Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual

[Part2: Parameters/Functions]

RKC INSTRUMENT INC.

IMR03A05-E6

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for explanation purpose.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
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- 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.
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Symbols

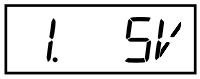
■ Screens used in this manual

It should be noted that this manual describes various screens of F110/400/900 according to the following rules.

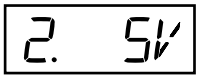
- FZ110/400/900 are available in two types: single input type and dual input type.
  The dual input type is further categorized into two types: Dual PV type (for FZ400/900) and PV + Remote setting type (for FZ110/400/900).
  For a dual input model, the same parameter may exist in both Input 1 and Input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

  [Display example of the dual input type]

  Input 1_Set value (SV)

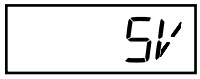
  

  Input 2_Set value (SV)

  [Display example of a single input type]

  Set value (SV)

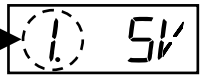
  This manual uses the dual inputs for explanation. For other types such as a single input type, ignore the first character "***1.***" at the top of the parameter.

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

  [Notation in this manual]

  Input 1_Set value (SV)

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

  Input 2_Set value (SV)

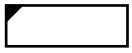
  Parameter shown only on the dual input type

  FUNC key assignment

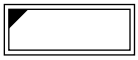
  Parameters used only on FZ400/900 regardless of the number of inputs.

- In the explanation of the operating navigation "**2. SELECTING PARAMETERS (P. 2-1)**," such display frames as shown below are used to show the difference.

  Parameters always displayed

  
  Parameters that are displayed if the display requirements are satisfied.

  Parameters that are displayed if the display requirements are satisfied. (FZ400/900 only)

  
  Parameters with the different display requirements between FZ110 and FZ400/900.

■ Character Symbols

11-segment character

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

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

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

u	V	W	X	Y	Z	Degree	／	Prime	＊ (Asterisk)	→

7-segment character

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

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

L	M	N (n)	O (o)	P	Q	R	S	T	t	U	u

V	W	X	Y	Z	Degree	／	Prime	＊ (Asterisk)

■ Abbreviation symbols

These abbreviations are used in this manual:

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

Document Configuration

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

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

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E☐	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E☐	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E☐	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E☐	This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	**IMR03A05-E6**	This manual you are reading now. [Parameters] This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. [Functions] This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E☐	This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	IMR03A08-E☐	This manual describes how to set up the instrument for communication with a programmable controller (PLC).

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

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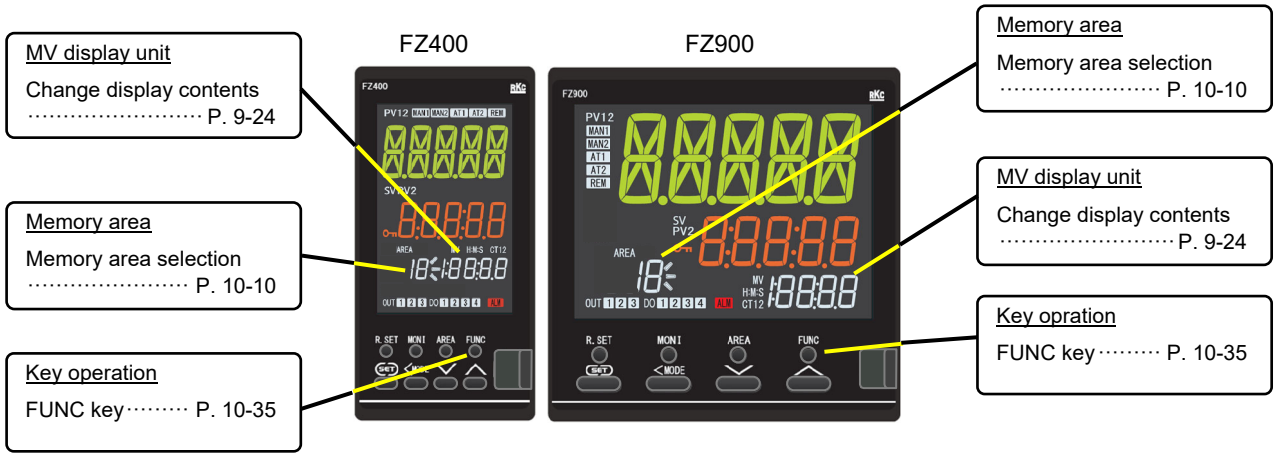
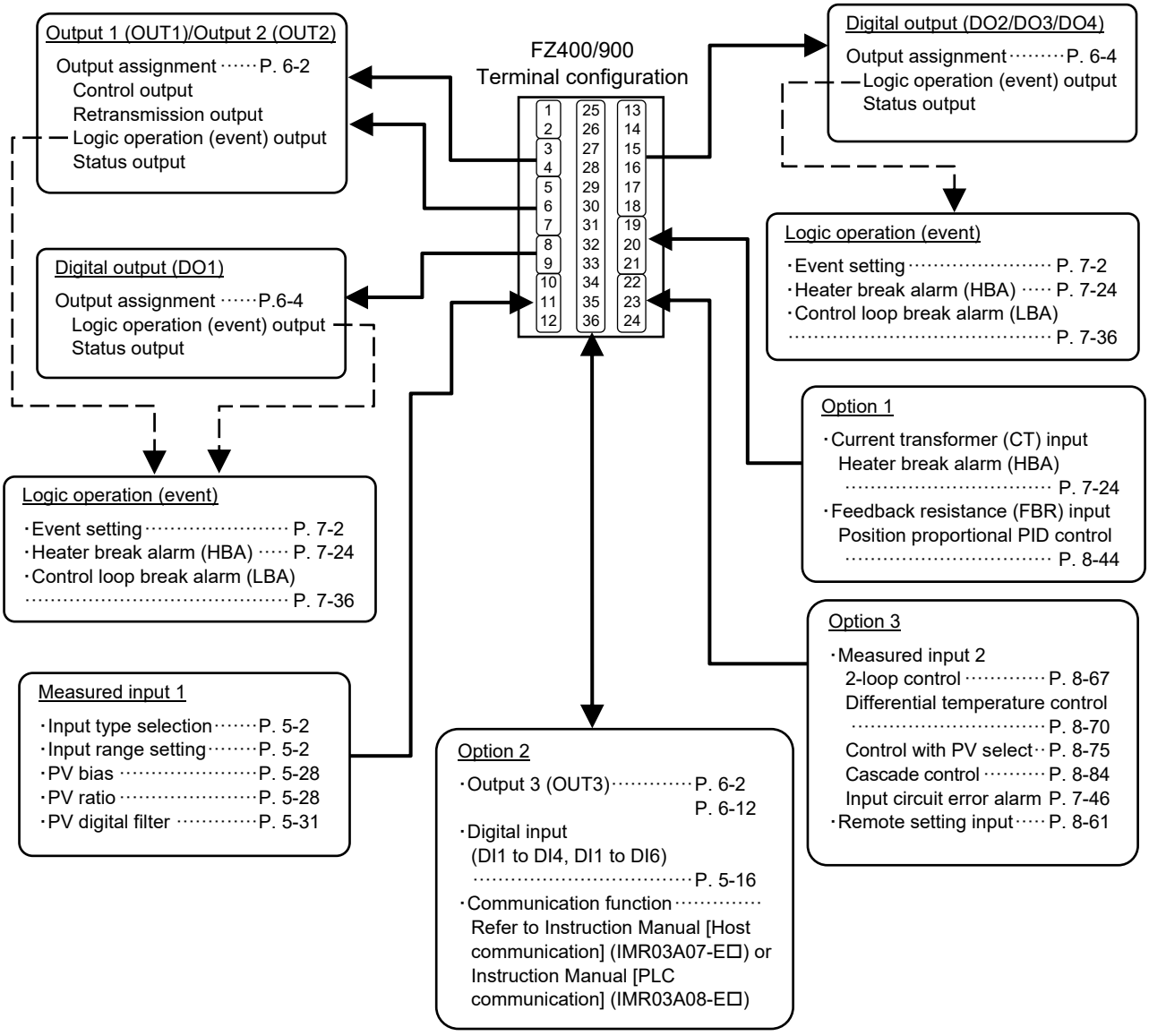
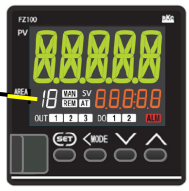




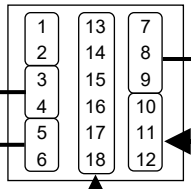
FZ110



Memory area

Change display contents
····· P. 10-10

FZ110
Terminal configuration



Output 1 (OUT1)/Output 2 (OUT2)

Output assignment ····· P. 6-2
Control output
Retransmission output
Logic operation (event) output
Status output

Digital output (DO1/DO2)

Output assignment ····· P.6-4
Logic operation (event) output
Status output

Logic operation (event)

Event setting ····· P. 7-2
Heater break alarm (HBA) ···· P. 7-24
Control loop break alarm (LBA)
····· P. 7-36

Logic operation (event)

Event setting ····· P. 7-2
Heater break alarm (HBA) ···· P. 7-24
Control loop break alarm (LBA)
····· P. 7-36

Measured input

Input type selection ····· P. 5-2
Input range setting ····· P. 5-2
PV bias ····· P. 5-28
PV ratio ····· P. 5-28
PV digital filter ····· P. 5-31

Option

- Remote setting input ····· P. 8-61
- Output 3 (OUT3) ····· P. 6-2
  P. 6-12
- Digital input (DI1, DI1 to DI3)
  ····· P. 5-16
- Current transformer (CT) input
  Heater break alarm (HBA) · P. 7-24
- Communication function ·····
  Refer to Instruction Manual [Host communication] (IMR03A07-E□) or Instruction Manual [PLC communication] (IMR03A08-E□)

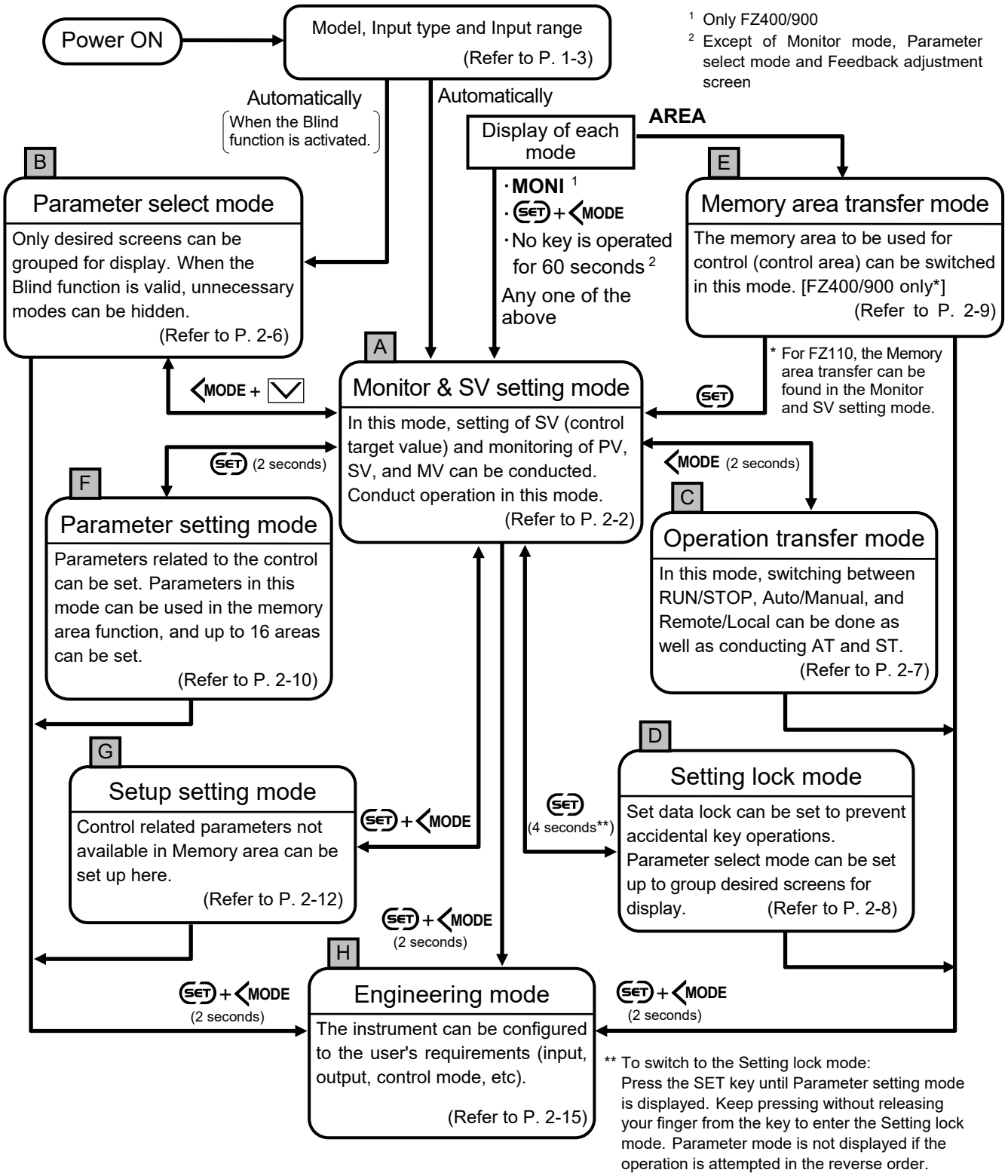
MEMO

1 MODE SWITCHING

This chapter describes various modes and how to switch between them.

■ Mode switching

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



Legend
X: Press X key once
X+Y: Press X and Y key simultaneously
X (*n* times): Press X key *n* times
X (*n* seconds): Press and hold X key for *n* seconds or more
X+Y (*n* seconds): Press and hold X and Y keys simultaneously for *n* seconds

■ Model, Input type, Unit and Input range

Immediately after the instrument is powered, the input type, the unit symbol and the input range will be displayed.

Example: FZ900, Thermocouple input (type K) and −200 to +1372 °C

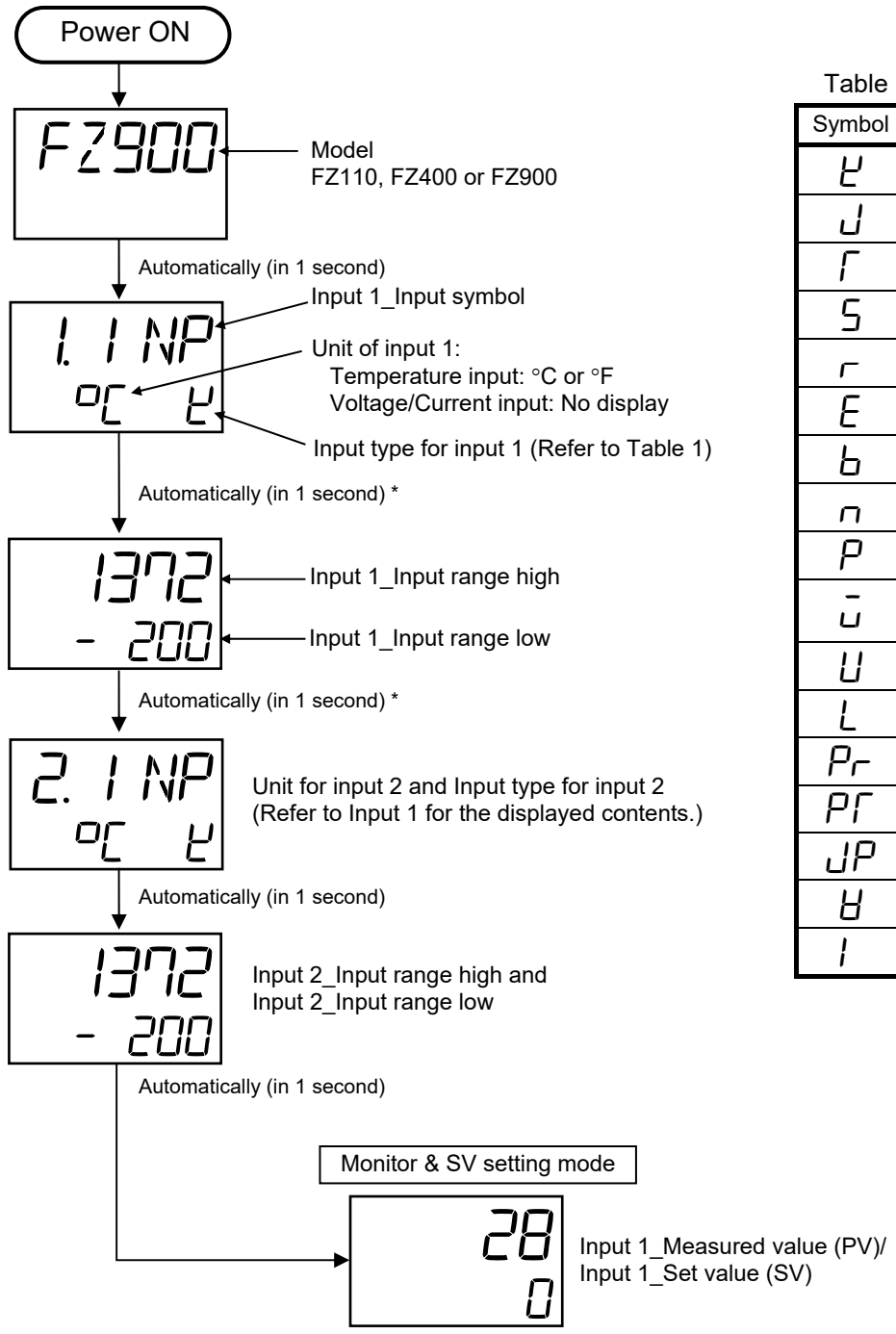


Table 1 Input type symbol

Symbol	Input type
K	Thermocouple K
J	Thermocouple J
T	Thermocouple T
S	Thermocouple S
r	Thermocouple R
E	Thermocouple E
b	Thermocouple B
n	Thermocouple N
P	Thermocouple PLII
C	Thermocouple W5Re/W26Re
U	Thermocouple U
L	Thermocouple L
Pr	Thermocouple PR40-20
Pt	RTD Pt100
JP	RTD JPt100
V	Voltage
I	Current

* Displayed for 2 seconds (Single input type)

MEMO

2 SELECTING PARAMETERS

This chapter describes various parameter types and how to switch between them.

