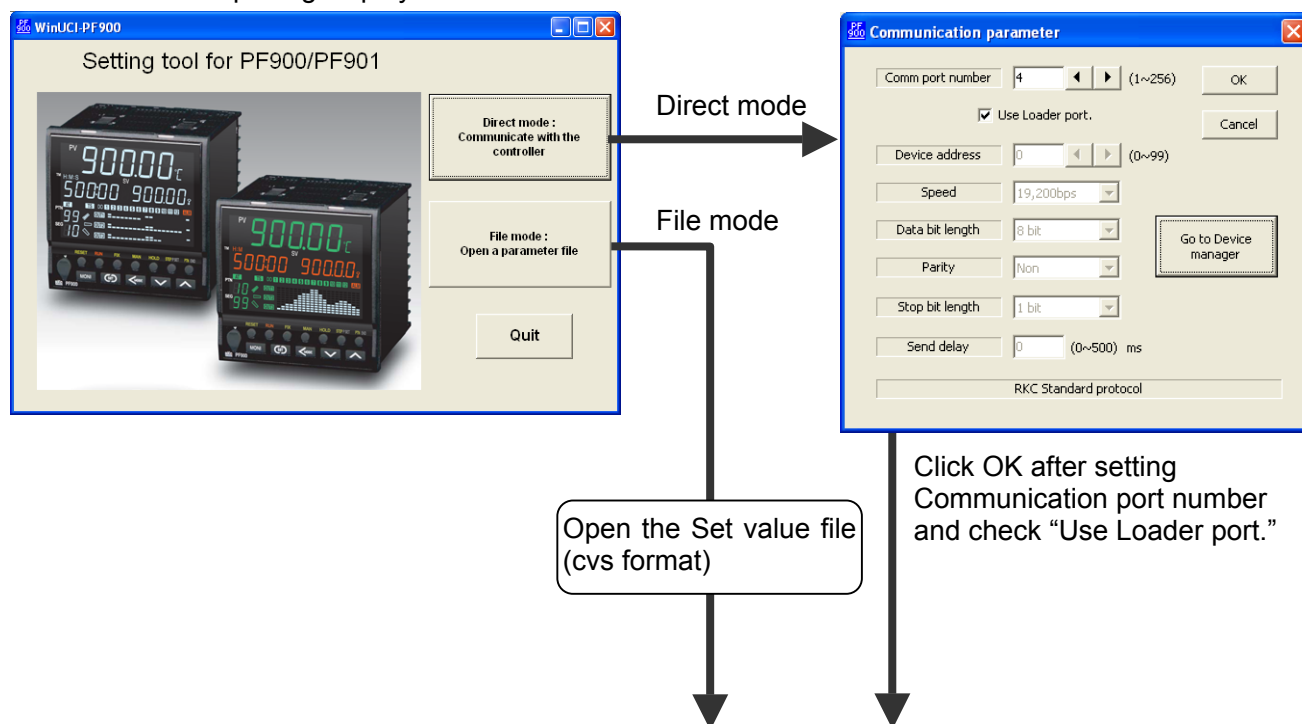
The monitor screen is first displayed where parameter is categorized into group. Select a group by using the screen transfer tab.

Screen transfer tab of parameter

Screen transfer window
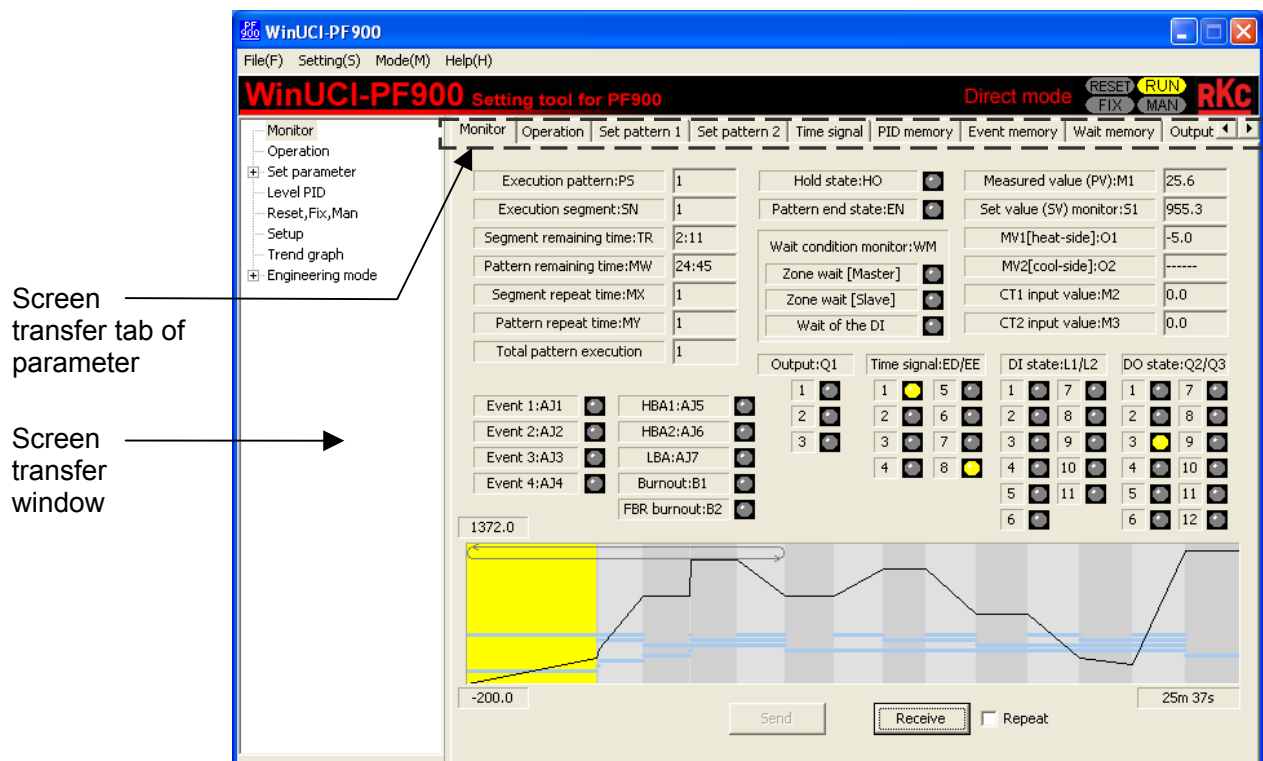
MEMO

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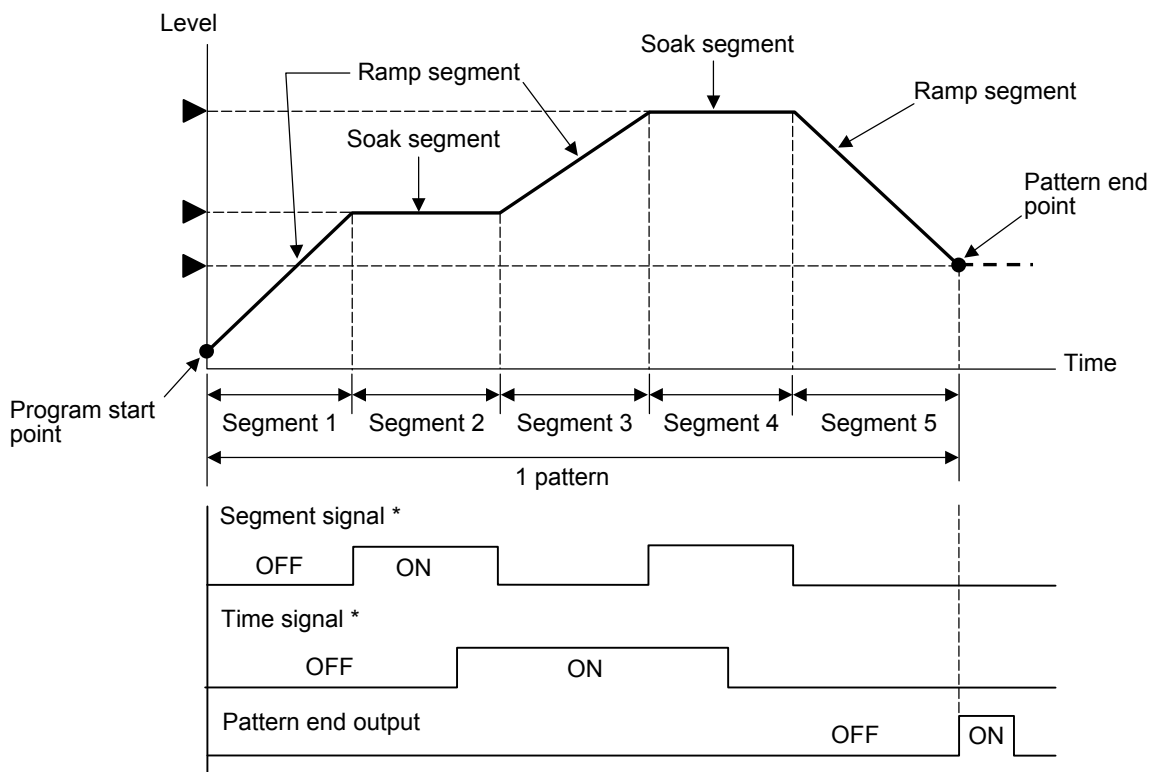
* The Segment signal and Time signal cannot be used at the same time.

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: Number of group: Up to 8 groups

Setting items:	PID memory group number	Output limiter high (MV1)
	Proportional band [heat-side]	Output limiter low (MV1)
	Integral time [heat-side]	Output limiter high (MV2)
	Derivative time [heat-side]	Output limiter low (MV2)
	Control response parameter	ON/OFF action differential gap
	Proportional band [cool-side]	(upper)
	Integral time [cool-side]	ON/OFF action differential gap
	Derivative time [cool-side]	(lower)
	Overlap/Deadband	Control loop break alarm (LBA)
	Open/Close output neutral zone	time
	Manual reset	LBA deadband (LBD)

Event memory group: 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: Number of group: Up to 8 groups

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

■ Memory group to be set by pattern

Time signal memory group:

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:

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
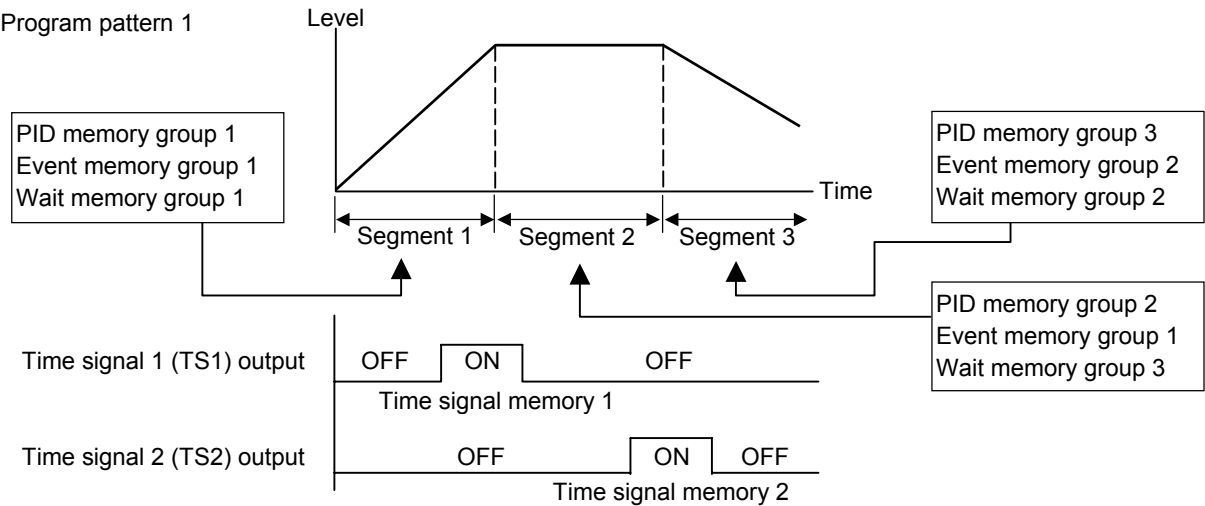
Program pattern 1

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 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 at F80 in the Engineering mode.

6.2.1 Description of function

■ Start with the Set value (SV) in the Reset mode
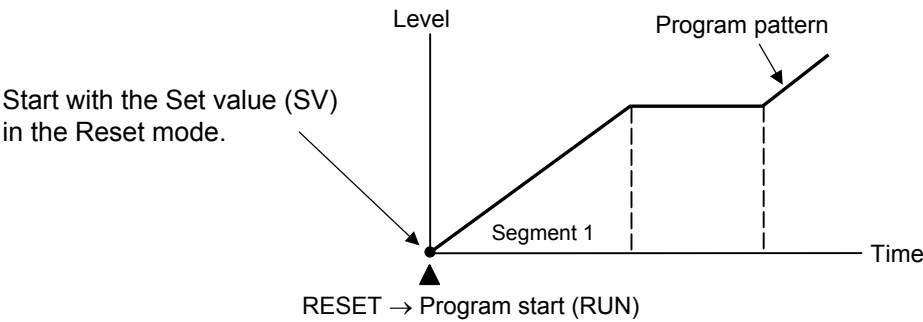
■ PV start 1 [Time fixed type]

Start at the same level of the Measured value (PV) at start.

Level

Program pattern

Time-fixed

Measured value (PV) ▶

Segment 1
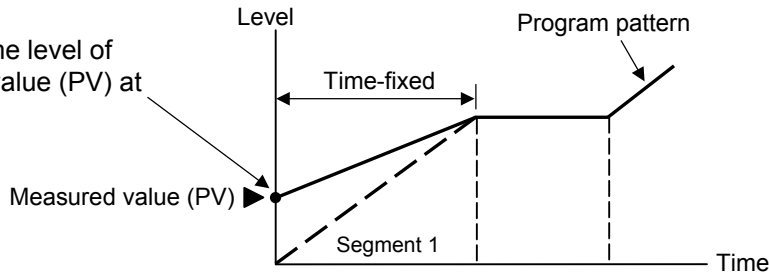
Time

📖 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

Level

Program pattern

Segment level of Segment 1 ▶

Measured value (PV) ▷

Set value (SV) in the Reset mode ▷

Time

Time-saving

Forward the time of process to the same level of the Set value (SV) of the Measured value (PV) at start.

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

Level

Segment level of Segment 1 ▶

Set value (SV) in the Reset mode ▷

Measured value (PV) ▷

Time

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

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

Level

Measured value (PV) ▷

Segment level of Segment 1 ▶

Start with the Segment level of the Segment 1.

Set value (SV) in the Reset mode ▷

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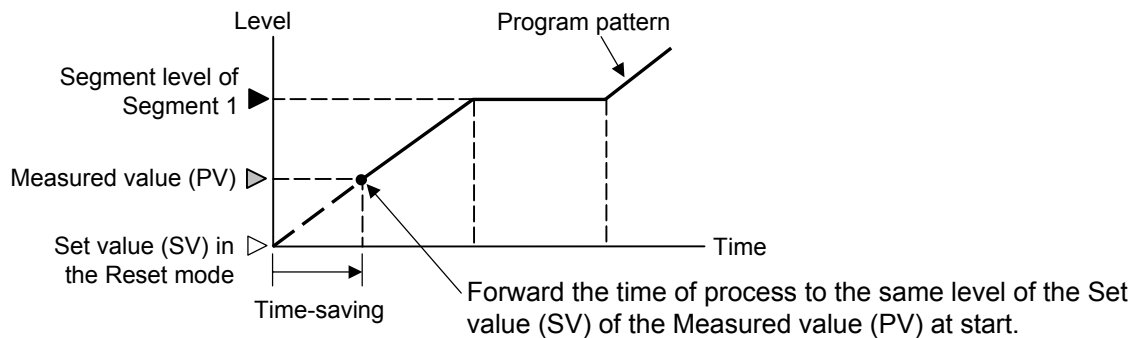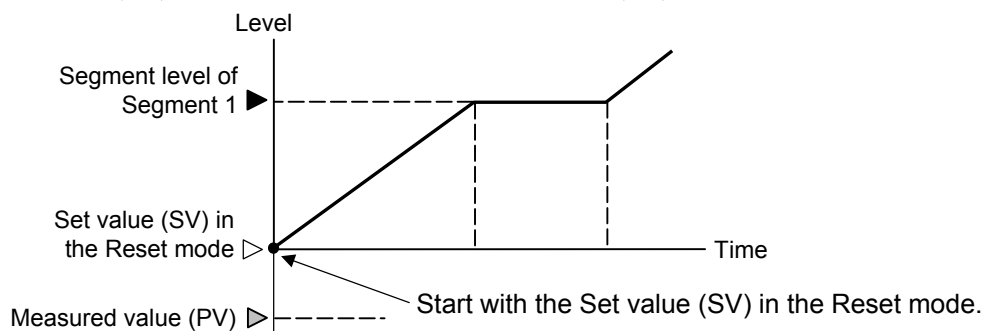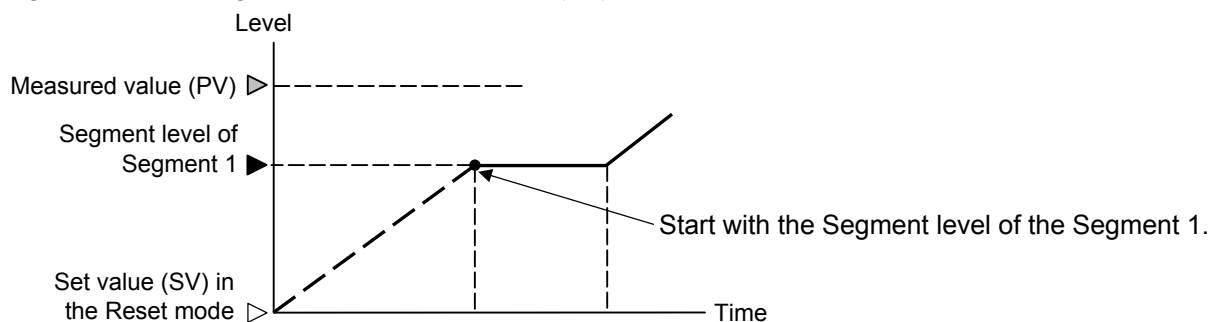
● **When Set value (SV) in the Reset mode is larger than the Segment level of the Segment 1**

• Set value (SV) in the Reset mode ≥ Measured value (PV) ≥ Segment level of Segment 1
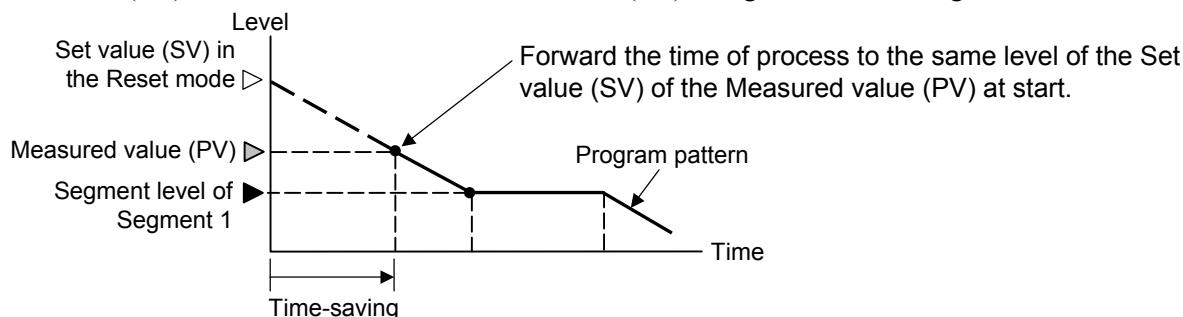
• Set value (SV) in the Reset mode ≤ Measured value (PV)
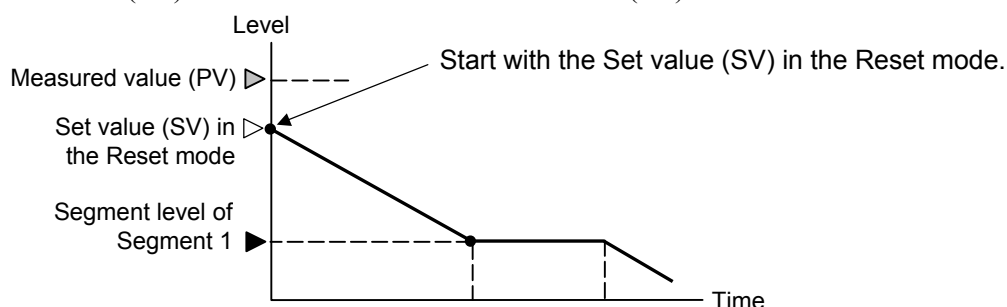
• Segment level of Segment 1 > Measured value (PV)
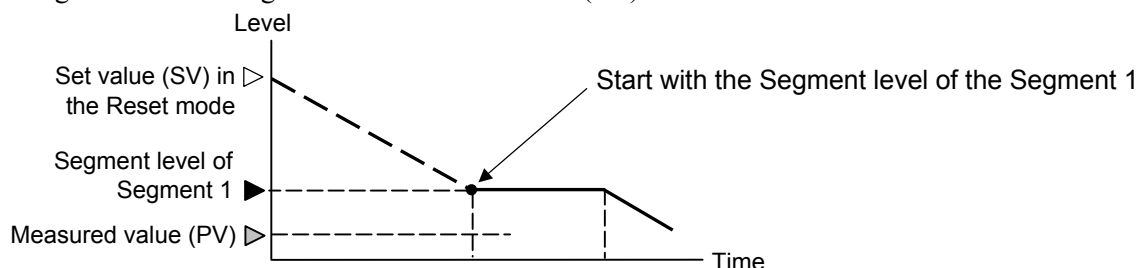
■ **PV start 3/PV start 4 [Time saving & level searching type]**