2.1 Monitor & SV Setting Mode [A] 2-2
2.2 Parameter Select Mode [B] 2-6
2.3 Operation Transfer Mode [C] 2-7
2.4 Setting Lock Mode [D] 2-8
2.5 Memory Area Transfer Mode [E] (FZ400/900) 2-9
2-6 Parameter Setting Mode [F] 2-10
2.7 Setup Setting Mode [G] 2-12
2.8 Engineering Mode [H] 2-15

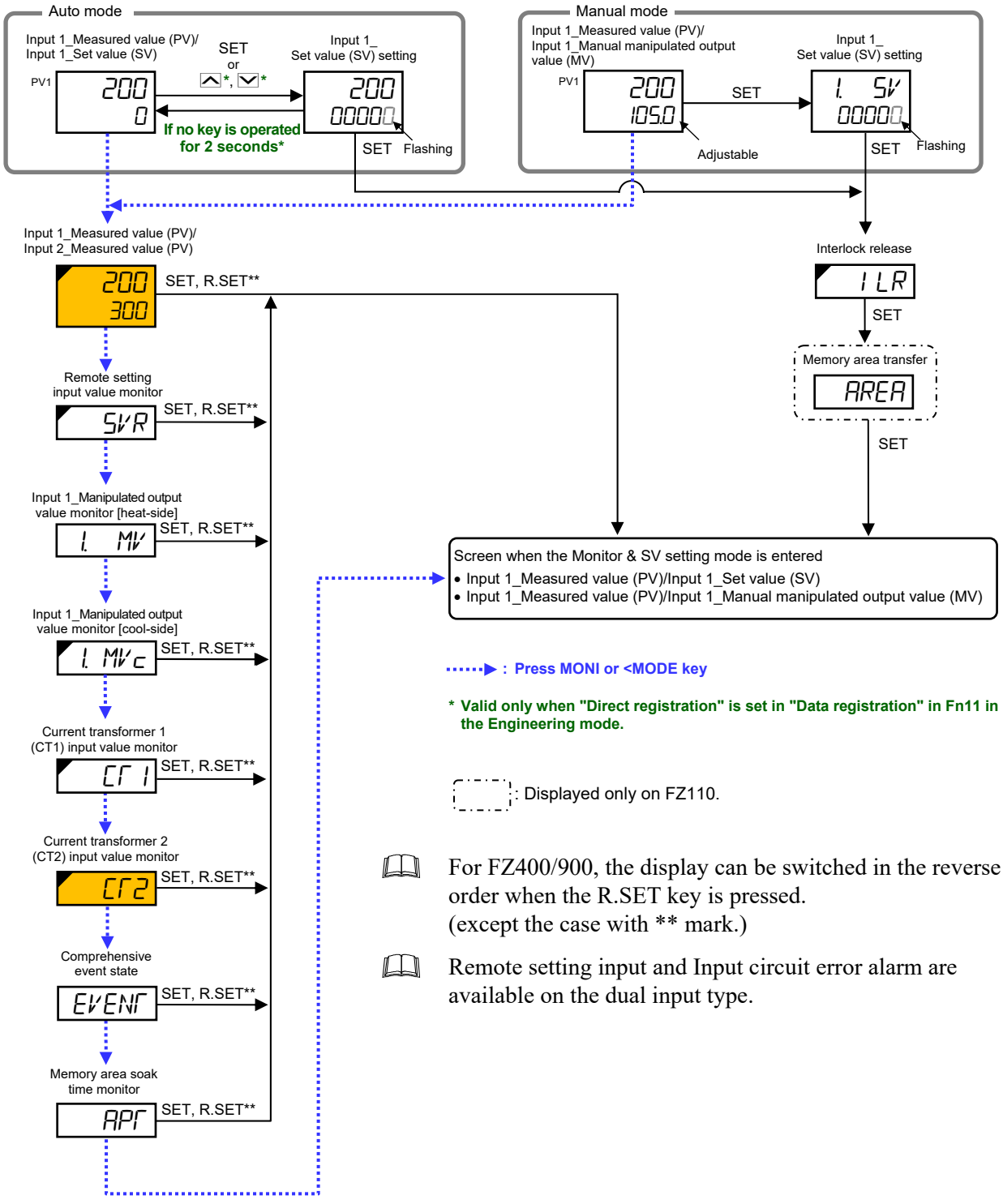
2.1 Monitor & SV Setting Mode [A]

When the Monitor and SV setting mode is entered, there are 4 (four) display contents depending on the control. Each display also differs between the Auto mode and the Manual mode.

- 1-loop control (including Remote setting input/Input circuit error alarm) (Input circuit error alarm is available only on FZ400/900)
- 2-loop control/Cascade control
- Control with PV select
- Differential temperature control

} FZ400/900 only

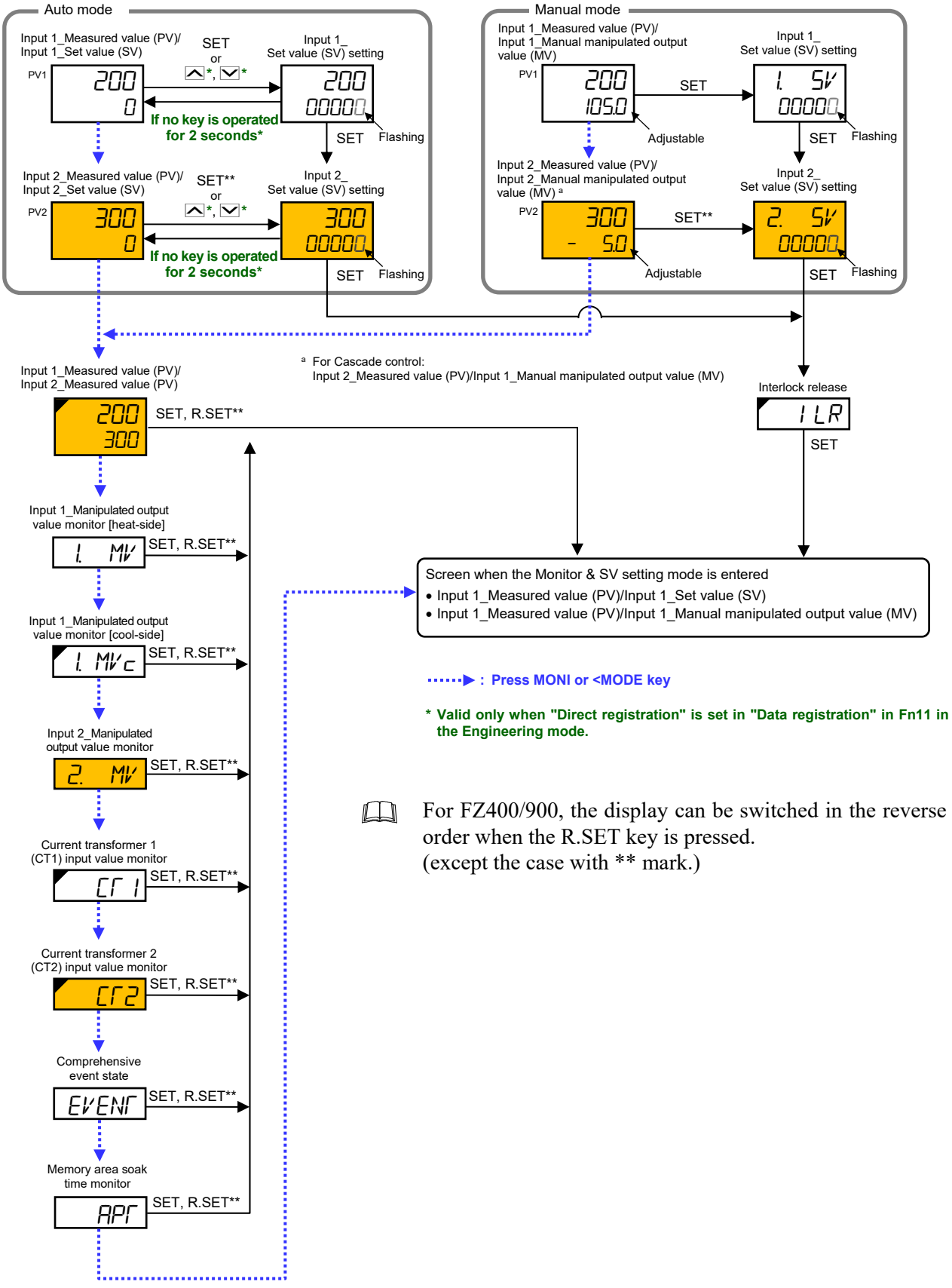
■ 1-loop control (including Remote setting input/Input circuit error alarm)



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(except the case with ** mark.)

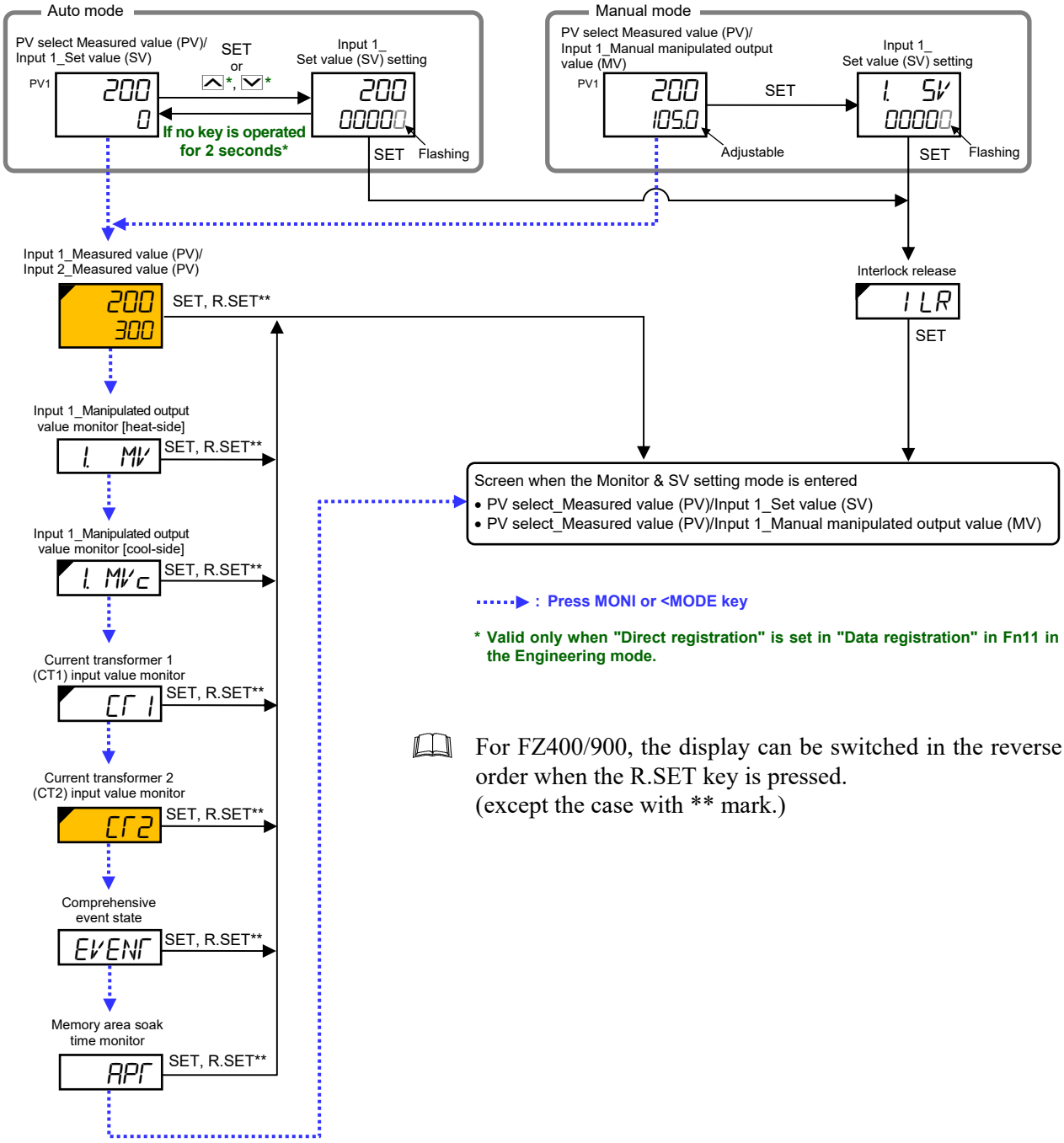
Remote setting input and Input circuit error alarm are available on the dual input type.

■ 2-loop control/Cascade control [FZ400/900]



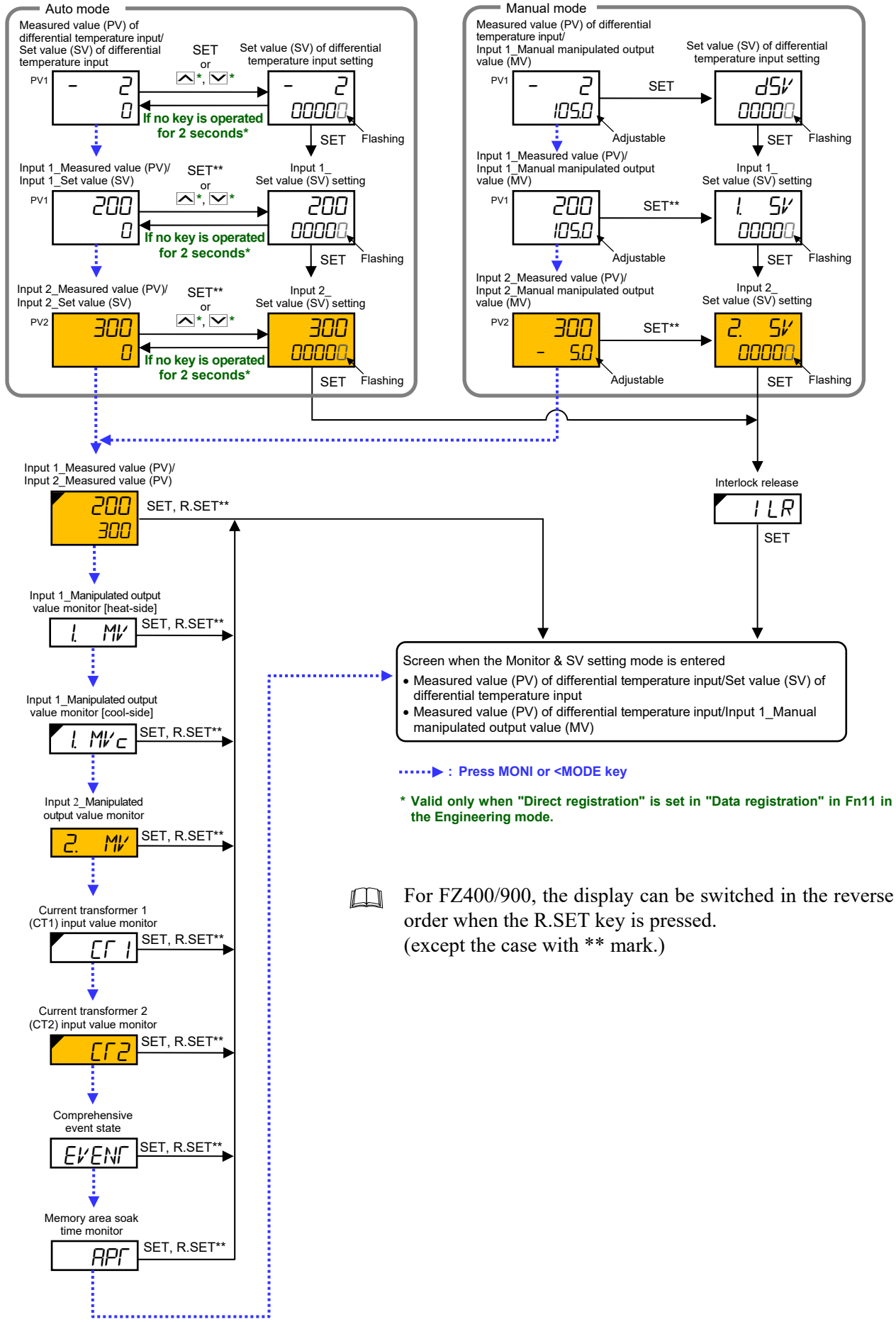
For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(except the case with ** mark.)

■ Control with PV select [FZ400/900]



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(except the case with ** mark.)

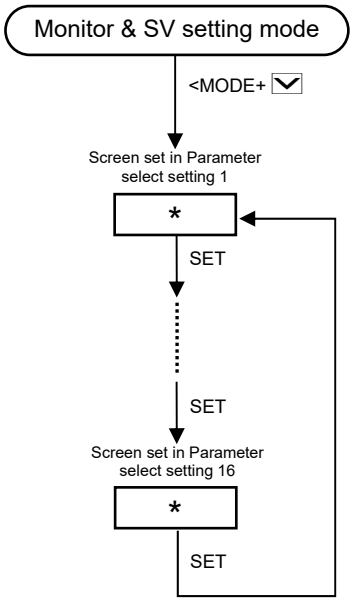
■ Differential temperature control [FZ400/900]



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(except the case with ** mark.)

2.2 Parameter Select Mode [B]

Displays the screens registered in Parameter select setting.

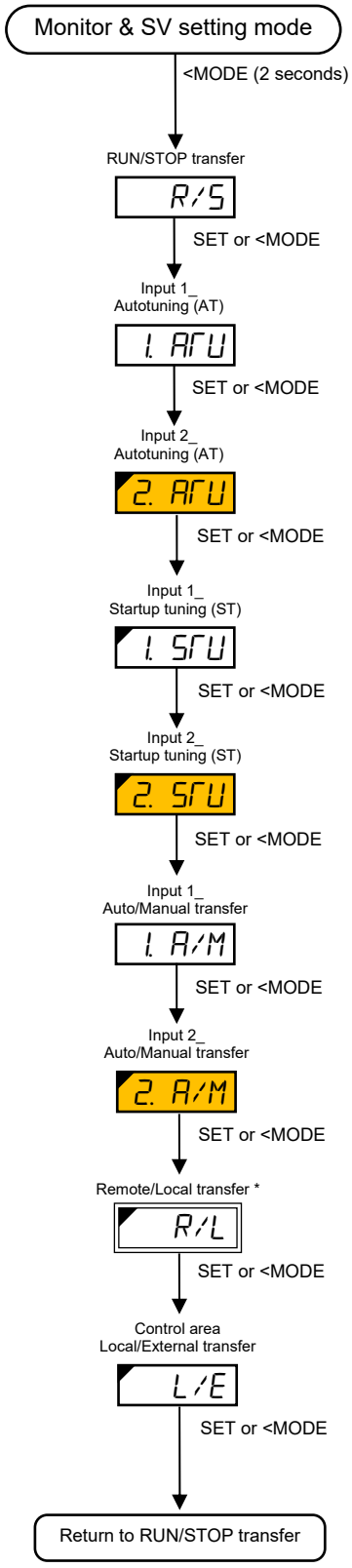


* Parameter symbol is displayed inside this box.

- For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
- While the Blind function is valid, only Parameter select setting screen, Set data lock mode, and PV/SV monitor * screens are displayed. The instrument starts from the Parameter select mode after powered on.

* The PV/SV monitor includes SV setting mode and Manual manipulated output value setting.

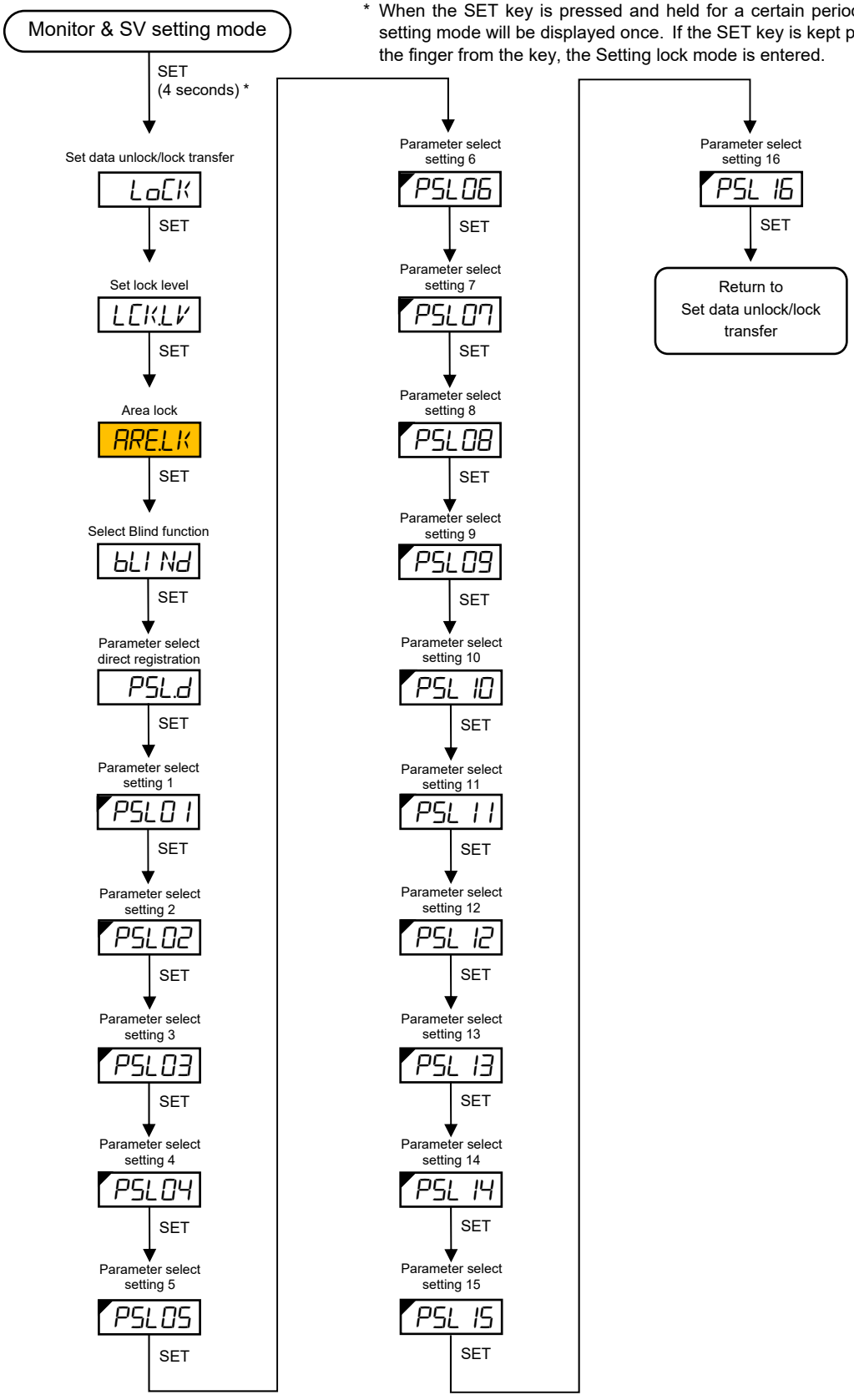
2.3 Operation Transfer Mode [C]



* For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.

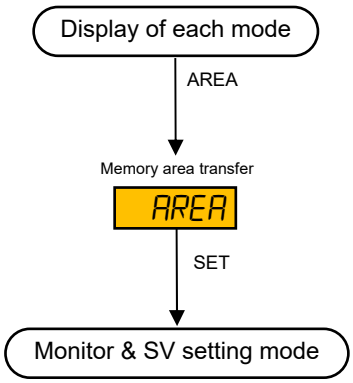
2.4 Setting Lock Mode [D]



* When the SET key is pressed and held for a certain period of time, the Parameter setting mode will be displayed once. If the SET key is kept pressing without releasing the finger from the key, the Setting lock mode is entered.

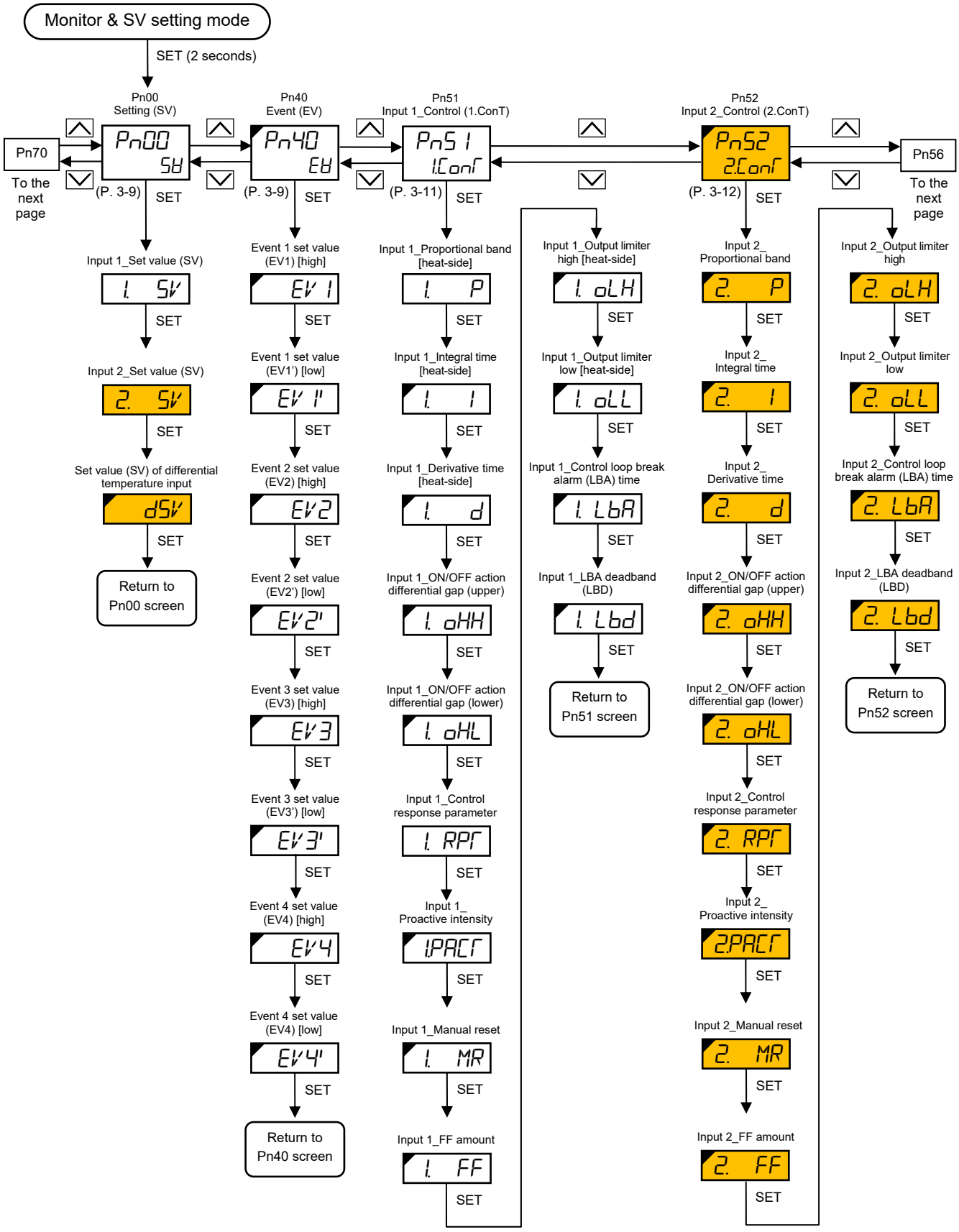
For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed. (Except the operation to enter the Set data lock)

2.5 Memory Area Transfer Mode [E] (FZ400/900)

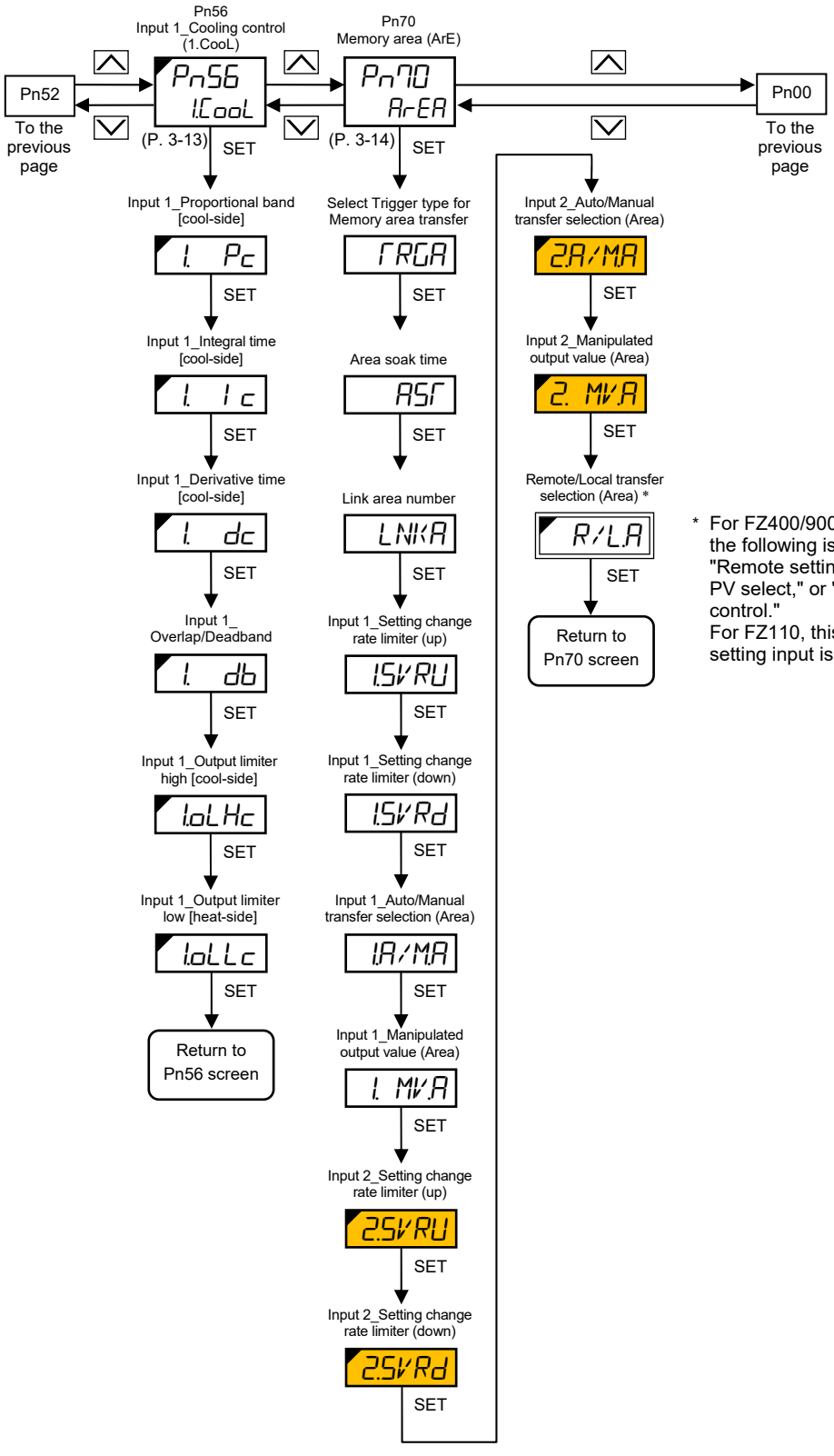


For FZ100, the Memory area selection screen can be found in the Monitor & SV setting mode.

2.6 Parameter Setting Mode [F]

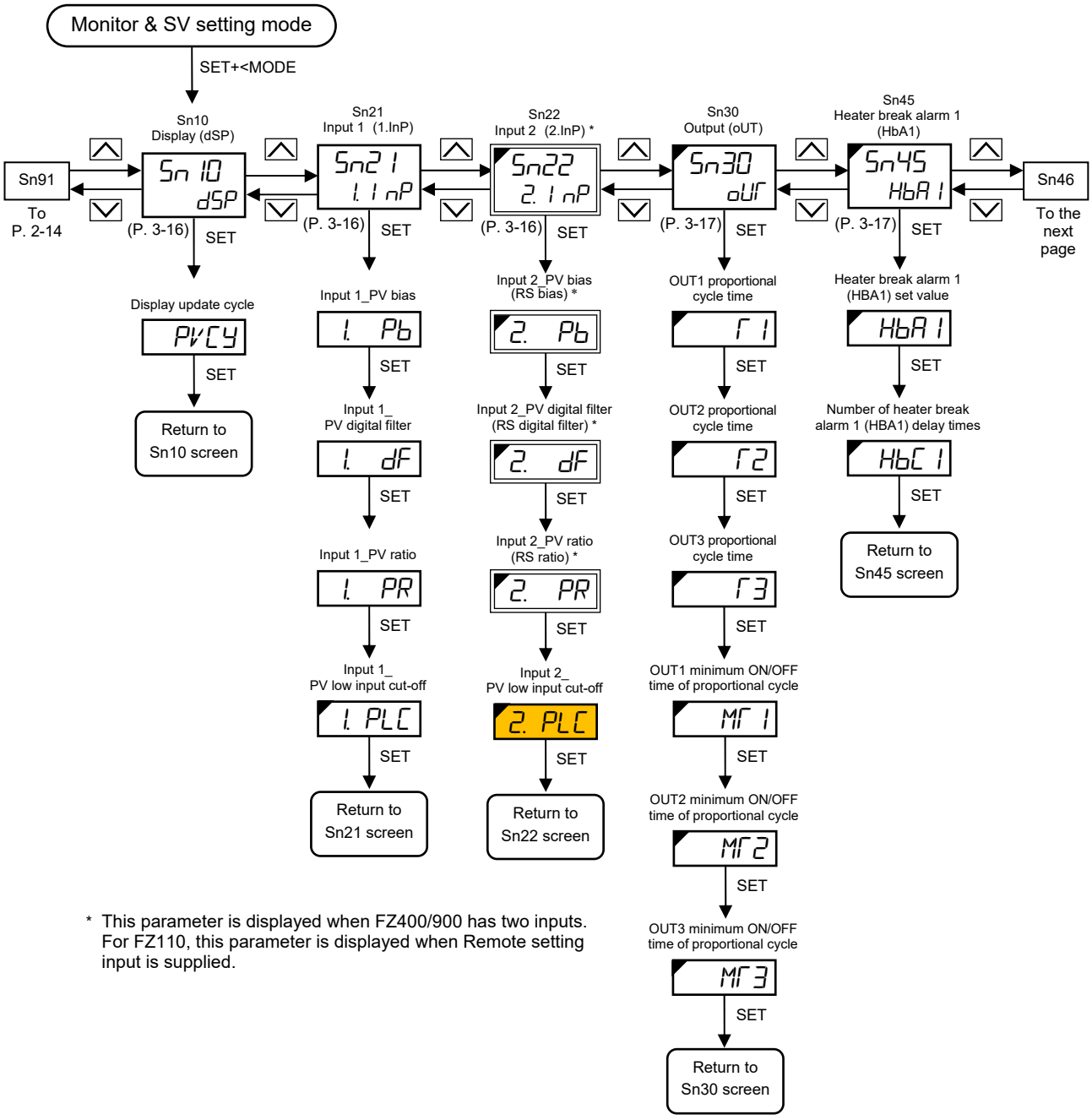


For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed. (Except the operation to enter the Set data lock)