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:**
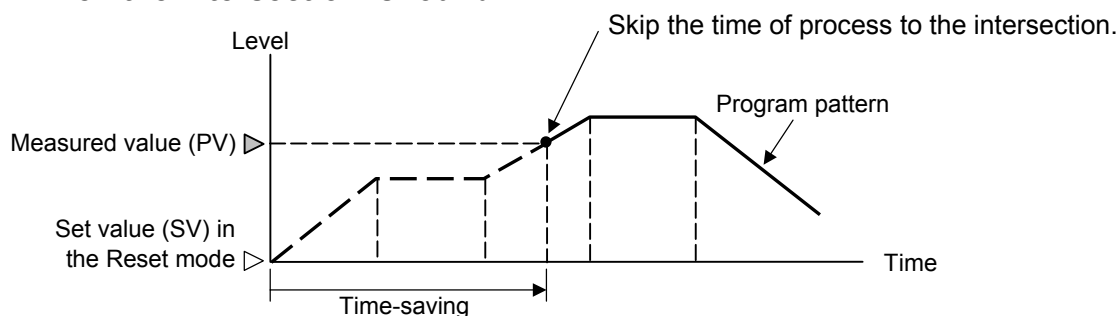
● **When the Measured value (PV) matches soak segment:**
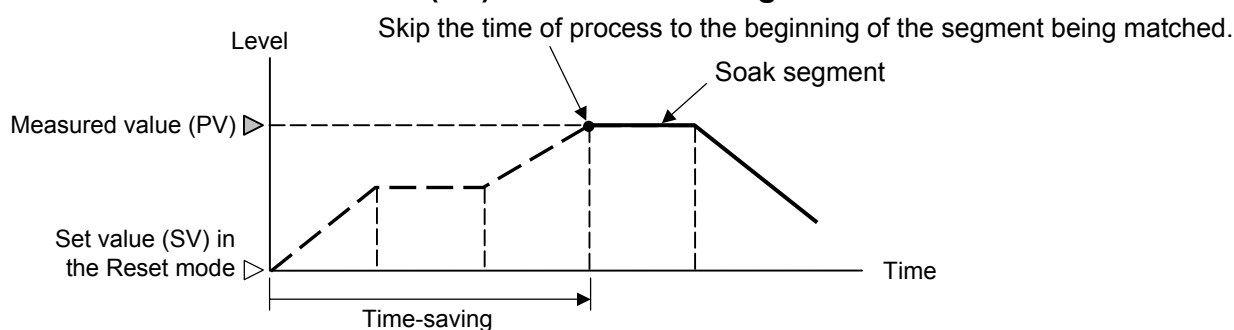
● **When no intersection was found:**
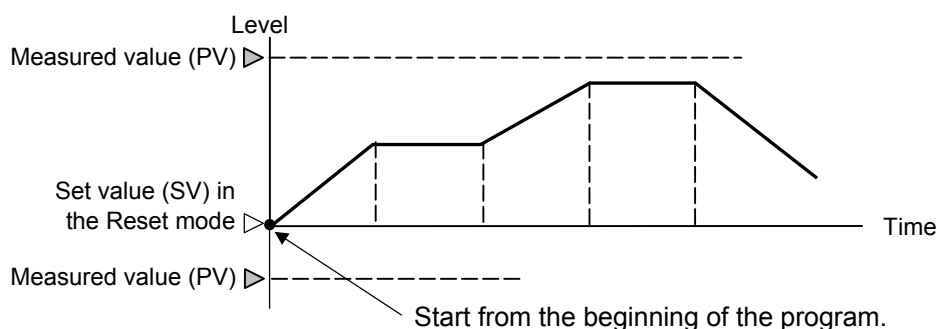
6.2.2 Parameter setting

● **SV selection at Program start [Setup setting mode]**

Select Segment level at Program control start.

Parameter symbol	Data range	Factory set value
5Γ.5Ӱ	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 in the Engineering mode.

● **Set value (SV) in Reset mode**

Set SV in the Reset mode.

Parameter symbol	Data range	Factory set value
5Ӱ	Setting limiter low to Setting limiter high	0 (0.0)

📖   SV at the Reset mode can be set in the Reset mode setting block 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
5Γ.ӰΓ	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.**

Before searching: in HOLD state

Start search   Search point 1
First search

Restart searching from the Search point 1.

Restart search   Search point 2
Second search
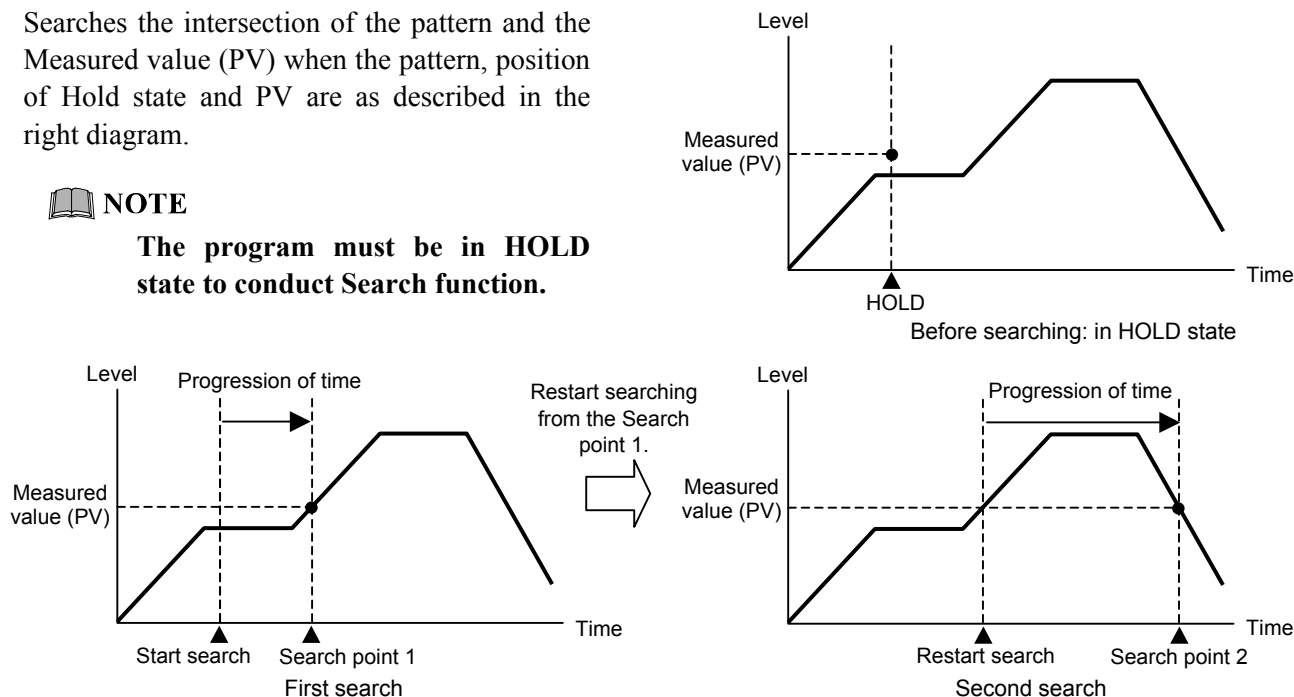
When finding an intersection: skip the time of process of the program to the intersection.
For Dot display, segments in progress flash. Next the segments of the intersection will flash.

Before searching   First search   Second search

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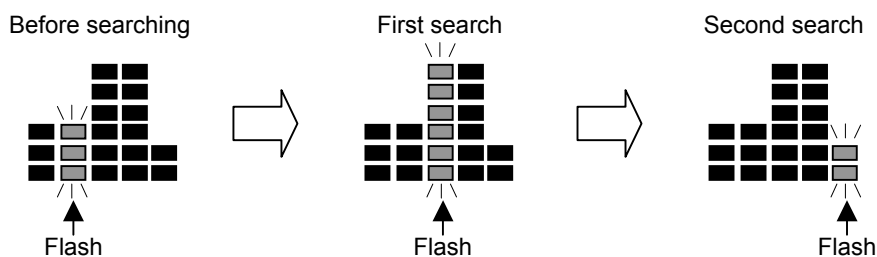
When no intersection was found: no change in operation occurs.

📖   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).

📖   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.
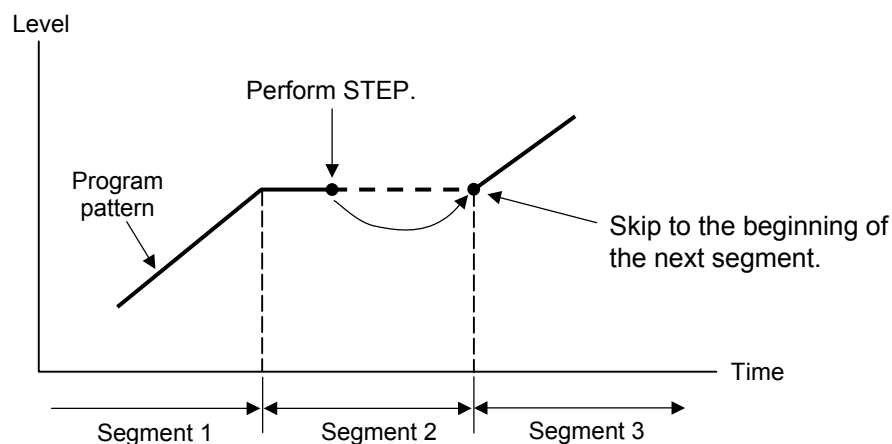
■ Key operation

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 mode (FIX) or the Manual 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 in the Engineering mode.

    ☞   For STEP function by Digital input (DI), refer to **6.1.9 Digital input (DI)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

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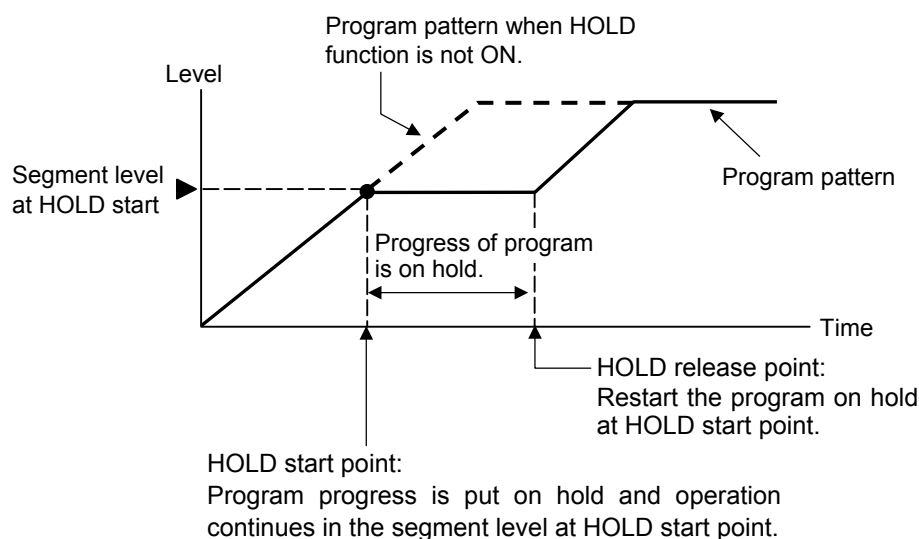
HOLD start condition
- Operation is in Program control mode (RUN).
- DI being assigned with Reset mode (RESET) is open.
- DI being assigned with Program control mode (RUN) is open.