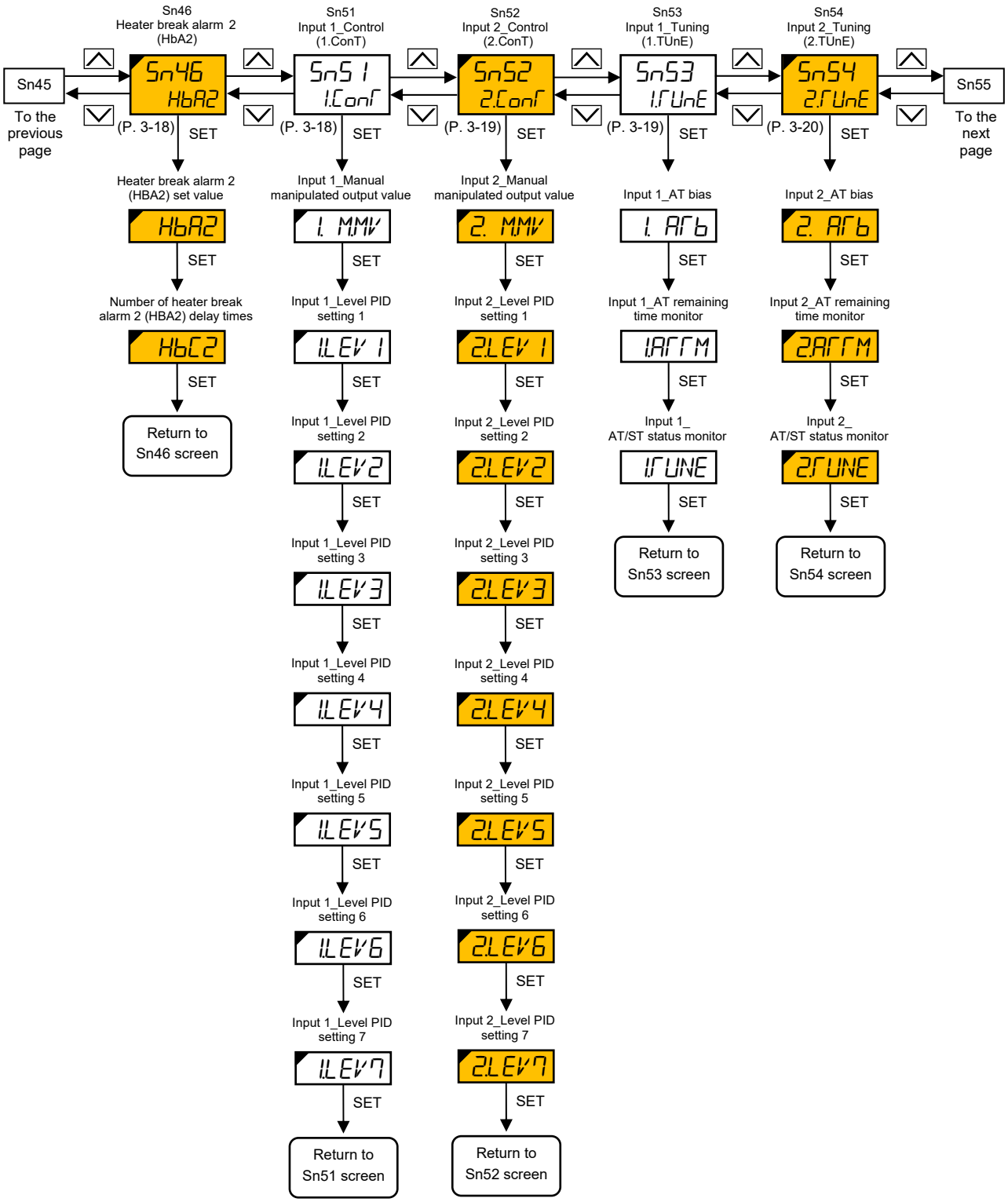
* For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

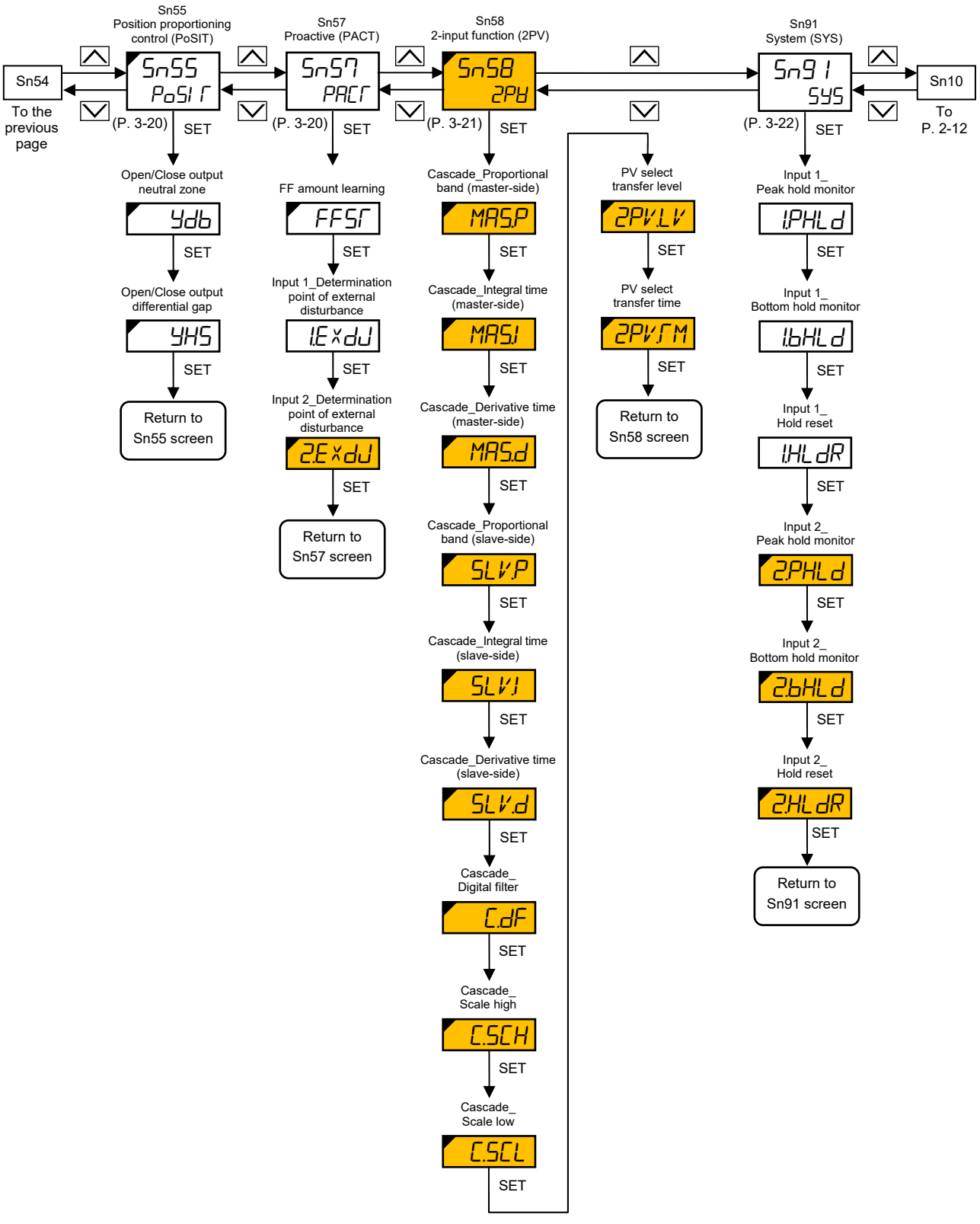
2.7 Setup Setting Mode [G]



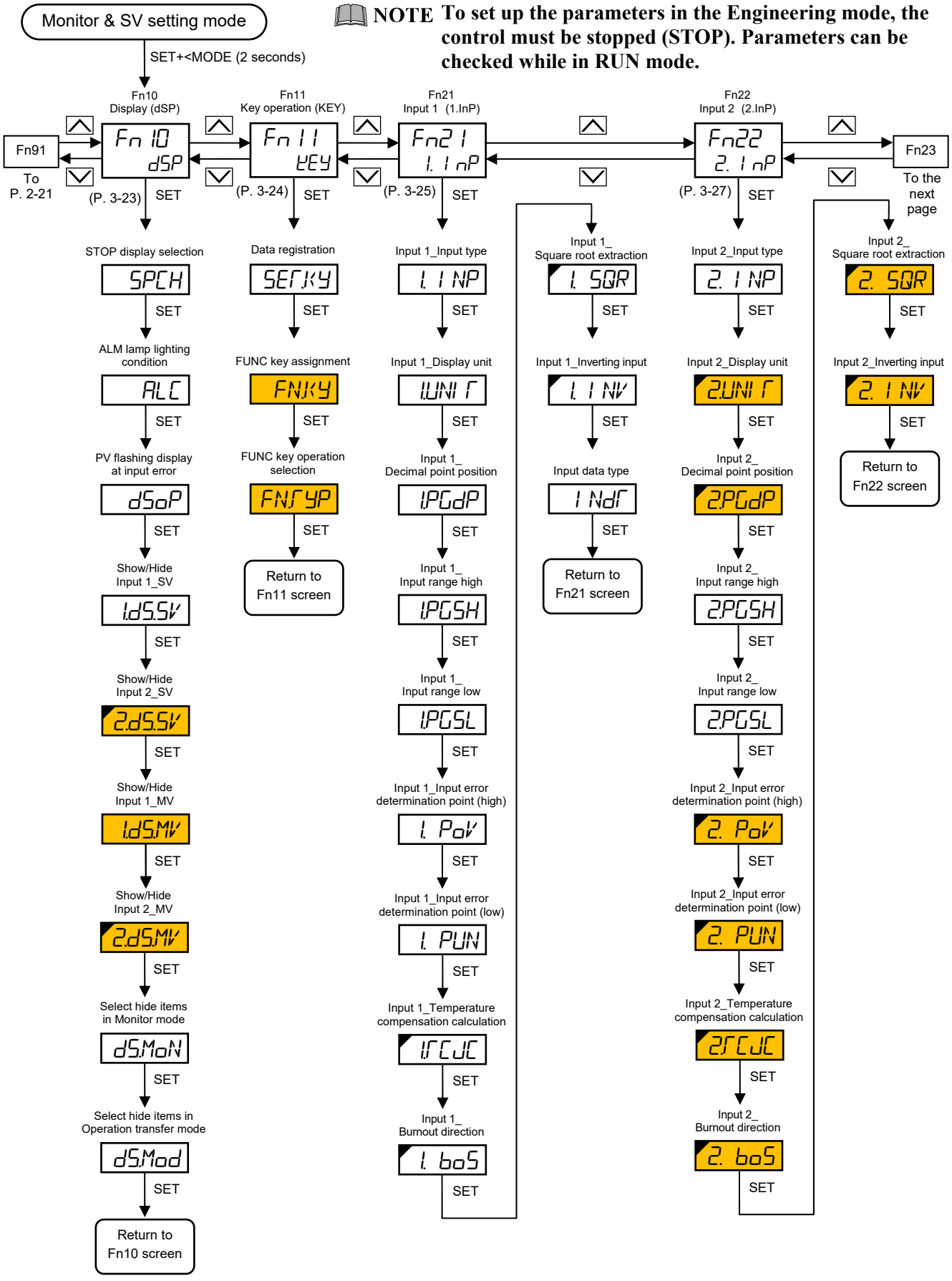
* This parameter is displayed when FZ400/900 has two inputs. For FZ110, this parameter is displayed when Remote setting input is supplied.

For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.



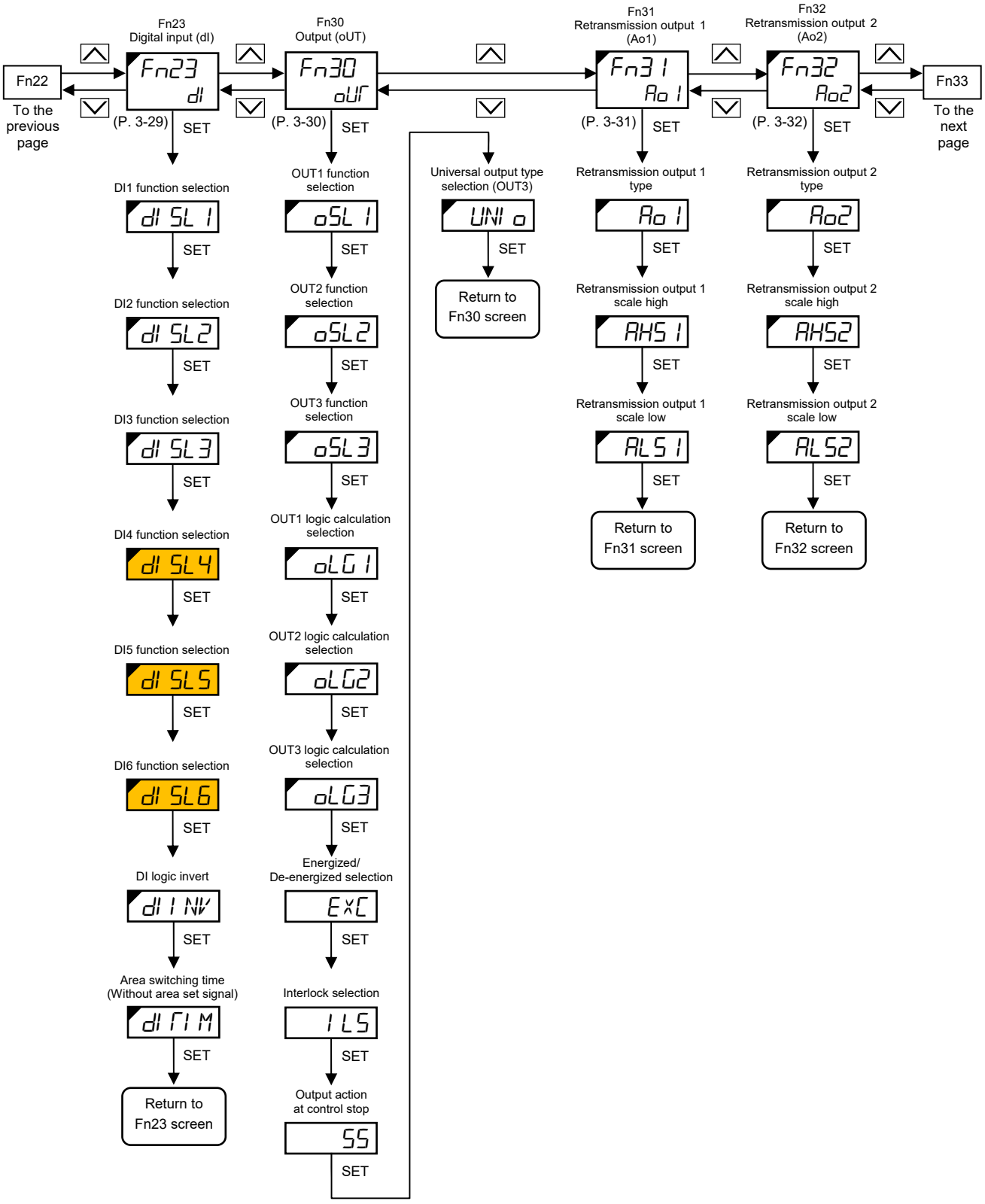

Sn54
To the previous page
Sn55
Position proportioning control (PoSIT)
(P. 3-20)
SET
Open/Close output neutral zone
SET
Open/Close output differential gap
SET
Return to Sn55 screen
Sn57
Proactive (PACT)
(P. 3-20)
SET
FF amount learning
SET
Input 1_Determination point of external disturbance
SET
Input 2_Determination point of external disturbance
SET
Return to Sn57 screen
Sn58
2-input function (2PV)
(P. 3-21)
SET
Cascade_Proportional band (master-side)
SET
Cascade_Integral time (master-side)
SET
Cascade_Derivative time (master-side)
SET
Cascade_Proportional band (slave-side)
SET
Cascade_Integral time (slave-side)
SET
Cascade_Derivative time (slave-side)
SET
Cascade_ Digital filter
SET
Cascade_ Scale high
SET
Cascade_ Scale low
SET
PV select transfer level
SET
PV select transfer time
SET
Return to Sn58 screen
Sn91
System (SYS)
(P. 3-22)
SET
Input 1_ Peak hold monitor
SET
Input 1_ Bottom hold monitor
SET
Input 1_ Hold reset
SET
Input 2_ Peak hold monitor
SET
Input 2_ Bottom hold monitor
SET
Input 2_ Hold reset
SET
Return to Sn91 screen
Sn10
To P. 2-12

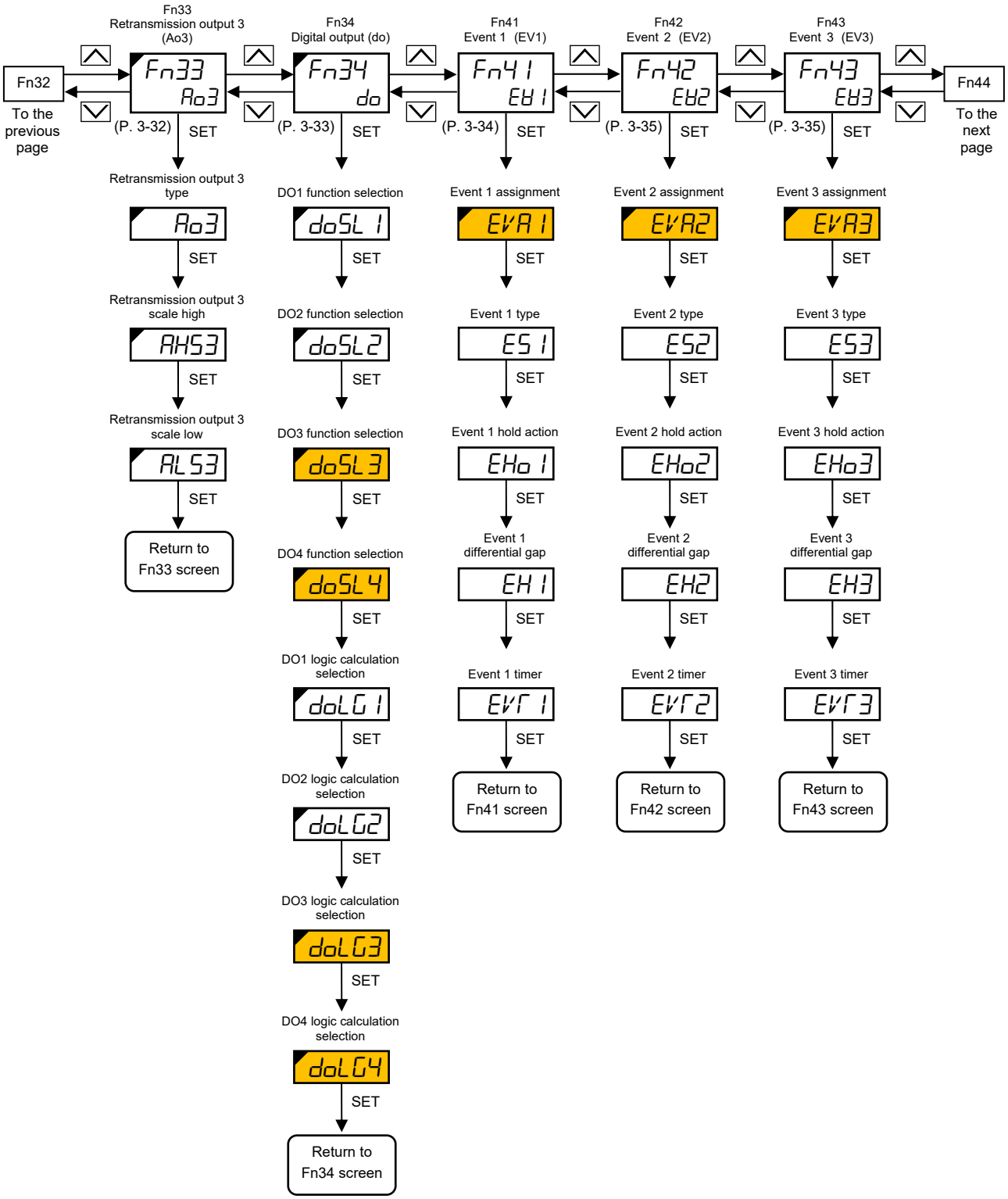
2.8 Engineering Mode [H]

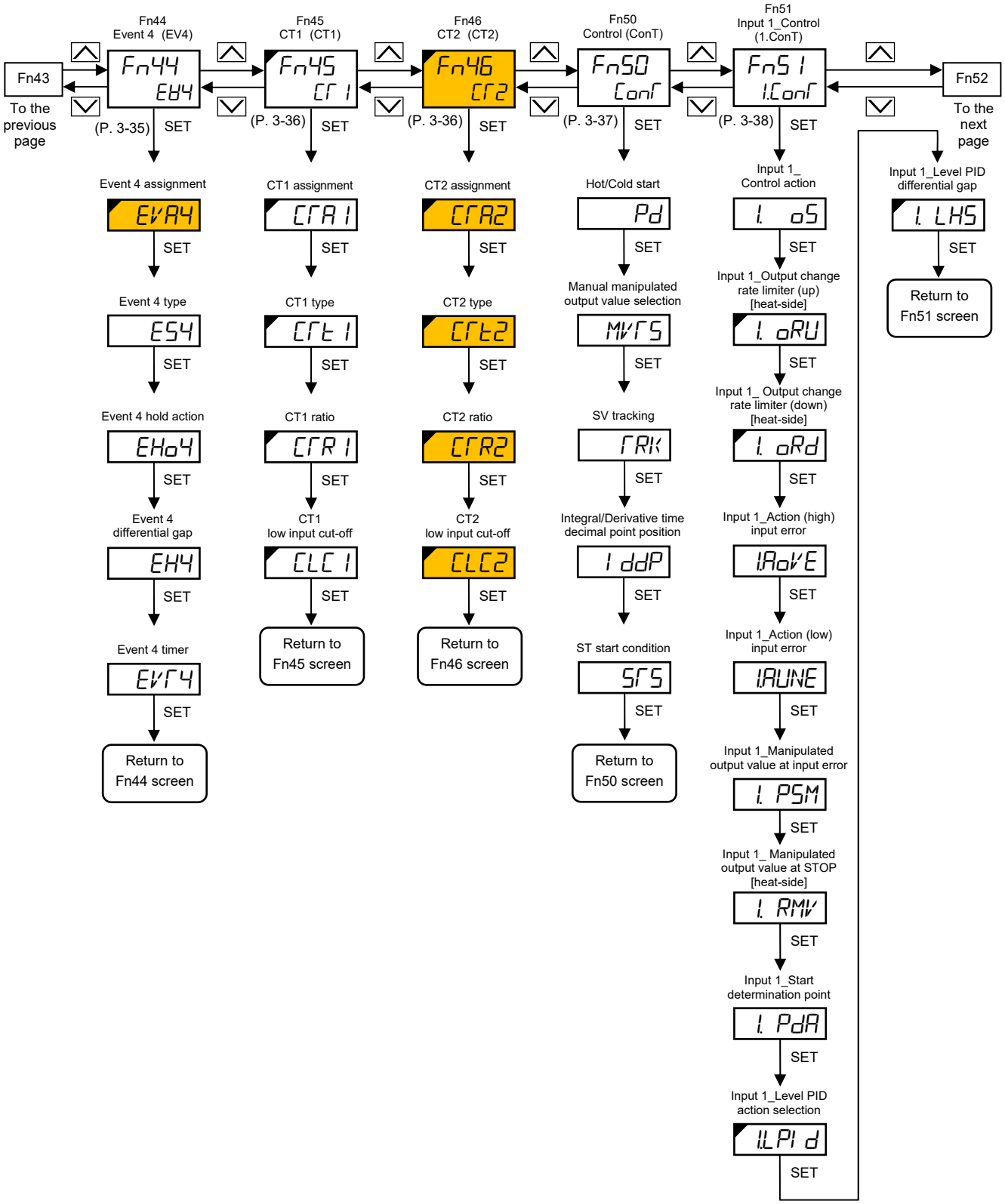


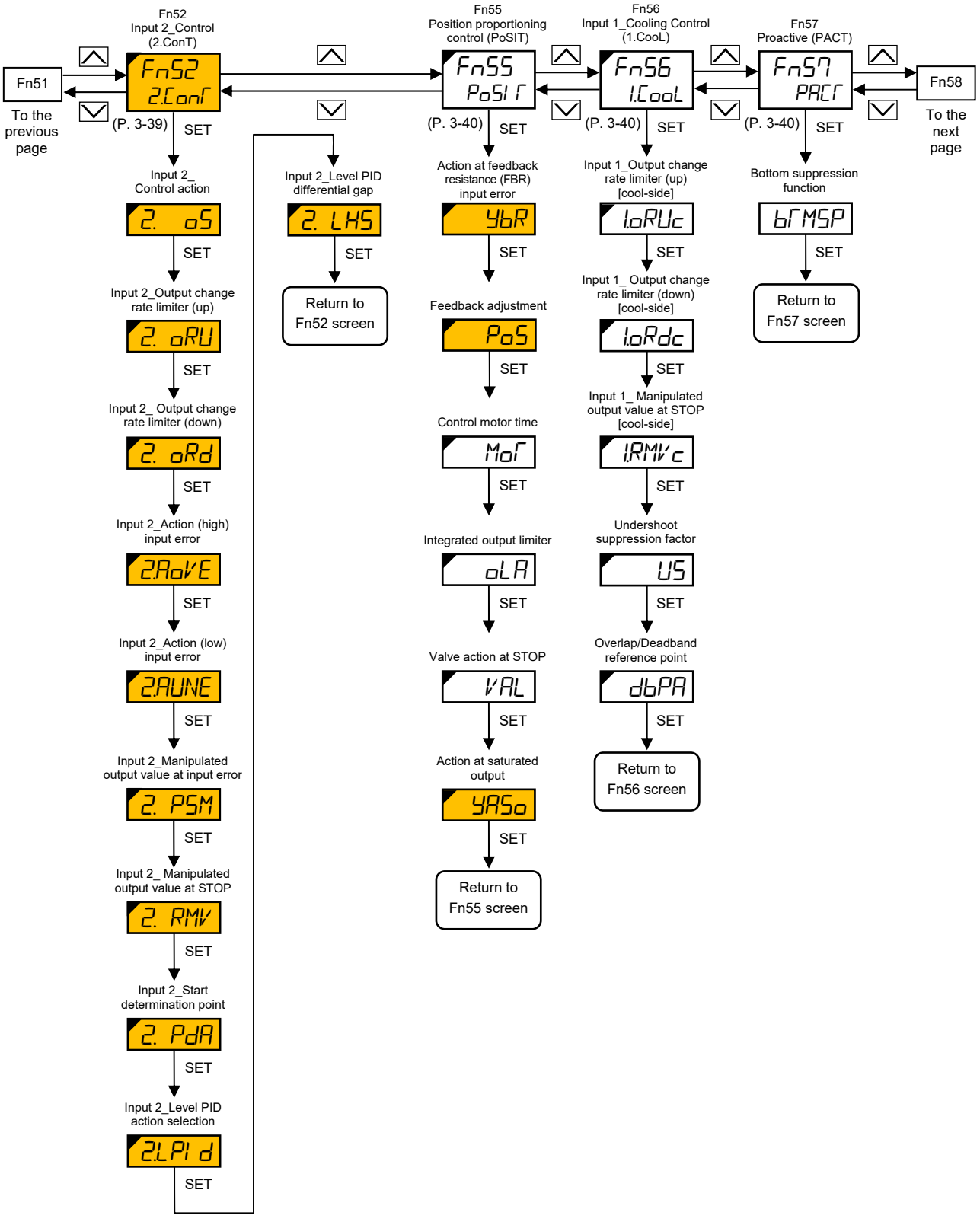
NOTE **To set up the parameters in the Engineering mode, the control must be stopped (STOP). Parameters can be checked while in RUN mode.**

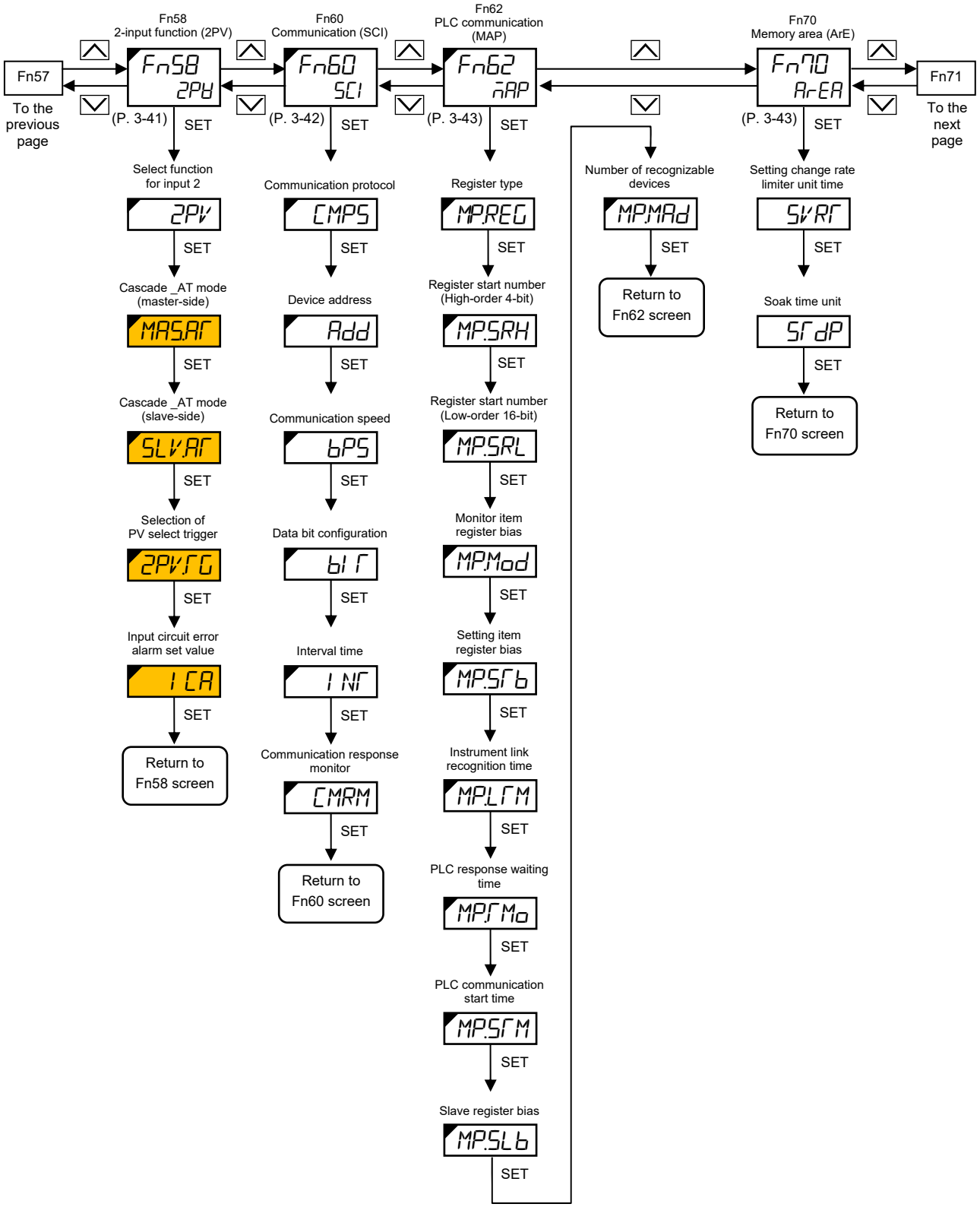
For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.

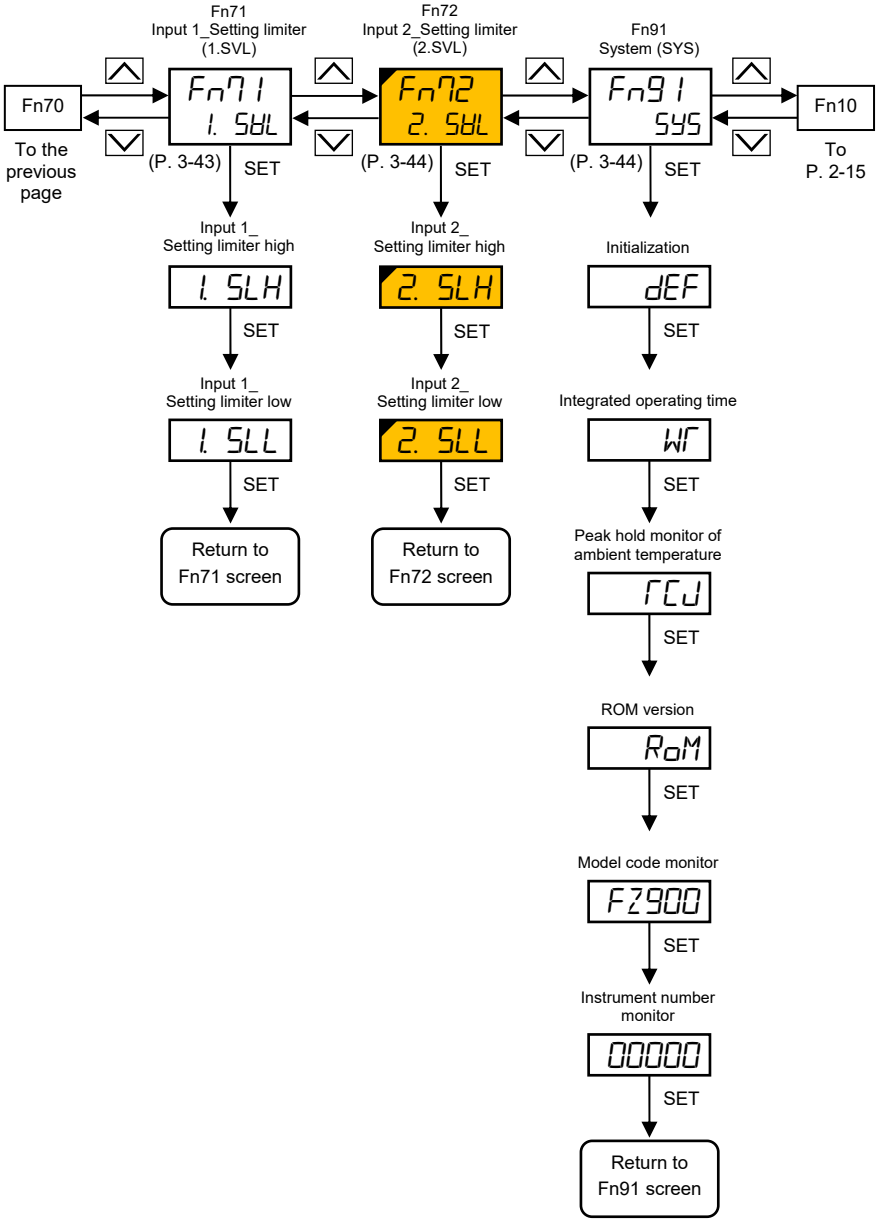



Fn32
To the previous page
Fn33
Retransmission output 3 (Ao3)
(P. 3-32)
SET
Fn34
Digital output (do)
(P. 3-33)
SET
Fn41
Event 1 (EV1)
(P. 3-34)
SET
Fn42
Event 2 (EV2)
(P. 3-35)
SET
Fn43
Event 3 (EV3)
(P. 3-35)
SET
Fn44
To the next page
Retransmission output 3 type
Retransmission output 3 scale high
Retransmission output 3 scale low
Return to Fn33 screen
DO1 function selection
DO2 function selection
DO3 function selection
DO4 function selection
DO1 logic calculation selection
DO2 logic calculation selection
DO3 logic calculation selection
DO4 logic calculation selection
Return to Fn34 screen
Event 1 assignment
Event 1 type
Event 1 hold action
Event 1 differential gap
Event 1 timer
Return to Fn41 screen
Event 2 assignment
Event 2 type
Event 2 hold action
Event 2 differential gap
Event 2 timer
Return to Fn42 screen
Event 3 assignment
Event 3 type
Event 3 hold action
Event 3 differential gap
Event 3 timer
Return to Fn43 screen