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.
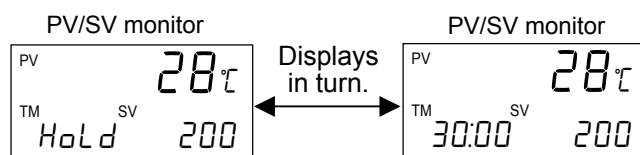
■ Key operation

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 **6.1.9 Digital input (DI)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

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

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]
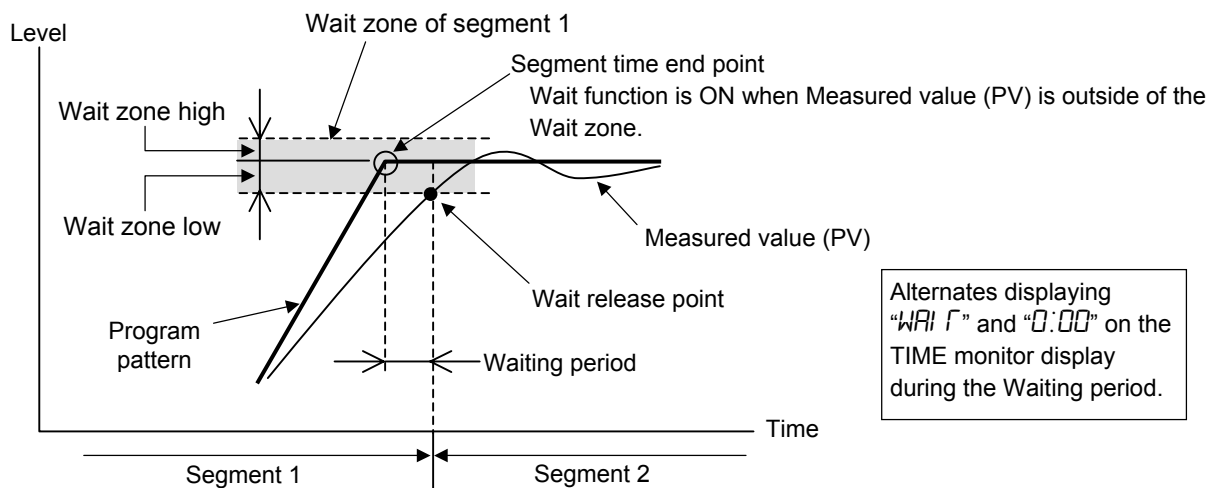
[Example: At Level dropping]
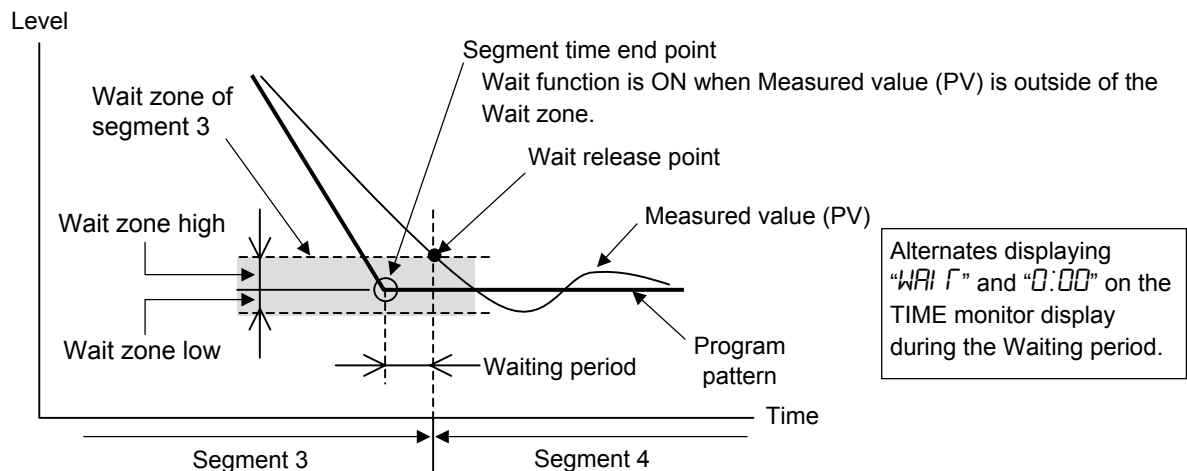
☞ Wait function is available for Link operation by Intercontroller communication. For details, refer to **■ Wait function in intercontroller communication** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

■ 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 ■ **Description of function: Wait state release** at **6.1.9 Digital input (DI)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

[Example]

Segment time end point
Wait function is ON when segment time is completed.

Wait release point

Program pattern

Waiting period

Time

Segment 1   Segment 2

Release Wait function by using DI

Close the DI for 200 ms or more to release the Wait function and go to the next segment.

ON

Alternates displaying "WAIT" and "0:00" on the TIME monitor display during the Waiting period.
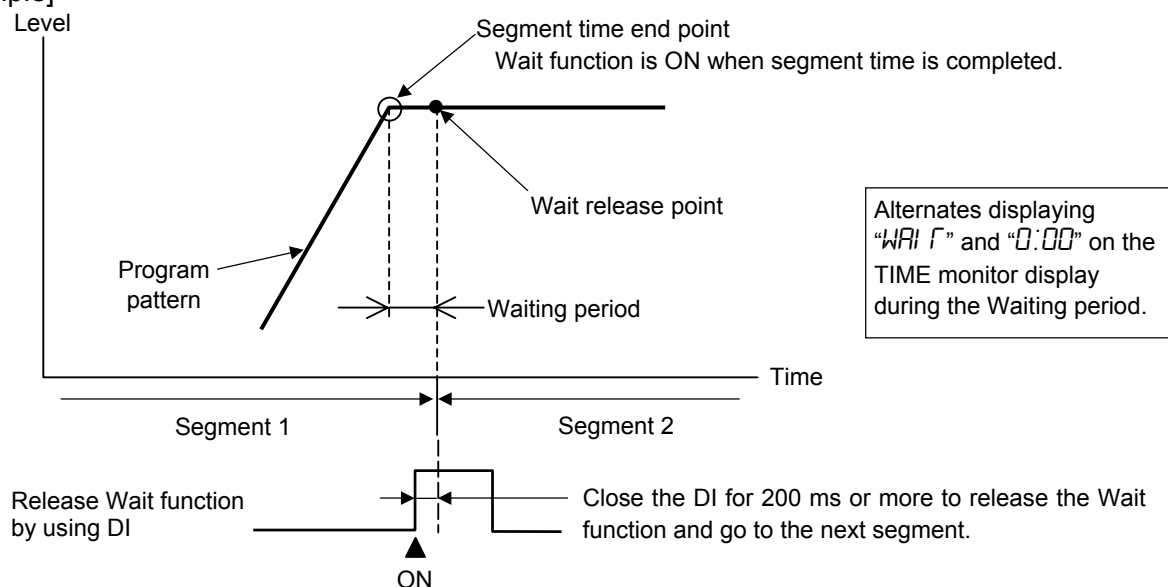
📖 Wait function is not possible when the DI (assigning Wait release) is closed.

📖 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]

Level

Wait zone of segment 1
Segment time end point
Wait function is ON when Measured value (PV) is outside of the Wait zone.

Wait zone high

Wait zone low

Measured value (PV)

Waiting period

Program pattern

Waiting period

Time

Segment 1   Segment 2

Release Wait function by using DI

Close the DI for 200 ms or more to release the Wait function and go to the next segment.

ON

Alternates displaying "WAIT" and "0:00" on the TIME monitor display during the Waiting period.

■ Wait releasing

How to release Wait function:
- By Wait zone judgment
- By Digital input (DI)
- By Wait time-out

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

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

- Wait release 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.
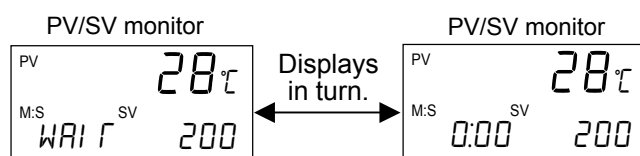
6.6.2 Parameter setting

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.
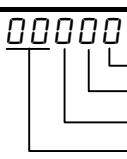
Parameter symbol	Data range	Factory set value
$ZoNE.H$	TC/RTD inputs: 0 (0.0, 0.00) to 200 (200.0, 200.00) (Unit: °C [°F]) Voltage (V)/Current (I) inputs: 0.0 to 20.0 % of Input span 0 (0.0, 0.00): Wait zone high becomes OFF	0
$ZoNE.L$	TC/RTD inputs: −200 (−200.0, −199.99) to 0 (0.0, 0.00) (Unit: °C [°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.ΓRG	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
ΓM.oUΓ	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 hour 00 minute

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-32)**.

■ 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) should be changed to 1 or 3.
[Refer to the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.]

● **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
$RE.\ulcorner R\ulcorner$	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
$\ulcorner M.o U\ulcorner$	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 hour 00 minute

☞   Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-32)**.

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 without Repeat

Repeating segments from 3 to 5
(Segment repeat execution time: twice)
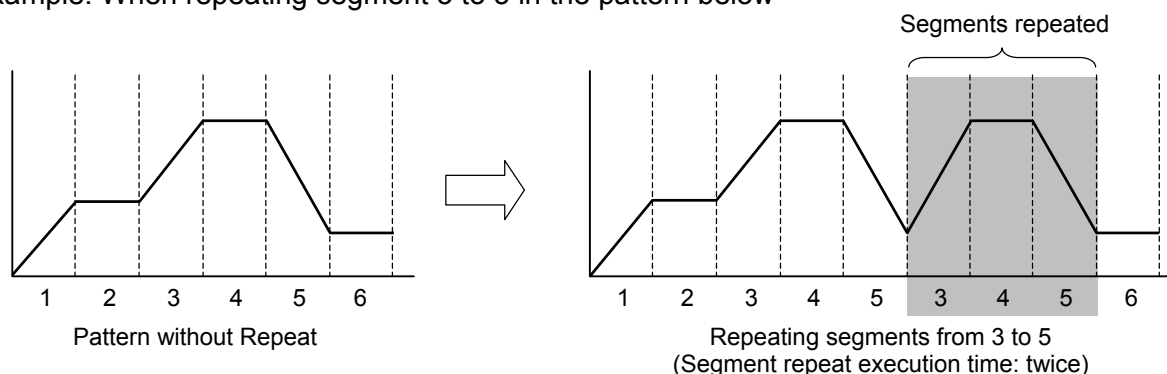
■ Pattern repeat

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 without Repeat

Performing Pattern repeat
(Pattern repeat execution time: twice)
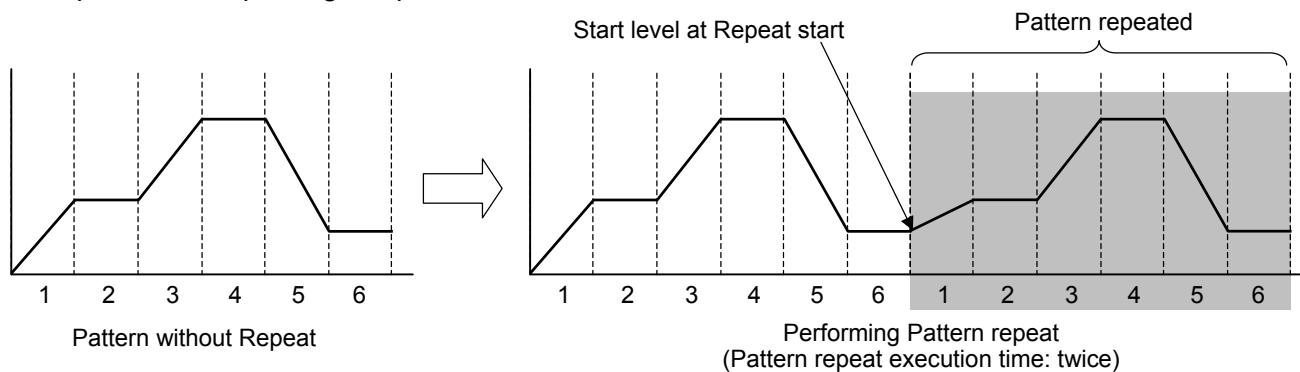
■ Pattern link

Link program patterns by setting pattern numbers.
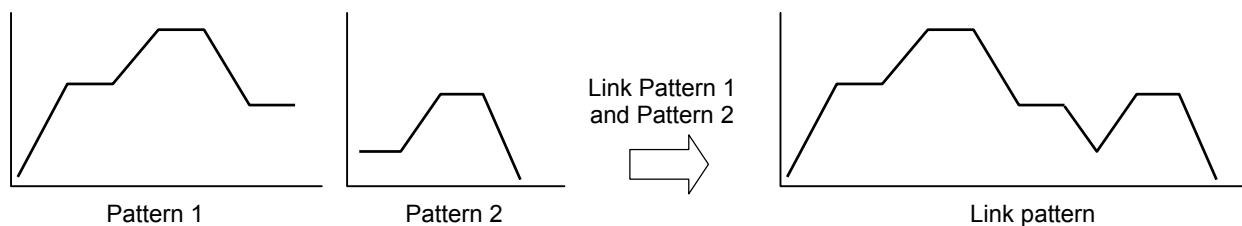
■ Combination of Repeat function and Pattern link

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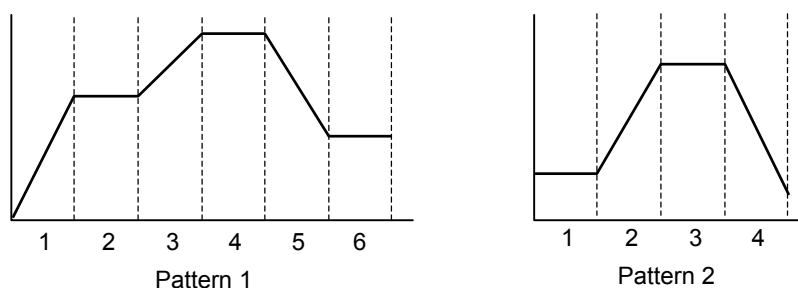
Program pattern composed by Repeat function and Pattern link
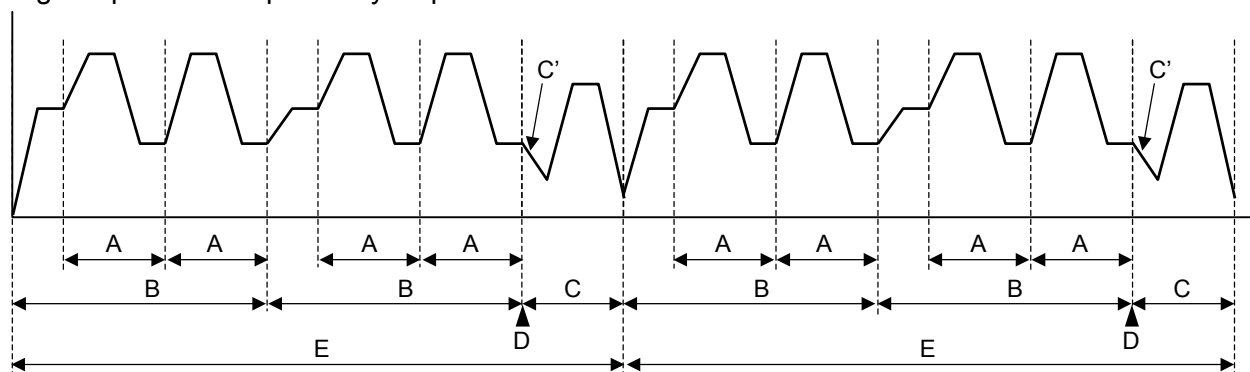
A: Repeating Segments from 3 to 6
B: Repeating Pattern 1
C: Pattern 2
D: Linking Pattern 1 and Patten 2
E: Repeating Total pattern *
　　* Repeat Total pattern (linked patterns)

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
$5\Gamma \text{ } ⊦ E d$	Start number (5Γ): 1 to 99 End number ($E d$): 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
$RP\Gamma.5G$	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
RPΓ.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
RPΓ.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

PV   28℃
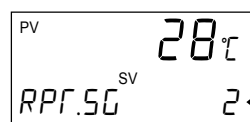
RPΓ.SG   SV   2 ← Segment repeat remaining time (including the pattern in progress)

6.8 Pattern End

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

When selecting "Action continued" for control action at Pattern end, operation proceeds with the Segment level at Pattern end.
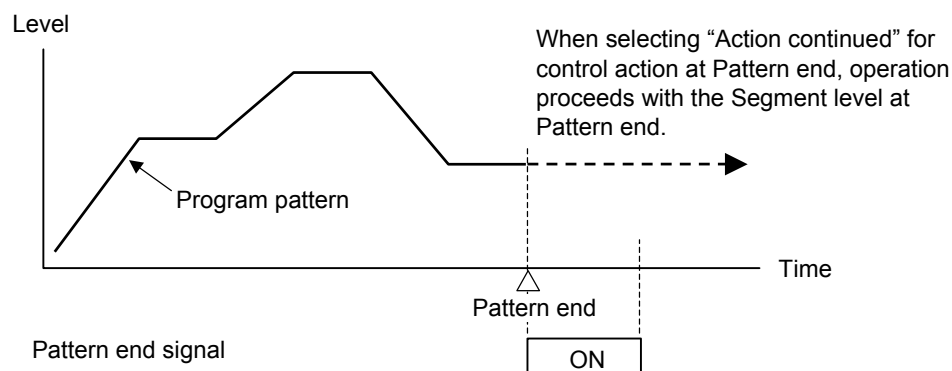
Continued on the next page.

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. 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 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)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

■ 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.

In Pattern end state
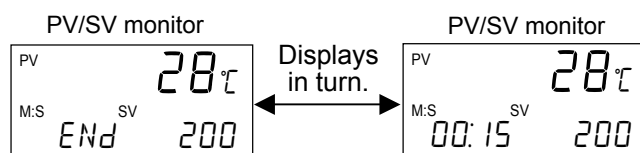
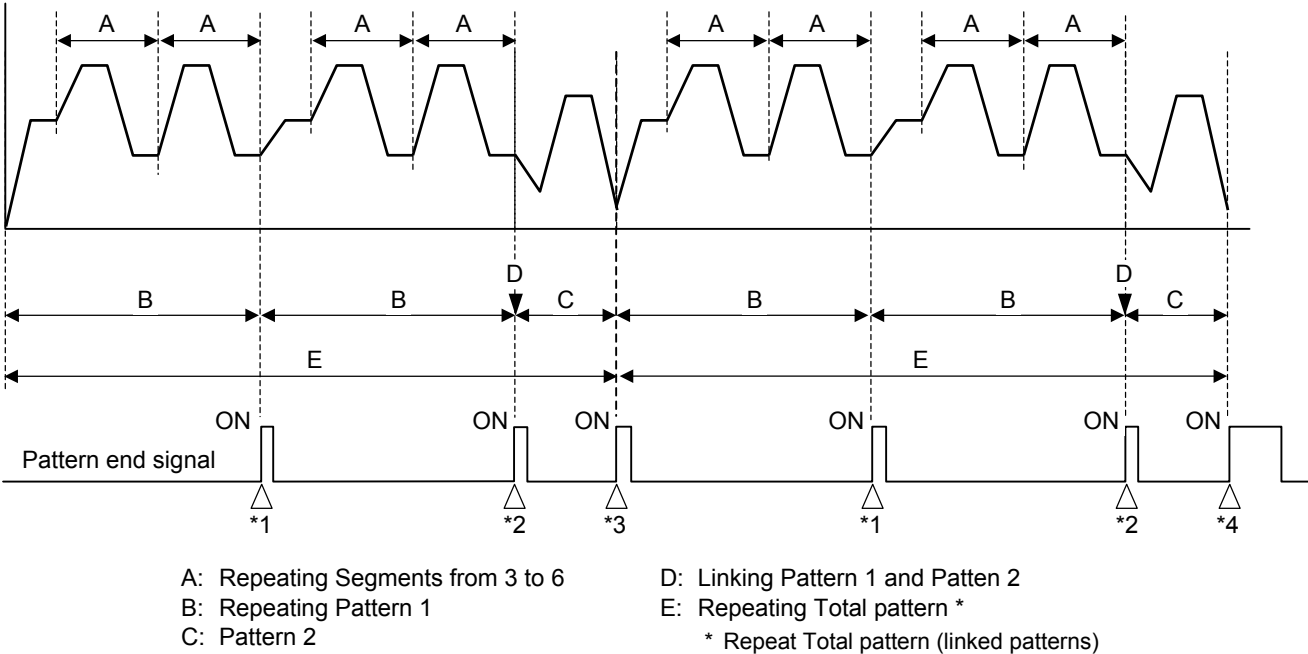Dot display

The dots of the last segment 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.ΓM	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 hour 00 minute

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-32)**.
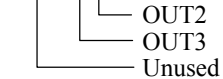
● **Control action at Pattern end [Setup setting mode]**

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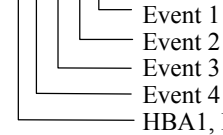
● **Transmission output action at Pattern end [Engineering mode F30.07]**

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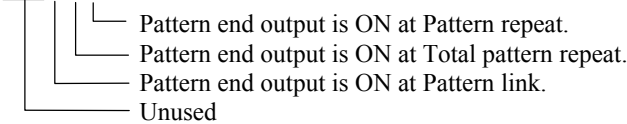
● **Event action at Pattern end [Engineering mode F30.08]**