Fn43
To the previous page
Fn44
Event 4 (EV4)
(P. 3-35)
SET
Fn45
CT1 (CT1)
(P. 3-36)
SET
Fn46
CT2 (CT2)
(P. 3-36)
SET
Fn50
Control (ConT)
(P. 3-37)
SET
Fn51
Input 1_Control (1.ConT)
(P. 3-38)
SET
Fn52
To the next page
Event 4 assignment
SET
Event 4 type
SET
Event 4 hold action
SET
Event 4 differential gap
SET
Event 4 timer
SET
Return to Fn44 screen
CT1 assignment
SET
CT1 type
SET
CT1 ratio
SET
CT1 low input cut-off
SET
Return to Fn45 screen
CT2 assignment
SET
CT2 type
SET
CT2 ratio
SET
CT2 low input cut-off
SET
Return to Fn46 screen
Hot/Cold start
SET
Manual manipulated output value selection
SET
SV tracking
SET
Integral/Derivative time decimal point position
SET
ST start condition
SET
Return to Fn50 screen
Input 1_ Control action
SET
Input 1_Output change rate limiter (up) [heat-side]
SET
Input 1_ Output change rate limiter (down) [heat-side]
SET
Input 1_Action (high) input error
SET
Input 1_Action (low) input error
SET
Input 1_Manipulated output value at input error
SET
Input 1_ Manipulated output value at STOP [heat-side]
SET
Input 1_Start determination point
SET
Input 1_Level PID action selection
SET
Input 1_Level PID differential gap
SET
Return to Fn51 screen


Fn51
To the previous page
Fn52
Input 2_Control (2.ConT)
(P. 3-39)
SET
Input 2_ Control action
Input 2_Output change rate limiter (up)
Input 2_ Output change rate limiter (down)
Input 2_Action (high) input error
Input 2_Action (low) input error
Input 2_Manipulated output value at input error
Input 2_ Manipulated output value at STOP
Input 2_Start determination point
Input 2_Level PID action selection
Input 2_Level PID differential gap
Return to Fn52 screen
Fn55
Position proportioning control (PoSIT)
(P. 3-40)
Action at feedback resistance (FBR) input error
Feedback adjustment
Control motor time
Integrated output limiter
Valve action at STOP
Action at saturated output
Return to Fn55 screen
Fn56
Input 1_Cooling Control (1.CooL)
(P. 3-40)
Input 1_Output change rate limiter (up) [cool-side]
Input 1_ Output change rate limiter (down) [cool-side]
Input 1_ Manipulated output value at STOP [cool-side]
Undershoot suppression factor
Overlap/Deadband reference point
Return to Fn56 screen
Fn57
Proactive (PACT)
(P. 3-40)
Bottom suppression function
Return to Fn57 screen
Fn58
To the next page


Fn57
To the previous page
Fn58
2-input function (2PV)
Fn58 2PU
(P. 3-41)
SET
Select function for input 2
2PV
SET
Cascade _AT mode (master-side)
MASAT
SET
Cascade _AT mode (slave-side)
SLVAT
SET
Selection of PV select trigger
2PVTG
SET
Input circuit error alarm set value
1CA
SET
Return to Fn58 screen
Fn60
Communication (SCI)
Fn60 SCI
(P. 3-42)
SET
Communication protocol
CMPS
SET
Device address
Add
SET
Communication speed
bPS
SET
Data bit configuration
bIT
SET
Interval time
INT
SET
Communication response monitor
CMRM
SET
Return to Fn60 screen
Fn62
PLC communication (MAP)
Fn62 MAP
(P. 3-43)
SET
Register type
MPREG
SET
Register start number (High-order 4-bit)
MPSRH
SET
Register start number (Low-order 16-bit)
MPSRL
SET
Monitor item register bias
MPMod
SET
Setting item register bias
MPSTb
SET
Instrument link recognition time
MPLTM
SET
PLC response waiting time
MPTMo
SET
PLC communication start time
MPSTM
SET
Slave register bias
MPSLb
SET
Number of recognizable devices
MPMAd
SET
Return to Fn62 screen
Fn70
Memory area (ArE)
Fn70 ArEA
(P. 3-43)
SET
Setting change rate limiter unit time
SVRT
SET
Soak time unit
STdP
SET
Return to Fn70 screen
Fn71
To the next page


Fn71
Input 1_Setting limiter
(1.SVL)
Fn72
Input 2_Setting limiter
(2.SVL)
Fn91
System (SYS)
Fn70
To the previous page
Fn71
1. SVL
Fn72
2. SVL
Fn91
SYS
Fn10
To P. 2-15
(P. 3-43)
SET
(P. 3-44)
SET
(P. 3-44)
SET
Input 1_
Setting limiter high
1. SLH
SET
Input 2_
Setting limiter high
2. SLH
SET
Initialization
dEF
SET
Input 1_
Setting limiter low
1. SLL
SET
Return to Fn71 screen
Input 2_
Setting limiter low
2. SLL
SET
Return to Fn72 screen
Integrated operating time
WT
SET
Peak hold monitor of ambient temperature
PCJ
SET
ROM version
RoM
SET
Model code monitor
FZ900
SET
Instrument number monitor
00000
SET
Return to Fn91 screen

MEMO

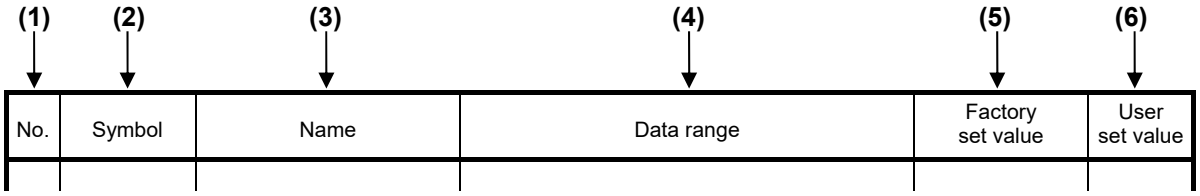
3

PARAMETER LIST

This chapter describes displays, names and data ranges of each parameter.

3.1 How to Read the Table 3-2
3.2 Monitor & SV Setting Mode [A] 3-3
3.3 Parameter Select Mode [B] 3-5
3.4 Operation Transfer Mode [C] 3-6
3.5 Setting Lock Mode [D] 3-7
3.6 Memory Area Transfer Mode [E] (FZ400/900) 3-8
3.7 Parameter Setting Mode [F] 3-9
3.8 Setup Setting Mode [G] 3-16
3.9 Engineering Mode [H] 3-23

3.1 How to Read the Table



(1) No. : This is a screen number used to register screens displayed in the Parameter select mode. The screen number can be registered in the Parameter select setting screen. Parameters without the number can not be regisered in Parameter select setting screen. If there are two items with the same number, one of them will be displayed according to the display requirements.

(2) Symbol: 11-segment parameter symbols shown on the PV display.

(3) Name: Name of parameter

(4) Data range: Data range of parameter

(5) Factory set value: Factory set value of parameters

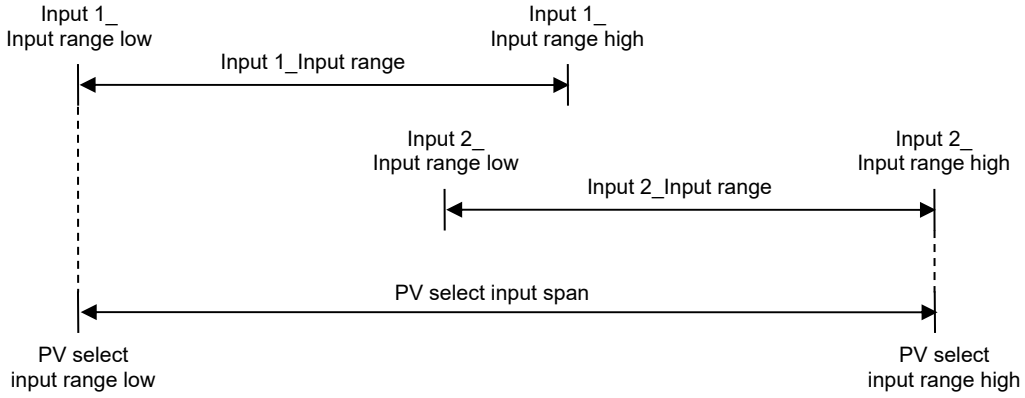
(6) User set value: Stores parameter values set by the user
This may be useful when the data is initialized.

In the data range and the factory set value some unfamiliar expressions are used. These are used for Control with PV select and can be rephrased as follows:
PV select input span as Input span
PV select input range high as Input range high
PV select input range low as Input range low

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



3.2 Monitor & SV Setting Mode [A]

No.	Symbol	Name	Data range	Factory set value	User set value
1	—	Input 1_Measured value (PV)/ Input 1_Set value (SV) [1]	PV display unit: Input 1_Input range low − (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
			SV display unit [2]: • Input 1_Set value (SV) (Auto mode: at RUN) • STOP display [StoP, dSTP, ESTP] • Remote setting input value (at Remote mode) • Input 1_Manual manipulated output value (at Manual mode)		
1	—	PV select Measured value (PV)/ Input 1_Set value (SV) [3]	PV display unit: When controlling with Input 1: Input 1_Input range low − (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) When controlling with Input 2: Input 2_Input range low − (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
			SV display unit [2]: • Input 1_Set value (SV) (Auto mode: at RUN) • STOP display [StoP, dSTP, ESTP] • Input 1_Manual manipulated output value (at Manual mode)		
2	—	Input 2_Measured value (PV)/ Input 2_Set value (SV) [4]	PV display unit: Input 2_Input range low − (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
			SV display unit [1]: • Input 2_Set value (SV) (Auto mode: at RUN) • STOP display [StoP, dSTP, ESTP] • Input 2_Manual manipulated output value (at Manual mode)		

Displayed in case of FZ400/900.

[1] Not displayed when “Control with PV select” is selected in “Select function for input 2.”

[2] Refer to the following table for the display range and the setting range of each data.

Display data	Data type	Data range
Input 1_Set value (SV)	Monitor/Setting	Input 1_Setting limiter low to Input 1_Setting limiter high
Input 2_Set value (SV)	Monitor/Setting	Input 2_Setting limiter low to Input 2_Setting limiter high
Remote setting input value	Monitor	Input 1_Setting limiter low to Input 1_Setting limiter high
Input 1_Manual manipulated output value	Setting	• In case of PID control or Position proportioning PID control with Feedback resistor (FBR): Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] • In case of Heat/Cool PID control: −Input 1_Output limiter low [cool-side] to +Input 1_Output limiter high [heat-side] • In case of Position proportioning PID control without Feedback resistor (FBR): Not displayed
Input 2_Manual manipulated output value	Setting	Input 2_Output limiter low to Input 2_Output limiter high

[3] Displayed when “Control with PV select” is selected in “Select function for input 2.”

[4] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
3	—	Measured value (PV) of differential temperature input/ Set value (SV) of differential temperature input [1]	PV display unit: −19999 to +99999* or −1999 to +9999** * In case of Input data type 0 ** In case of Input data type 1 [Varies with the setting of the Decimal point position.] SV display unit: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	—	—
4	—	Input 1_Measured value (PV)/ Input 2_Measured value (PV) [2]	PV display unit: Input 1_Input range low − (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.] SV display unit: Input 2_Input range low − (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
24	1. SV	Input 1_Set value (SV) [3] ★	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
25	2. SV	Input 2_Set value (SV) [3, 4] ★	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
26	dSV	Set value (SV) of differential temperature input [1, 3] ★	−(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0	
5	SVR	Remote setting input value monitor [5]	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—	—
6	1. MV	Input 1_Manipulated output value monitor [heat-side] [6]	−5.0 to +105.0 %	—	—
7	1. MVc	Input 1_Manipulated output value monitor [cool-side] [7]	−5.0 to +105.0 %	—	—
8	2. MV	Input 2_Manipulated output value monitor [8]	−5.0 to +105.0 %	—	—
9	CT 1	Current transformer 1 (CT1) input value monitor [9]	0.0 to 100.0 A	—	—
10	CT2	Current transformer 2 (CT2) input value monitor [10]	0.0 to 100.0 A	—	—
11	EVENT	Comprehensive event state	When an event occurs, the character of the occurring event is displayed on the Set value (SV) display unit. If two or more events occur at the same time, the relevant characters are displayed alternately every 0.5 seconds. EVT 1: Event 1 EVT2: Event 2 EVT3: Event 3 EVT4: Event 4 HbA 1: Heater break alarm 1 (HBA1) HbA2: Heater break alarm 2 (HBA2) LbA 1: Control loop break alarm 1 (LBA1) LbA2: Control loop break alarm 2 (LBA2) In 1.UP: Input 1_Input error high In 1.dn: Input 1_Input error low In2.UP: Input 2_Input error high In2.dn: Input 2_Input error low	—	—

Displayed in case of FZ400/900.

★ Data included in Memory area

[1] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2” AND “Differential temperature control” is selected in “2-loop control/Differential temperature control.”

[2] Displayed when “2-loop control/Differential temperature control,” “Cascade control,” “Control with PV select” or “Input circuit error alarm” is selected in “Select function for input 2.”

[3] Displayed in Manual mode.

[4] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[5] For FZ400/900, this parameter is displayed when “Remote setting input” is selected in “Select function for input 2.”
For FZ110, this parameter is displayed when Remote setting input is supplied.

[6] Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.
Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID controller with Feedback resistance (FBR) input.

[7] Displayed when Input 1 is Heat/Cool PID control.

[8] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

[9] Displayed when Current transformer (CT) input is supplied.

[10] Displayed when two Current transformer (CT) inputs are supplied.

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
12	APT	Memory area soak time monitor	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Displayed only for FZ400/900 when the input data type is 0. [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	—	—
13	ILR	Interlock release [1]	oFF: Interlock release on: Interlock state	oFF	
14	AREA	Memory area transfer [2]	1 to 16	1	

[1] Displayed when Interlock function is valid.

[2] Displayed on FZ110. For FZ400/900, this parameter is displayed in the Memory area transfer mode.
This parameter is display only (not settable) if “Memory area transfer (without area set signal)” is selected in DI function selection AND “External mode” is selected in “Control area Local/External transfer.”

3.3 Parameter Select Mode [B]

Up to 16 screens registered on the Parameter select setting screen (Set data lock mode) by the user can be displayed.

3.4 Operation Transfer Mode [C]

No.	Symbol	Name	Data range	Factory set value	User set value
15	R/S	RUN/STOP transfer	rUn: RUN (Control start) StoP: STOP (Control stop)	rUn	
16	1. AtU	Input 1_Autotuning (AT)	oFF: PID control on: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "oFF."	oFF	
17	2. AtU	Input 2_Autotuning (AT) [1]	oFF: PID control on: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "oFF."	oFF	
18	1. StU	Input 1_Startup tuning (ST) [2]	oFF: ST unused on 1: Execute once * on2: Execute always * When the ST is finished, the control will automatically return to "oFF."	oFF	
19	2. StU	Input 2_Startup tuning (ST) [1]	oFF: ST unused on 1: Execute once * on2: Execute always * When the ST is finished, the control will automatically return to "oFF."	oFF	
20	1. A/M	Input 1_Auto/Manual transfer	AUto: Auto mode mAn: Manual mode	AUto	
21	2. A/M	Input 2_Auto/Manual transfer [1]	AUto: Auto mode mAn: Manual mode	AUto	
22	R/L	Remote/Local transfer [3]	• When "Remote setting input" is selected at Select function for Input 2 [4] LoC: Local mode rEm: Remote mode	LoC	
			• When "Cascade control" is selected at Select function for input 2 [5] SnGL: Single control CAS: Cascade control	SnGL	
			• When "Control with PV select" is selected at Select function for input 2 [6] Inp 1: Input 1 Inp2: Input 2	Inp 1	
			• When "2-loop control/Differential temperature control" is selected at Select function for input 2 [1] 2Loop: 2-loop control dI FF: Differential temperature control	2Loop	
23	L/E	Control area Local/External transfer [7]	LoC: Local mode EXt: External mode	LoC	

Displayed in case of FZ400/900.

[1] Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

[2] Displayed when the Control action is not a Position proportioning PID control.

[3] For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

[4] For FZ400/900, this parameter is displayed when "Remote setting input" is selected in "Select function for input 2."
For FZ110, this parameter is displayed when Remote setting input is supplied.

[5] Displayed when "Cascade control" is selected in "Select function for input 2."

[6] Displayed when "Control with PV select" is selected in "Select function for input 2."
When "Switching by level" is selected at "Selection of PV select trigger," the parameter becomes display only.