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** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.
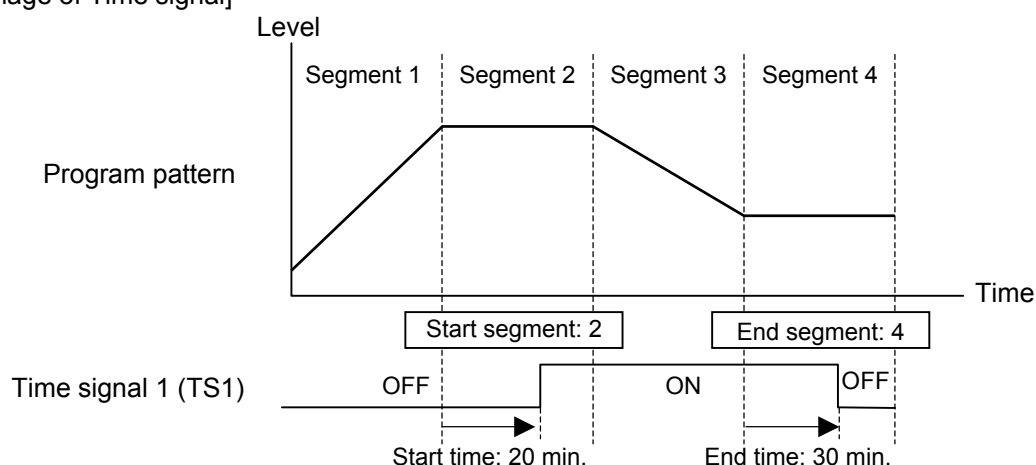
6.9 Time Signal (Segment Signal)

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

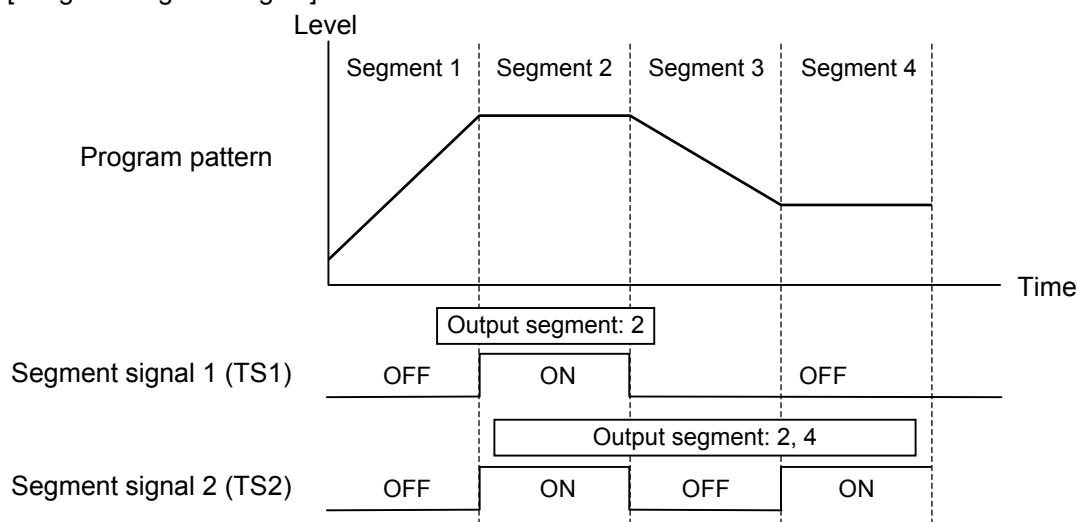It is possible to produce a signal over two or more segments by setting Start/End segment number and Start/End time.

[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)** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

■ 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.

$$\text{Start segment} < \text{End segment}$$

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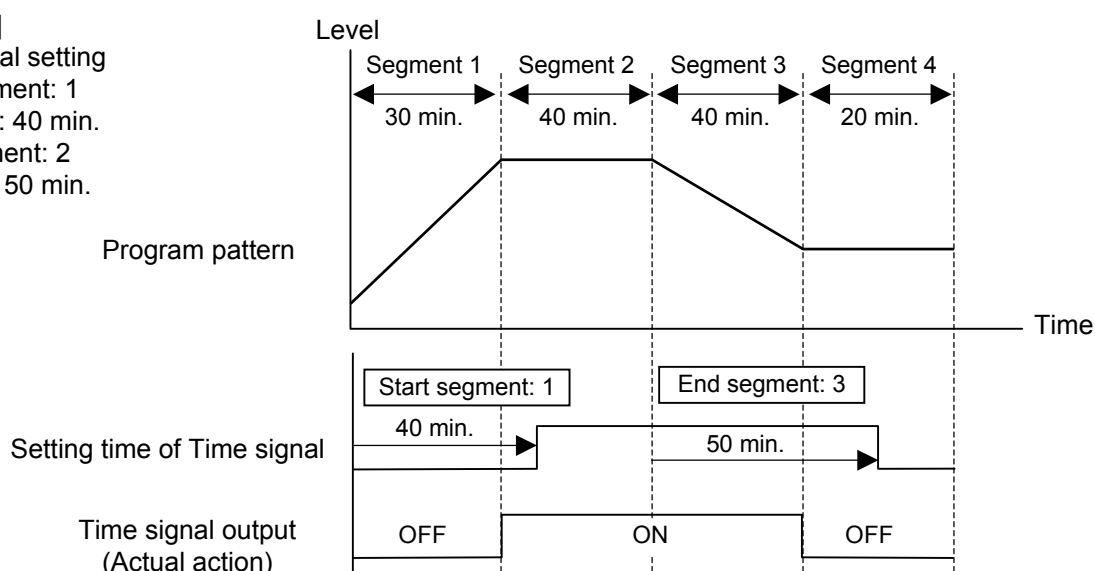
[Example]
Time signal setting
Start segment: 1
Start time: 40 min.
End segment: 2
End time: 50 min.

📖 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 mode (MAN) turns OFF the Time signal. Time signal turns ON when switching to the Program control mode (RUN).
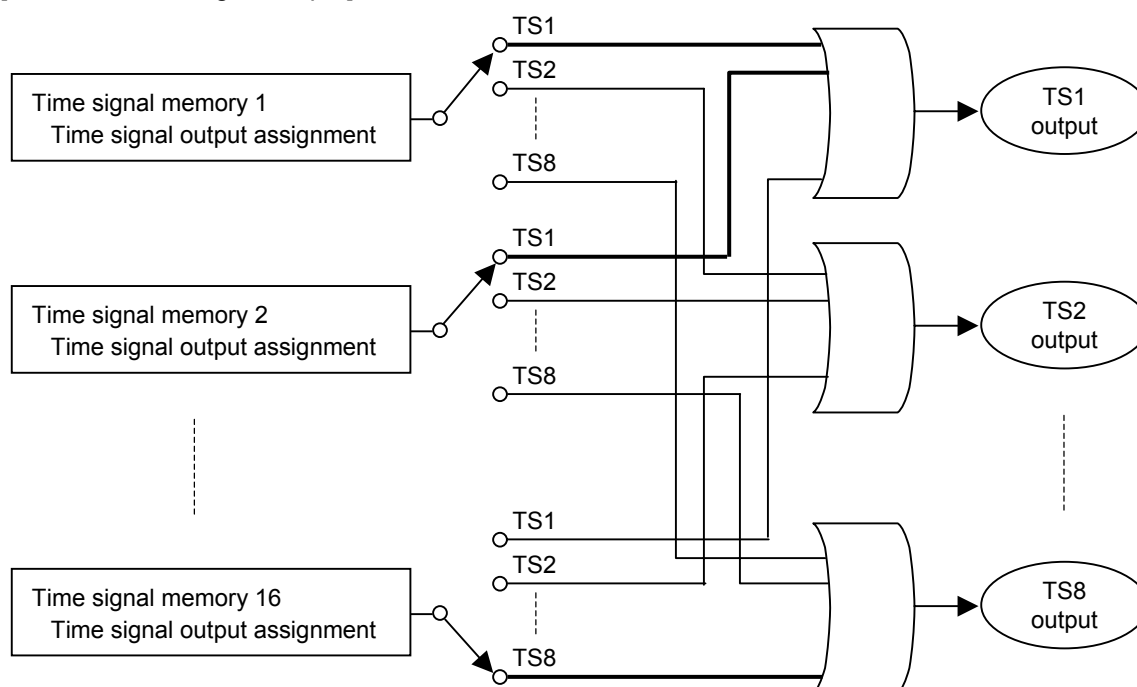
■ Time signal memory group

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*.
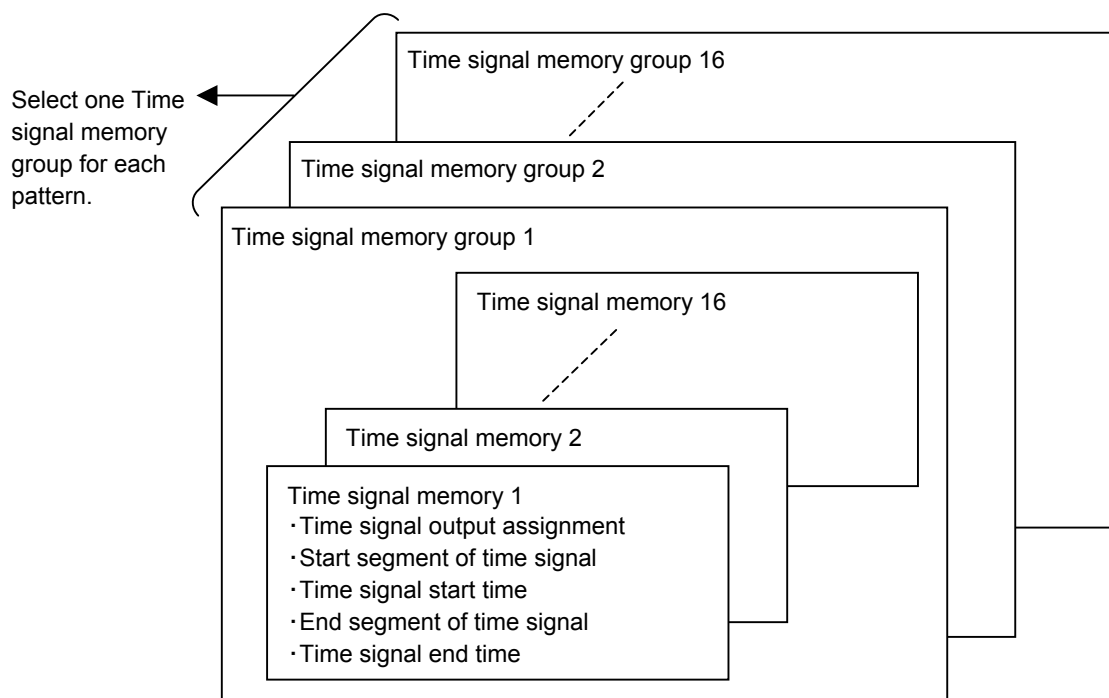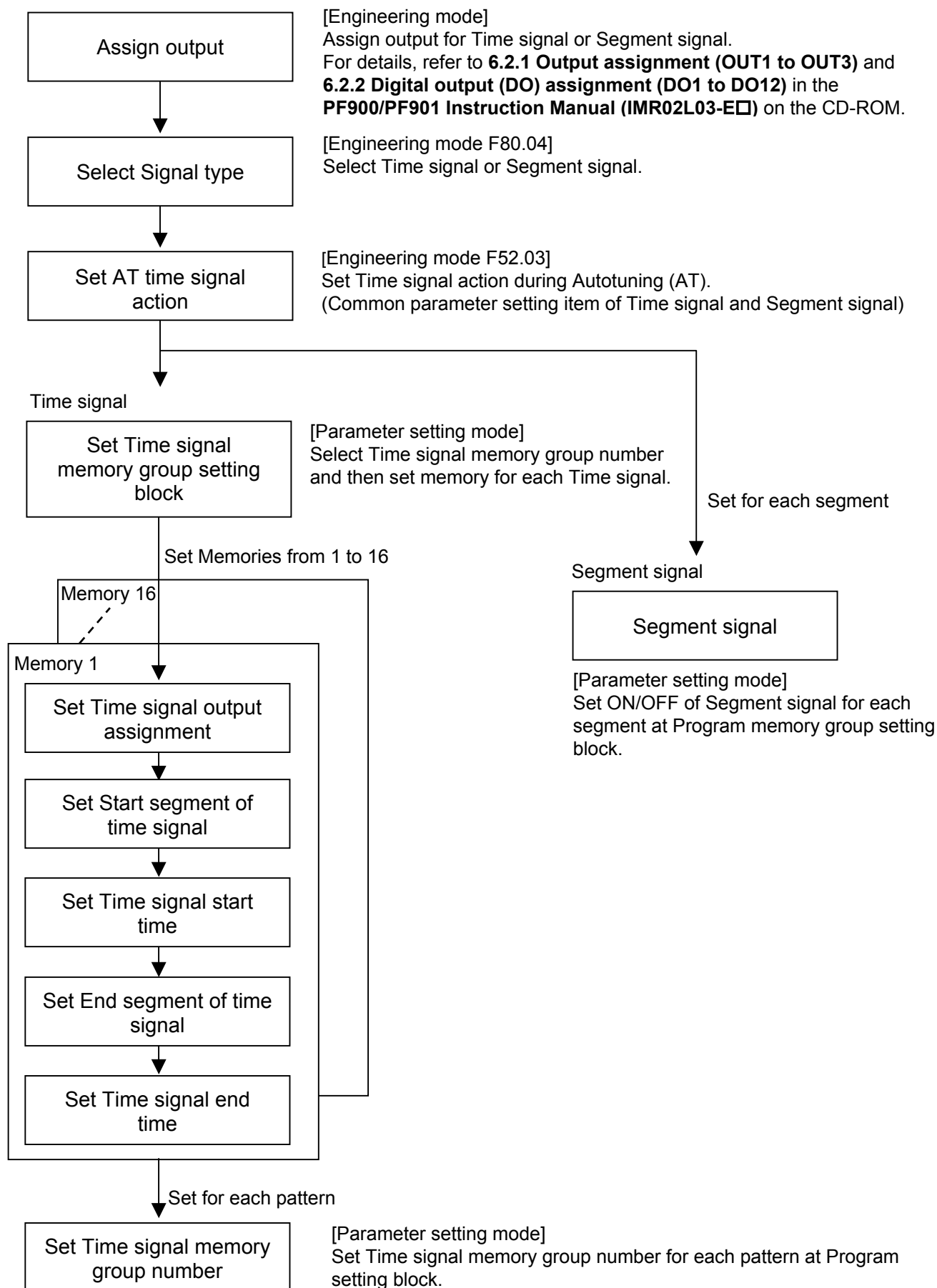

[Outline of Time signal output]

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

```
┌─────────────────────┐
│    Assign output    │
└─────────────────────┘
```
[Engineering mode]
Assign output for Time signal or Segment signal.
For details, refer to **6.2.1 Output assignment (OUT1 to OUT3)** and
6.2.2 Digital output (DO) assignment (DO1 to DO12) in the
PF900/PF901 Instruction Manual (IMR02L03-E□) on the CD-ROM.

```
┌─────────────────────┐
│  Select Signal type │
└─────────────────────┘
```
[Engineering mode F80.04]
Select Time signal or Segment signal.

```
┌─────────────────────┐
│  Set AT time signal │
│       action        │
└─────────────────────┘
```
[Engineering mode F52.03]
Set Time signal action during Autotuning (AT).
(Common parameter setting item of Time signal and Segment signal)

Time signal

```
┌─────────────────────┐
│   Set Time signal   │
│ memory group setting│
│        block        │
└─────────────────────┘
```
[Parameter setting mode]
Select Time signal memory group number
and then set memory for each Time signal.

Set for each segment

Set Memories from 1 to 16

Memory 16

Memory 1

```
┌─────────────────────┐
│ Set Time signal output│
│     assignment      │
└─────────────────────┘
        ↓
┌─────────────────────┐
│  Set Start segment of│
│     time signal     │
└─────────────────────┘
        ↓
┌─────────────────────┐
│  Set Time signal start│
│        time         │
└─────────────────────┘
        ↓
┌─────────────────────┐
│ Set End segment of time│
│       signal        │
└─────────────────────┘
        ↓
┌─────────────────────┐
│  Set Time signal end │
│        time         │
└─────────────────────┘
```

Segment signal

```
┌─────────────────────┐
│   Segment signal    │
└─────────────────────┘
```
[Parameter setting mode]
Set ON/OFF of Segment signal for each
segment at Program memory group setting
block.

Set for each pattern

```
┌─────────────────────┐
│ Set Time signal memory│
│    group number     │
└─────────────────────┘
```
[Parameter setting mode]
Set Time signal memory group number for each pattern at Program
setting block.

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
⌐5.⌐YP	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
A⌐⌐5	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
⌐5.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
O1.oU⌐	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
O1.5.5N	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
O1.5.⌐M	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0 hour 00 minute

☞ Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-32)**.

● **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
`0 1.E. 5N`	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
`0 1.E.ΓM`	From 0:00 to 500:00 (Hour: Minute), or from 0:00 to 500:00 (Minute: Second)	0 hour 00 minute
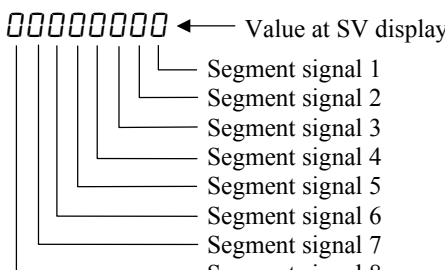
☞   Set time unit at F80.05 in the Engineering mode. Refer to **4.5.5 Engineering mode (P. 4-32)**.

■ **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

`5I 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]
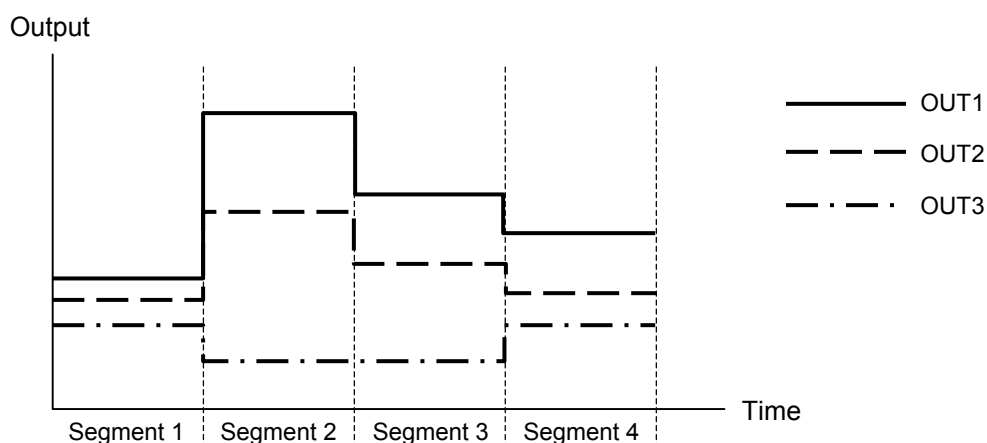
■ Output program memory group

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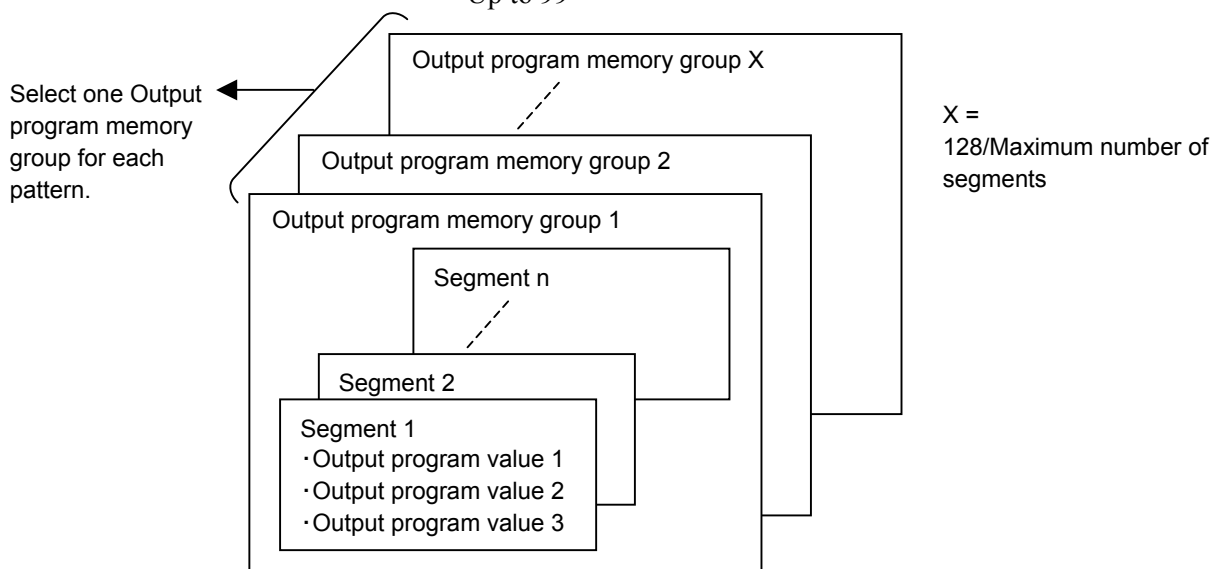
📖 "Control stop" or "Control continued" can be set for Control action selection at Pattern end of F50.07 in the Engineering mode when Output program value is assigned to OUT1.
"Control stop" or "Control continued" can be set for Transmission output action at Pattern end of F30.07 in the Engineering mode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

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

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.MV 2	Output program value 2: −5.0 to +105.0 %	−5.0
P.MV 3	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]

PV/SV monitor
(Reset mode)

PV **28**
TM   SV
1
1

Press and hold the [SET] key for 2 seconds or more to change to Parameter setting mode.

Program setting block

PV **PRoG**
SV
1
1

[SET]

Setting pattern number

PV **PTN.No**
SV
1
1
32

Segment time of
Segment 1

[SET]

PV **TIME**
M:S _ _ _ _ SV
030:00   150
1

Set 30 minutes 0 seconds for the time of Segment 1.

[SET]

Segment level of
Segment 1

PV **LEVEL**
SV
30:00 **00 150**
1
1

Set the level of Segment 1 to 150 °C.