[7] Displayed when "Memory area transfer (without area set signal)" is selected in DI function selection.

3.5 Setting Lock Mode [D]

No.	Symbol	Name	Data range	Factory set value	User set value
—	LoCK	Set data unlock/lock transfer	oFF: Unlock state on: Lock state	oFF	
—	LCK.LV	Set lock level	0: Unlock 1: Lock 00000 ← SV display unit SV setting mode* + Parameter select mode Operation transfer mode Parameter setting mode Setup setting mode Engineering mode Set Lock/Unlock at each digit. * Set value (SV), Interlock release and Memory area transfer (FZ110 only)	00000	
—	ARE.LK	Area lock	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0	
—	bLInd	Select Blind function	oFF: Blind function: OFF on: Blind function: ON	oFF	
—	PSL.d	Parameter select direct registration	oFF: Direct registration: OFF on: Direct registration: ON	oFF	
—	PSL01	Parameter select setting 1	0 to 303 (Screen No.) 0: No registration	0	
—	PSL02	Parameter select setting 2	0 to 303 (Screen No.) 0: No registration	0	
—	PSL03	Parameter select setting 3	0 to 303 (Screen No.) 0: No registration	0	
—	PSL04	Parameter select setting 4	0 to 303 (Screen No.) 0: No registration	0	
—	PSL05	Parameter select setting 5	0 to 303 (Screen No.) 0: No registration	0	
—	PSL06	Parameter select setting 6	0 to 303 (Screen No.) 0: No registration	0	
—	PSL07	Parameter select setting 7	0 to 303 (Screen No.) 0: No registration	0	
—	PSL08	Parameter select setting 8	0 to 303 (Screen No.) 0: No registration	0	
—	PSL09	Parameter select setting 9	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 10	Parameter select setting 10	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 11	Parameter select setting 11	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 12	Parameter select setting 12	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 13	Parameter select setting 13	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 14	Parameter select setting 14	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 15	Parameter select setting 15	0 to 303 (Screen No.) 0: No registration	0	
—	PSL 16	Parameter select setting 16	0 to 303 (Screen No.) 0: No registration	0	

Displayed in case of FZ400/900.

3.6 Memory Area Transfer Mode [E] (FZ400/900)

No.	Symbol	Name	Data range	Factory set value	User set value
14	AREA	Memory area transfer *	1 to 16	1	

Displayed in case of FZ400/900.

* For FZ110, this parameter is displayed in the Monitor & SV setting mode.
This parameter is display only (not settable) if “Memory area transfer (without area set signal)” is selected in DI function selection AND “External mode” is selected in “Control area Local/External transfer.”
Not displayed when “Memory area is not adjustable when the setting data is locked” is selected in Area lock.

3.7 Parameter Setting Mode [F]

■ Parameter group No. 00: Setting (SU)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn00	Parameter group No. 00	This is the first parameter symbol of Parameter group No. 00.	—	—
24	1. SV	Input 1_Set value (SV) ★	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
25	2. SV	Input 2_Set value (SV) [1] ★	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
26	dSV	Set value (SV) of differential temperature input [2] ★	−(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0	

Displayed in case of FZ400/900.

★ Data included in Memory area

[1] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2” AND “Differential temperature control” is selected in “2-loop control/Differential temperature control.”

■ Parameter group No. 40: Event (EU)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn40	Parameter group No. 40 [1]	This is the first parameter symbol of Parameter group No. 40.	—	—
27	EV 1	Event 1 set value (EV1) [2] Event 1 set value (EV1) [high] [2, 3] ★	Deviation: • When assigned to Input_1 or Differential temperature input −(Input 1_Input span) to +(Input 1_Input span) • When assigned to Input 2 −(Input 2_Input span) to +(Input 2_Input span) • When Control with PV select is selected at Select function for input 2. −(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.] Input value or Set value: • When assigned to Input 1 Input 1_Input range low to Input 1_Input range high • When assigned to Input 2 Input 2_Input range low to Input 2_Input range high • When assigned to Differential temperature input −(Input 1_Input span) to +(Input 1_Input span) • When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] Manipulated output value: −5.0 to +105.0 %	For Deviation, Input value and Set value: TC/RTD inputs: 10 V/I inputs: 5 % of input span For Manipulated output value: 50.0	
28	EV 1'	Event 1 set value (EV1') [low] [2, 3] ★	Deviation: • When assigned to Input_1 or Differential temperature input −(Input 1_Input span) to +(Input 1_Input span) • When assigned to Input 2 −(Input 2_Input span) to +(Input 2_Input span) • When Control with PV select is selected at Select function for input 2. −(PV select input span) to +(PV select input span) Input value or Set value: • When assigned to Input 1 Input 1_Input range low to Input 1_Input range high • When assigned to Input 2 Input 2_Input range low to Input 2_Input range high • When assigned to Differential temperature input −(Input 1_Input span) to +(Input 1_Input span) • When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: −10 V/I inputs: −5 % of input span	

★ Data included in Memory area

[1] Displayed when the Event function is valid.

[2] Displayed when Event 1 is valid.

[3] Displayed when Event 1 type is high/low with individual setting.

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
29	EV2	Event 2 set value (EV2) [1] Event 2 set value (EV2) [high] [1, 2] ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
30	EV2'	Event 2 set value (EV2') [low] [1, 2] ★	Same as Event 1 set value (EV1') [low]		
31	EV3	Event 3 set value (EV3) [3] Event 3 set value (EV3) [high] [3, 4] ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
32	EV3'	Event 3 set value (EV3') [low] [3, 4] ★	Same as Event 1 set value (EV1') [low]		
33	EV4	Event 4 set value (EV4) [5] Event 4 set value (EV4) [high] [5, 6] ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
34	EV4'	Event 4 set value (EV4') [low] [5, 6] ★	Same as Event 1 set value (EV1') [low]		

★ Data included in Memory area

[1] Displayed when Event 2 is valid.

[2] Displayed when Event 2 type is high/low with individual setting.

[3] Displayed when Event 3 is valid.

[4] Displayed when Event 3 type is high/low with individual setting.

[5] Displayed when Event 4 is valid.

[6] Displayed when Event 4 type is high/low with individual setting.

■ Parameter group No. 51: Input 1_Control (I.ConF)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn51	Parameter group No. 51	This is the first parameter symbol of Parameter group No. 51	—	—
35	I. P	Input 1_Proportional band [heat-side]	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action ★	TC/RTD inputs: 30 V/I inputs: 3.0	
36	I. I	Input 1_Integral time [heat-side] [1]	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.] ★	240	
37	I. d	Input 1_Derivative time [heat-side] [1]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.] ★	60	

★ Data included in Memory area

[1] Displayed when the "Input 1_Proportional band [heat-side]" in the same memory area is other than 0 (0.0).

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
38	1. oHH	Input 1_ON/OFF action differential gap (upper) [1]	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1	
39	1. oHL	Input 1_ON/OFF action differential gap (lower) [1]	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1	
40	1. rPr	Input 1_Control response parameter ★	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	
41	1.PArC	Input 1_Proactive intensity [2, 3] ★	0 to 4 0: No function	2	
42	1. MR	Input 1_Manual reset [2, 4] ★	−100.0 to +100.0 %	0.0	
43	1. FF	Input 1_FF amount [1, 3, 5, 6] ★	−100.0 to +100.0 %	0.0	
44	1. oLH	Input 1_Output limiter high [heat-side] [7] ★	Input 1_Output limiter low [heat-side] to 105.0 %	105.0	
45	1. oLL	Input 1_Output limiter low [heat-side] [7] ★	−5.0 % to Input 1_Output limiter high [heat-side]	−5.0	
46	1. LbA	Input 1_Control loop break alarm (LBA) time ★	0 to 7200 seconds 0: No function	LBA function is spaecified: 480 LBA function is not specified: 0	
47	1. Lbd	Input 1_LBA deadband (LBD) ★	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0	

★ Data included in Memory area

[1] Displayed when the “Input 1_Proportional band [heat-side]” in any memory area is 0 (0.0, 0.00). (Common setting in memory area)

[2] Displayed when the “Input 1_Proportional band [heat-side]” in the same memory area is other than 0 (0.0, 0.00).

[3] Displayed when the “Input 1_Integral time [heat-side]” in the same memory area is other than 0 (0.0, 0.00).

[4] Displayed when the “Input 1_Integral time [heat-side]” in the same memory area is 0 (0.0, 0.00).

[5] Displayed when Bottom suppression function is valid.

[6] Displayed when the “Input 1_Control action” is other than Position proportioning PID control.

[7] Not displayed when the “Input 1_Control action” is Position proportioning PID control AND Feedback resistance (FBR) input is not supplied.

■ Parameter group No. 52: Input 2_Control (2.Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn52	Parameter group No. 52 [1]	This is the first parameter symbol of Parameter group No. 52	—	—
48	2. P	Input 2_Proportional band [1]	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action ★	TC/RTD inputs: 30 V/I inputs: 3.0	
49	2. I	Input 2_Integral time [1, 2]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action ★ [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
50	2. d	Input 2_Derivative time [1, 2]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action ★ [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
51	2. oHH	Input 2_ON/OFF action differential gap (upper) [2, 3]	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1	
52	2. oHL	Input 2_ON/OFF action differential gap (lower) [2, 3]	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1	
53	2. rPr	Input 2_Control response parameter [1]	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid] ★	0	
54	2.PACr	Input 2_Proactive intensity [1, 2, 4]	0 to 4 0: No function ★	2	
55	2. MR	Input 2_Manual reset [1, 2, 5]	−100.0 to +100.0 % ★	0.0	
56	2. FF	Input 2_FF amount [1, 2, 4, 6]	−100.0 to +100.0 % ★	0.0	
57	2. oLH	Input 2_Output limiter high [2]	Input 2_Output limiter low to 105.0 % ★	105.0	
58	2. oLL	Input 2_Output limiter low [2]	−5.0 % to Input 2_Output limiter high ★	−5.0	
59	2. LbA	Input 2_Control loop break alarm (LBA) time [1]	0 to 7200 seconds 0: No function ★	LBA function is spaecified: 480 LBA function is not specified: 0	
60	2. Lbd	Input 2_LBA deadband (LBD) [1]	0 to Input 2_Input span [Varies with the setting of the Decimal point position.] ★	0	

Displayed in case of FZ400/900.

★ Data included in Memory area

[1] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when the “Input 2_Proportional band” in the same memory area is other than 0 (0.0, 0.00).

[3] Displayed when the “Input 2_Proportional band” in any memory area is 0 (0.0, 0.00). (Common setting in memory area)

[4] Displayed when the “Input 2_Integral time” in the same memory area is other than 0 (0.0, 0.00).

[5] Displayed when the “Input 2_Integral time” in the same memory area is 0 (0.0, 0.00).

[6] Displayed when Bottom suppression function is valid.

■ Parameter group No. 56: Input 1_Cooling control (I.CooL)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn56	Parameter group No. 56 [1]	This is the first parameter symbol of Parameter group No. 56	—	—
61	I. Pc	Input 1_Proportional band [cool-side] [1, 2] ★	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0	
62	I. Ic	Input 1_Integral time [cool-side] [1, 2] ★	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
63	I. dc	Input 1_Derivative time [cool-side] [1, 2] ★	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
64	I. db	Input 1_Overlap/Deadband [1] ★	TC/RTD inputs: −(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: −(PV select input span) to +(PV select input span)) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: −100.0 to +100.0 % of Input 1_Input span (When Control with PV select: −100.0 to +100.0 % of PV select input span) Minus (−) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0	
65	I.oLHc	Input 1_Output limiter high [cool-side] [1] ★	Input 1_Output limiter low [cool-side] to 105.0 %	105.0	
66	I. oLLc	Input 1_Output limiter low [cool-side] [1] ★	−5.0 % to Input 1_Output limiter high [cool-side]	−5.0	

★ Data included in Memory area

[1] Displayed when the “Input 1_Control action” is Heat/Cool PID control.

[2] Displayed when the “Input 1_Proportional band [heat-side]” in the same memory area is other than 0 (0.0, 0.00).

■ Parameter group No. 70: Memory area (A-EA)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn70	Parameter group No. 70	This is the first parameter symbol of Parameter group No. 70	—	—
67	TRGA	Select Trigger type for Memory area transfer ★	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0	
68	AST	Area soak time ★	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. [Data range of Area soak time can be selected on the Soak time unit.]	0:00 (0 minutes 00 seconds)	
69	LNKA	Link area number ★	0 to 16 0: No link	0	
70	1.SVRU	Input 1_Setting change rate limiter (up) ★	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0	
71	1.SVRd	Input 1_Setting change rate limiter (down) ★	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0	
72	1.A/M.A	Input 1_Auto/Manual transfer selection (Area) ★	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0	
73	1. MV.A	Input 1_Manipulated output value (Area) ★	PID control, Position proportioning PID control: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 %	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control:0.0	
74	2.SVRU	Input 2_Setting change rate limiter (up) [1] ★	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0	
75	2.SVRd	Input 2_Setting change rate limiter (down) [1] ★	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0	
76	2.A/M.A	Input 2_Auto/Manual transfer selection (Area) [2] ★	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0	
77	2. MV.A	Input 2_Manipulated output value (Area) [2] ★	−5.0 to +105.0 %	−5.0	

Displayed in case of FZ400/900.

★ Data included in Memory area

[1] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
78	R/L.A	Remote/Local transfer selection (Area) [1]	• When “Remote setting input” is selected at Select function for Input 2 [2] 0: No transfer 1: Local mode 2: Remote mode	0	
			• When “Cascade control” is selected at Select function for input 2 [3] 0: No transfer 1: Single control 2: Cascade control		
			• When “Control with PV select” is selected at Select function for input 2 [4] 0: No transfer 1: Input 1 2: Input 2		
		★	• When “2-loop control/Differential temperature control” is selected at Select function for input 2 [5] 0: No transfer 1: 2-loop control 2: Differential temperature control		

Displayed in case of FZ400/900.

★ Data included in Memory area

[1] For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: “Remote setting input,” “Cascade control,” “Control with PV select,” or “2-loop control/Differential temperature control.”
For FZ110, this parameter is displayed when Remote setting input is supplied.

[2] For FZ400/900, this parameter is displayed when “Remote setting input” is selected in “Select function for input 2.”
For FZ110, this parameter is displayed when Remote setting input is supplied.

[3] Displayed when “Cascade control” is selected in “Select function for input 2.”

[4] Displayed when “Control with PV select” is selected in “Select function for input 2.”

[5] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

3.8 Setup Setting Mode [G]

■ Setting group No. 10: Display (dSP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn 10	Setting group No. 10	This is the first parameter symbol of Setting group No. 10	—	—
79	PVCY	Display update cycle	1: 50 ms 5: 250 ms 9: 450 ms 2: 100 ms 6: 300 ms 10: 500 ms 3: 150 ms 7: 350 ms 4: 200 ms 8: 400 ms	1	

■ Setting group No. 21: Input 1 (1. InP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn21	Setting group No. 21	This is the first parameter symbol of Setting group No. 21	—	—
80	1. Pb	Input 1_PV bias	–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0	
81	1. dF	Input 1_PV digital filter	0.0 to 100.0 seconds 0.0: Filter OFF	0.0	
82	1. PR	Input 1_PV ratio	0.500 to 1.500	1.000	
83	1. PLC	Input 1_PV low input cut-off *	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00	

* This parameter is displayed when Input 1 is Voltage/Current and when Square root extraction is valid.

■ Setting group No. 22: Input 2 (2. InP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn22	Setting group No. 22 [1]	This is the first parameter symbol of Setting group No. 22	—	—
84	2. Pb	Input 2_PV bias [2] (RS bias) [3]	–(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0	
85	2. dF	Input 2_PV digital filter [2] (RS digital filter) [4]	0.0 to 100.0 seconds 0.0: Filter OFF	0.0	
86	2. PR	Input 2_PV ratio [2] (RS ratio) [5]	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999	1.000	
87	2. PLC	Input 2_PV low input cut-off [6]	0.00 to 25.00 % of Input 2_Input span	0.00	

Displayed in case of FZ400/900.

[1] Displayed on FZ400/900 with dual inputs. Not displayed when “No function” is slected in “Select function for input 2.”
For FZ110, this parameter is displayed when Remote setting input is supplied.

[2] Displayed on FZ400/900 with dual inputs. Not displayed when “No function” is slected in “Select function for input 2.”

[3] This parameter is displayed as “RS bias” on FZ400/900 if “Remote setting input” is selected in Select function for input 2.
For FZ110: Displayed as “RS bias” when Remote setting input is supplied.

[4] This parameter is displayed as “RS digital filter” on FZ400/900 if “Remote setting input” is selected in Select function for input 2.
For FZ110: Displayed as “RS digital filter” when Remote setting input is supplied.

[5] This parameter is displayed as “RS ratio” on FZ400/900 if “Remote setting input” is selected in Select function for input 2.
For FZ110: Displayed as “RS ratio” when Remote setting input is supplied.

[6] This parameter is displayed when Input 2 is Voltage/Current and when Square root extraction is valid. Not displayed when “No function” or “Remote setting input” is slected in “Select function for input 2.”

■ Setting group No. 30: Output (oUT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn30	Setting group No. 30 [1]	This is the first parameter symbol of Setting group No. 30	—	—
88	r1	OUT1 proportional cycle time [2]	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1	
89	r2	OUT2 proportional cycle time [3]	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2	
90	r3	OUT3 proportional cycle time [4]	0.1 to 100.0 seconds	Voltage pulse output: Note3	
91	Mr1	OUT1 minimum ON/OFF time of proportional cycle [2]	0 to 1000 ms	0	
92	Mr2	OUT2 minimum ON/OFF time of proportional cycle [3]	0 to 1000 ms	0	
93	Mr3	OUT3 minimum ON/OFF time of proportional cycle [4]	0 to 1000 ms	0	

Note1: In case OUT1 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

Note3: In case OUT3 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

[1] Displayed when any one of OUT1 to OUT3 is Relay contact output, Voltage pulse output or Transistor output.