Segment number

Pattern number

[SET]

Copy Segment level

Segment level of
Segment 2

PV **LEVEL**
SV
0:00 00000
1
2

Press and hold the [▲] key and the [▼] key.

Segment level of
Segment 2

PV **LEVEL**
SV
0:00 **00 150**
1
2

Segment level of the Segment 1 has been copied.

[SET]

Copy Segment time

Segment time of
Segment 2

PV **TIME**
M:S _ _ _ _ SV
030:00   150
1
2

Segment time of the Segment 1 has been copied.

Press and hold the [▲] key and the [▼] key.

Segment time of
Segment 2

PV **TIME**
M:S   SV
000:00   150
1
2

To the segment level of Segment 3

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]
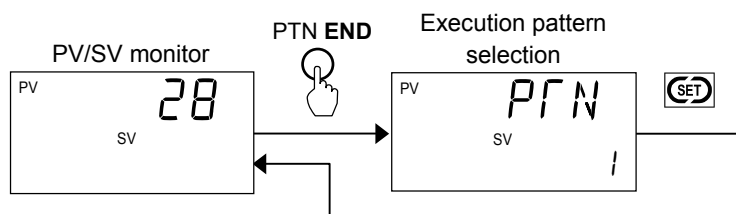
[Example of display with Tag name]
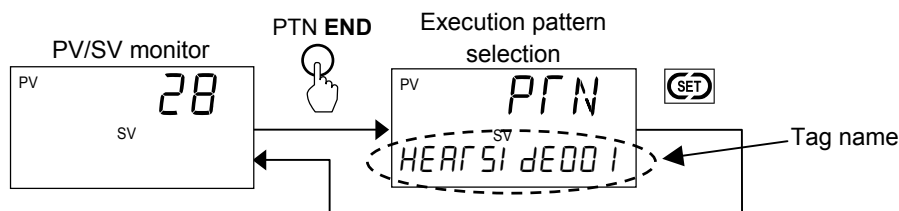
📖   Use the WinUCI-PF900 setting tool to input a Tag name.

📖   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** in the **PF900/PF901 Instruction Manual (IMR02L03-E□)** on the CD-ROM.

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** in the **PF900/PF901 Instruction Manual (IMR02L03-E☐)** on the CD-ROM.

■ 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**.)	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).	Event output: Output depending on the Event output action at input error	
⊔⊔⊔⊔ [Flashing]	Underscale Measured value (PV) is below the input display range low (or –19999).		

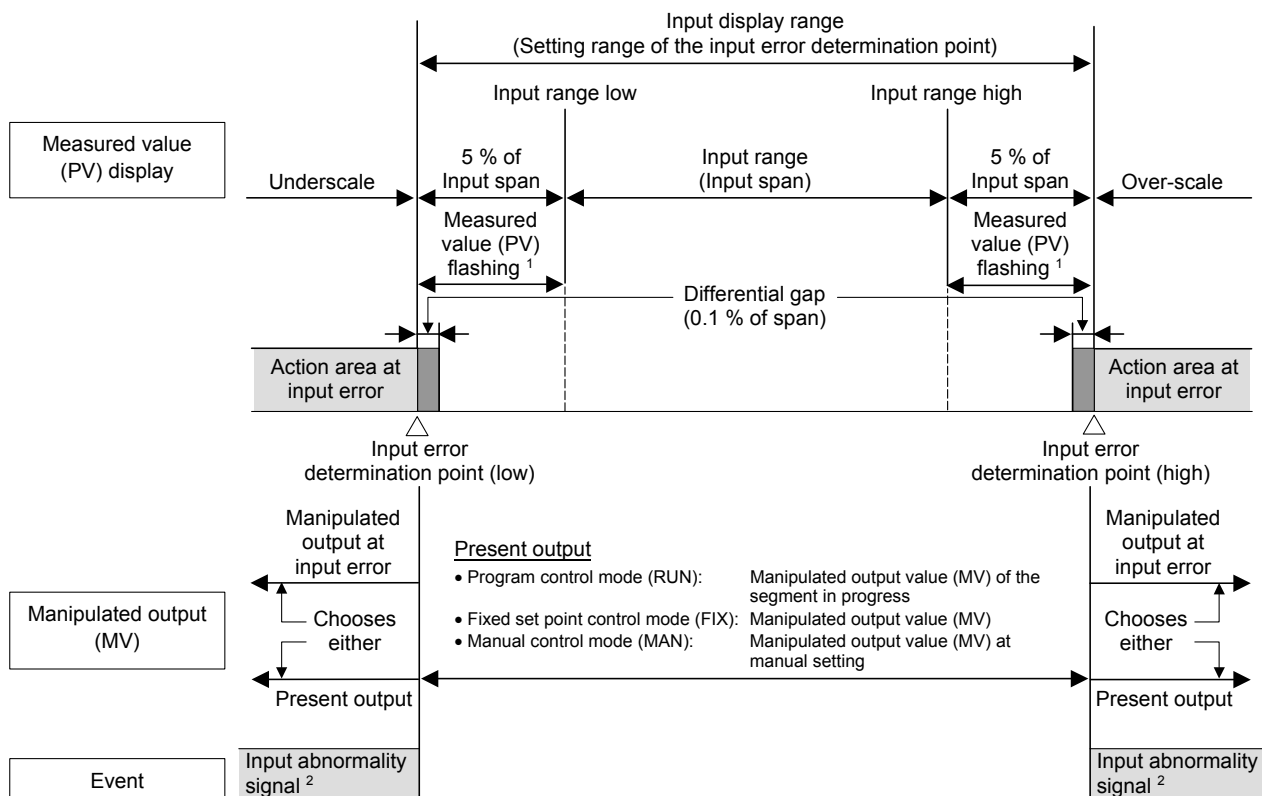● **Setting Input error determination point within input range**
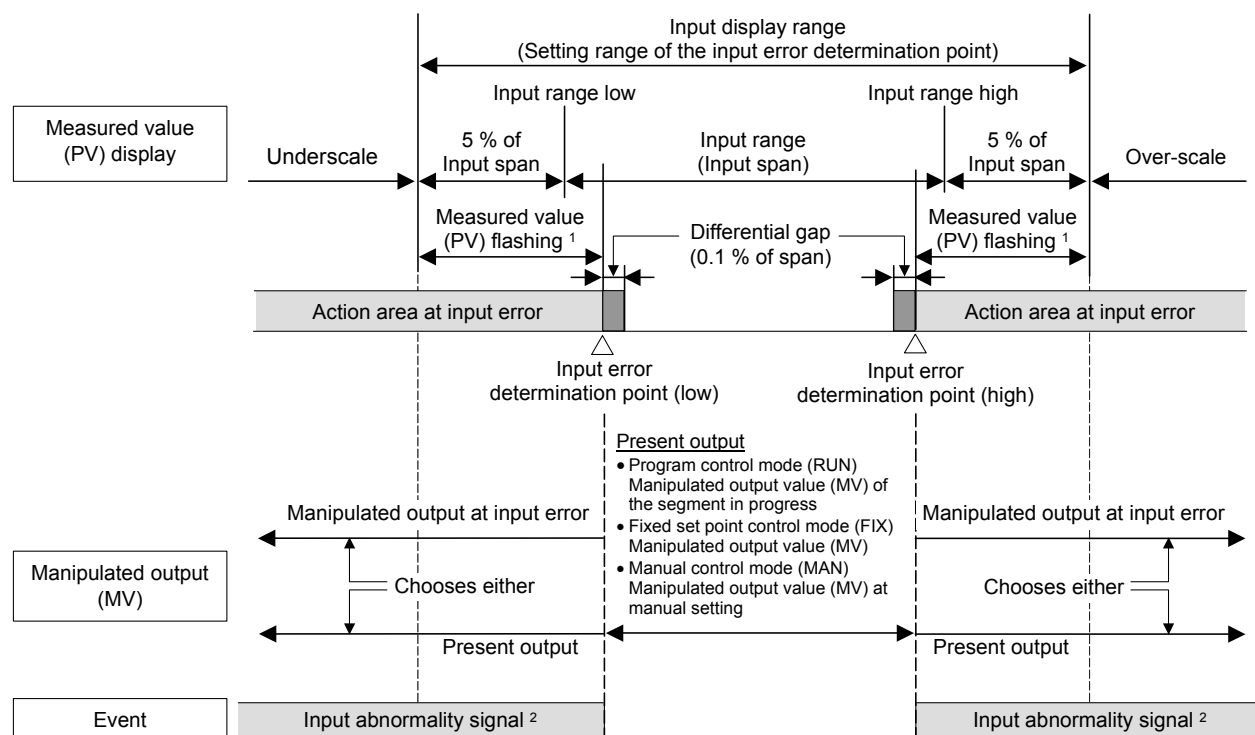
[1] "Flashing display" or "Non-flashing display" of PV can be selected for the PV flashing display at input error of the Engineering mode (F10.01).

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

● **Setting Input error determination point when out of input range**

Input display range
(Setting range of the input error determination point)

Input range low · Input range high

| Measured value (PV) display | Underscale | 5 % of Input span | Input range (Input span) | 5 % of Input span | Over-scale |

Measured value (PV) flashing [1] · Measured value (PV) flashing [1]

Differential gap (0.1 % of span)

Action area at input error · Action area at input error

Input error determination point (low) · Input error determination point (high)

Manipulated output at input error · Manipulated output at input error

Present output
- Program control mode (RUN): Manipulated output value (MV) of the segment in progress
- Fixed set point control mode (FIX): Manipulated output value (MV)
- Manual control mode (MAN): Manipulated output value (MV) at manual setting

Chooses either · Chooses either

Present output · Present output

Manipulated output (MV)

Event

Input abnormality signal [2] · Input abnormality signal [2]

[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□)** on the CD-ROM.

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 code display
		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/PF901 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/PF901 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/PF901 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 $= \sqrt{\text{(Input value)}} \times$ 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 (DI)

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 3, DO1 to 12)
OUT3 and DO5 to 12 is optional
Output type:
- **Relay contact output (OUT1 and 2)**
  - Contact type: 1a contact
  - Contact rating (Resistive load):
    - 250 V AC 3 A, 30 V DC 1 A
- **Relay contact output (DO1 to 4)**
  - Contact type: 1a contact
  - Contact rating (Resistive load):
    - 250 V AC 1 A, 30 V DC 1 A
- **Voltage pulse output (OUT1 to 3)**
  - 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 3)**
  - Output current (Rating):
    - 4 to 20 mA DC, 0 to 20 mA DC
  - Allowable load resistance: 600 Ω or less
- **Voltage output (OUT1 to 3)**
  - 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 2)**
  - 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 3)**
  - 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 12)**
  Output method: Sink type
                 Use same common terminal for DO5
                 to 8 and DO9 to 12.
  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 3)
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: Without, 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: Without
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: Without
Stop bit: 1

Maximum connections: 1 point (Only COM-K)
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 [Approximately15 % OFF] (at 100 V AC)
10.9 VA [Approximately16 % 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 50mm 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 × 96 × 80 mm (W × H × D)

Mounting size: 25 mm (Wide), 30 mm (High)

RKC

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