[2] Displayed when OUT1 is Relay contact output, Voltage pulse output or Transistor output.

[3] Displayed when OUT2 is Relay contact output, Voltage pulse output or Transistor output.

[4] Displayed when OUT3 is supplied and “Universal output type selection” is “Voltage pulse output.”

■ Setting group No. 45: Heater break alarm 1 (HbA1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn45	Setting group No. 45	This is the first parameter symbol of Setting group No. 45	—	—
94	HbA1	Heater break alarm 1 (HBA1) set value [1, 2]	0.0 to 100.0 A 0.0: HBA function OFF	0.0	
95	HbC1	Number of heater break alarm 1 (HBA1) delay times [1]	0 to 255 times	5	

[1] Displayed when Current transformer (CT) input is supplied. Not displayed in the following cases.
- CT1 assignment is “None.”
- The output type of CT1 assignment is Current output or Continuous voltage output.

[2] For FZ400/900: Current transformer 1 (CT1) input is displayed on the MV display.

■ Setting group No. 46: Heater break alarm 2 (HbA2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn46	Setting group No. 46	This is the first parameter symbol of Setting group No. 46	—	—
96	HbA2	Heater break alarm 2 (HBA2) set value [1, 2]	0.0 to 100.0 A 0.0: HBA function OFF	0.0	
97	HbC2	Number of heater break alarm 2 (HBA2) delay times [1]	0 to 255 times	5	

Displayed in case of FZ400/900.

[1] Displayed when two Current transformer (CT) inputs are supplied. Not displayed in the following cases.
- CT2 assignment is “None.”
- The output type of CT2 assignment is Current output or Continuous voltage output.

[2] For FZ400/900: Current transformer 2 (CT2) input is displayed on the MV display.

■ Setting group No. 51: Input 1_Control (I.Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn51	Setting group No. 51	This is the first parameter symbol of Setting group No. 51	—	—
98	I. MMV	Input 1_Manual manipulated output value [1]	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control [2]: −(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control: 0.0	
99	I.LEV 1	Input 1_Level PID setting 1 [3, 4]	Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high (Control with PV select: PV select input range high)	
100	I.LEV2	Input 1_Level PID setting 2 [3, 4]	Same as Input 1_Level PID setting 1		
101	I.LEV3	Input 1_Level PID setting 3 [3, 4]	Same as Input 1_Level PID setting 1		
102	I.LEV4	Input 1_Level PID setting 4 [3, 4]	Same as Input 1_Level PID setting 1		
103	I.LEV5	Input 1_Level PID setting 5 [3, 4]	Same as Input 1_Level PID setting 1		
104	I.LEV6	Input 1_Level PID setting 6 [3, 4]	Same as Input 1_Level PID setting 1		
105	I.LEV7	Input 1_Level PID setting 7 [3, 4]	Same as Input 1_Level PID setting 1		

[1] Not displayed on a Position proportioning PID controller without Feedback resistor (FBR).

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

(1) Input 1_Output limiter high [cool-side] is ≤ 0.0 %
- Input 1_Output limiter low [heat-side] is ≤ 0.0 %: 0.0 % to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is > 0.0 %: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is ≤ 0.0 %
- Input 1_Output limiter low [cool-side] is ≤ 0.0 %: −(Input 1_Output limiter high [cool-side]) to 0.0 %
- Input 1_Output limiter low [cool-side] is > 0.0 %: −(Input 1_Output limiter high [cool-side]) to −(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0% in the following cases:
Input 1_Output limiter high [cool-side] ≤ 0.0 %, AND Input 1_Output limiter high [heat-side] ≤ 0.0 %

[3] Displayed when Input 1 is with Level-PID AND any code other than “Cascade control” is selected in Select function for input 2.

[4] Input 1_Level PID settings 1 to 7 always maintain the following relation.
(Input 1_Level PID setting 1) ≤ (Input 1_Level PID setting 2) ≤ (Input 1_Level PID setting 3) ≤ (Input 1_Level PID setting 4) ≤ (Input 1_Level PID setting 5) ≤ (Input 1_Level PID setting 6) ≤ (Input 1_Level PID setting 7)

■ Setting group No. 52: Input 2_Control (2.Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn52	Setting group No. 52 [1]	This is the first parameter symbol of Setting group No. 52	—	—
106	2. MMV	Input 2_Manual manipulated output value [1]	Input 2_Output limiter low to Input 2_Output limiter high	–5.0	
107	2.LEV 1	Input 2_Level PID setting 1 [2, 3]	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_ Input range high	
108	2.LEV2	Input 2_Level PID setting 2 [2, 3]	Same as Input 2_Level PID setting 1		
109	2.LEV3	Input 2_Level PID setting 3 [2, 3]	Same as Input 2_Level PID setting 1		
110	2.LEV4	Input 2_Level PID setting 4 [2, 3]	Same as Input 2_Level PID setting 1		
111	2.LEV5	Input 2_Level PID setting 5 [2, 3]	Same as Input 2_Level PID setting 1		
112	2.LEV6	Input 2_Level PID setting 6 [2, 3]	Same as Input 2_Level PID setting 1		
113	2.LEV7	Input 2_Level PID setting 7 [2, 3]	Same as Input 2_Level PID setting 1		

Displayed in case of FZ400/900.

[1] Displayed if “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

[2] Displayed when Input 2 is with Level-PID AND “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

[3] Input 2_Level PID settings 1 to 7 always maintain the following relation.
(Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)

■ Setting group No. 53: Input 1_Tuning (1.TUnE)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn53	Setting group No. 53	This is the first parameter symbol of Setting group No. 53	—	—
114	1. AT b	Input 1_AT bias	–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0	
115	1.ATTM	Input 1_AT remaining time monitor	0 hours 00 minutes to 48 hours 00 minutes	—	—
116	1.TUNE	Input 1_AT/ST status monitor	0: AT/ST complete 1: AT running now 2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—	—

■ Setting group No. 54: Input 2_Tuning (2.TUnE)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn54	Setting group No. 54 *	This is the first parameter symbol of Setting group No. 54	—	—
117	2. AT b	Input 2_AT bias *	−(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0	
118	2.ATTM	Input 2_AT remaining time monitor *	0 hours 00 minutes to 48 hours 00 minutes	—	—
119	2.TUNE	Input 2_AT/ST status monitor *	0: AT/ST complete 1: AT running now 2: ST running now −1: Aborted. Setting changed. −2: Aborted. Abnormal input. −3: Aborted. Timeout. −4: Aborted. Abnormal calculated values.	—	—

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

■ Setting group No. 55: Position proportioning control (PoSI T)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn55	Setting group No. 55 *	This is the first parameter symbol of Setting group No. 55	—	—
120	Ydb	Open/Close output neutral zone *	0.1 to 10.0 % of output	2.0	
121	YHS	Open/Close output differential gap *	0.1 to 5.0 % of output	1.0	

* Displayed when the control action is Position proportioning PID control.

■ Setting group No. 57: Proactive (PACT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn57	Setting group No. 57	This is the first parameter symbol of Setting group No. 57	—	—
122	FFST	FF amount learning [1]	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0	
123	1.EXdJ	Input 1_Determination point of external disturbance	−(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: −(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	−1	
124	2.EXdJ	Input 2_Determination point of external disturbance [2]	−(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	−1	

Displayed in case of FZ400/900.

[1] Displayed when Bottom suppression function is valid.

[2] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Setting group No. 58: 2-input function (2PU)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn58	Setting group No. 58 [1, 2]	This is the first parameter symbol of Setting group No. 58	—	—
125	MAS.P	Cascade_Proportional band (master-side) [1]	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0	
126	MAS.I	Cascade_Integral time (master-side) [1]	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
127	MAS.d	Cascade_Derivative time (master-side) [1]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
128	SLV.P	Cascade_Proportional band (slave-side) [1]	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0	
129	SLV.I	Cascade_Integral time (slave-side) [1]	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
130	SLV.d	Cascade_Derivative time (slave-side) [1]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
131	C.dF	Cascade_Digital filter [1]	0.0 to 100.0 seconds 0.0: Filter OFF	10.0	
132	C.SCH	Cascade_Scale high [1]	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_ Setting limiter high	
133	C.SCL	Cascade_Scale low [1]	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_ Setting limiter low	
134	2PV.LV	PV select transfer level [2]	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_ Input range high	
135	2PV.TM	PV select transfer time [2]	0.0 to 100.0 seconds	0.0	

Displayed in case of FZ400/900.

[1] Displayed when “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when “Control with PV select” is selected in “Select function for input 2.”

■ Setting group No. 91: System (SYS)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Sn91	Setting group No. 91	This is the first parameter symbol of Setting group No. 91	—	—
136	1.PHLd	Input 1_Peak hold monitor	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
137	1.bHLd	Input 1_Bottom hold monitor	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
138	1.HLdR	Input 1_Hold reset	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd	—
139	2.PHLd	Input 2_Peak hold monitor *	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
140	2.bHLd	Input 2_Bottom hold monitor *	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
141	2.HLdR	Input 2_Hold reset *	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd	—

Displayed in case of FZ400/900.

* This parameter is displayed when any of the following is selected in Select function for input 2: “Cascade control,” “Control with PV select,” “2-loop control/Differential temperature control” or “Input circuit error alarm.”

3.9 Engineering Mode [H]

⚠ WARNING

Parameters in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the parameters in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.

NOTE

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

■ Function block No. 10: Display (dSP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn 10	Function block No. 10	This is the first parameter symbol of Function block No. 10	—	—
142	SPCH	STOP display selection	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display * * Selectable only for FZ400/900.	1	
143	ALC	ALM lamp lighting condition	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255	
144	dSoP	PV flashing display at input error	0: Flashing display 1: Non-flashing display	0	
145	I.dS.SV	Show/Hide Input 1_SV	0: Hide Input 1_SV 1: Show Input 1_SV	1	
146	2.dS.SV	Show/Hide Input 2_SV [1]	0: Hide Input 2_SV 1: Show Input 2_SV	1	
147	I.dS.MV	Show/Hide Input 1_MV	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1	
148	2.dS.MV	Show/Hide Input 2_MV [2]	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1	

Displayed in case of FZ400/900.

[1] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
149	d5.MoN	Select hide items in Monitor mode	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Current transformer (CT) input value monitor +8: Comprehensive event state +16: Memory area soak time To select two or more functions, sum each value.	0	
150	d5.Mod	Select hide items in Operation transfer mode	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0	

■ Function block No. 11: Key operation (KEY)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn 11	Function block No. 11	This is the first parameter symbol of Function block No. 11	—	—
151	SET.KY	Data registration	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0	
152	FN.KY	FUNC key assignment	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data unlock/lock transfer 15: Area jump	1	
153	FN.TYP	FUNC key operation selection	0: Press once The function set at “FUNC key assignment” is activated upon a press of the FUNC key. 1: Press and hold The function set at "FUNC key assignment" is activated by holding the FUNC key pressed.	0	

Displayed in case of FZ400/900.

■ Function block No. 21: Input 1 (1. 1nP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn21	Function block No. 21	This is the first parameter symbol of Function block No. 21	—	—
154	1. 1NP	Input 1_Input type	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as the input type of the input range code specified at the time of order.	
155	1.UNIT	Input 1_Display unit [1]	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.	
156	1.PGdP	Input 1_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 to 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1	
157	1.PGSH	Input 1_Input range high	(Input 1_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0	
158	1.PGSL	Input 1_Input range low	Input 1_Minimum value of input range to (Input 1_Input range high − 1 digit) [Varies with the setting of the Decimal point position.]	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0	
159	1. PoV	Input 1_Input error determination point (high)	Input 1_Input error determination point (low) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high + (Input 1_5 % of input span)	
160	1. PUN	Input 1_Input error determination point (low)	Input 1_Input range low − (Input 1_5 % of input span) * to Input 1_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: −245.5 °C [−409.8 °F], JPt100: −237.6 °C [−395.7 °F])	Input 1_ Input range low − (Input 1_5 % of input span)	
161	1.rCJC	Input 1_Temperature compensation calculation [2]	0: No temperature compensation calculation 1: With temperature compensation calculation	1	
162	1. boS	Input 1_Burnout direction [3]	0: Upscale 1: Downscale	0	

[1] Displayed when “Input 1_Input type” is either Thermocouple (TC) or RTD.

[2] Displayed when “Input 1_Input type” is Thermocouple (TC).

[3] Displayed when “Input 1_Input type” is Thermocouple (TC) or Low voltage input (0 to 100 mV DC and 0 to 10 mV DC).

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
163	I. SQR	Input 1_Square root extraction [1]	0: Unused 1: Used	0	
164	I. INV	Input 1_Inverting input [1]	0: Unused 1: Used	0	
165	INDT	Input data type	0: Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication digits: 6 * Modbus: Single word ** PLC communication: Single word * Set “2” to handle the data of REX-D and its equivalent models in RKC communication. ** The data of the FB series and its equivalent are included. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Conforms to Input range code to specified at the time of ordering	

[1] Displayed when Input 1 is Voltage (V)/Current (I).

■ Function block No. 22: Input 2 (2. InP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn22	Function block No. 22 [1]	This is the first parameter symbol of Function block No. 22	—	—
166	2. INP	Input 2_Input type [1, 2]	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC ・ When Measured Input 2 is selected for FZ400/900: 0 to 24 ・ When Remote setting input is selected for FZ400/900: 15 to 24 ・ When Remote setting input is selected for FZ110: 15 to 22	Same as Input 1_ Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17	
167	2.UNIT	Input 2_Display unit [2, 3, 4]	0: °C 1: °F	Same as Input 1_ Display unit	
168	2.PGdP	Input 2_Decimal point position [2, 4]	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 to 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: For Input data type is 0: 0 to 4 For Input data type is 1: 0 to 3	Same as Input 1_ Decimal point position	
169	2.PGSH	Input 2_Input range high [1]	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1 digit) to Input 2_Maximum value of input range Voltage (V)/Current (I) Inputs (For Remote setting input): (Input 2_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	Same as Input 1_ Input range high	
170	2.PGSL	Input 2_Input range low [1]	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high − 1 digit) Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to (Input 2_Input range high − 1 digit) [Varies with the setting of the Decimal point position.]	Same as Input 1_ Input range low	

Displayed in case of FZ400/900.

[1] For FZ400/900, this parameter is displayed when Remote setting input or Measured input 2 is supplied.
For FZ110, this parameter is displayed when Remote setting input is supplied.

[2] Not displayed when "No function" is selected in "Select function for input 2."

[3] Displayed when Input 2 is either Thermocouple (TC) or RTD.

[4] Not settable when Remote setting input or Control with PV select is selected.

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
171	2. PoV	Input 2_Input error determination point (high) [1]	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 2_ Input range high + (Input 2_ 5 % of input span)	
172	2. PUN	Input 2_Input error determination point (low) [1]	Input 2_Input range low − (Input 2_5 % of input span) * to Input 2_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 2 is RTD, low limit value is about 2 Ohms. (Pt100: −245.5 °C [−409.8 °F], JPt100: −237.6 °C [−395.7 °F])	Input 2_ Input range low − (Input 2_ 5 % of input span)	
173	2.rCJC	Input 2_Temperature compensation calculation [2, 3]	0: No temperature compensation calculation 1: With temperature compensation calculation	1	
174	2. boS	Input 2_Burnout direction [2, 4]	0: Upscale 1: Downscale	0	
175	2. SQR	Input 2_Square root extraction [1, 5]	0: Unused 1: Used	0	
176	2. INV	Input 2_Inverting input [1, 5]	0: Unused 1: Used	0	

Displayed in case of FZ400/900.

[1] Not displayed when “No function” or “Remote setting input” is selected in “Select function for input 2.”

[2] Not displayed when “No function” is selected in “Select function for input 2.”

[3] Displayed when Input 2 is either Thermocouple (TC) or RTD.

[4] Displayed when Input 2 is Thermocouple (TC) or Low voltage input (0 to 100 mV DC and 0 to 10 mV DC).

[5] Displayed when Input 2 is Voltage (V)/Current (I).

■ Function block No. 23: Digital input (dI)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn23	Function block No. 23 [1]	This is the first parameter symbol of Function block No. 23	—	—
177	dI SL 1	DI1 function selection [1]	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer 5: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, without area set signal) 16: Memory area transfer (8 points, without area set signal) 17: Memory area transfer (8 points, with area set signal) 18: Memory area transfer (16 points, without area set signal) 19: Memory area transfer (16 points, with area set signal) 20: Area jump	Based on Model code	
178	dI SL2	DI2 function selection [2]	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
179	dI SL3	DI3 function selection [2]	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
180	dI SL4	DI4 function selection [3]	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
181	dI SL5	DI5 function selection [4]	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
182	dI SL6	DI6 function selection [4]	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
183	dI INV	DI logic invert [1]	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0	
184	dI TIM	Area switching time [1] (without area set signal)	1 to 5 seconds	2	

Displayed in case of FZ400/900.

[1] Displayed when Digital input function is supplied.

[2] Displayed when Digital input function is supplied. For FZ110: Displayed when three Digital inputs (DI) are supplied.

[3] Displayed when Digital input function is supplied. (FZ400/900 only)

[4] Displayed when six Digital inputs (DI) are supplied. (FZ400/900 only)

■ Function block No. 30: Output (oUT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn30	Function block No. 30	This is the first parameter symbol of Function block No. 30	—	—
185	oSL1	OUT1 function selection [1]	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, HBA, LBA, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	Based on Model code	
186	oSL2	OUT2 function selection [2]	Same as OUT1 function selection	Based on Model code	
187	oSL3	OUT3 function selection [3]	Same as OUT1 function selection	4	
188	oLG1	OUT1 logic calculation selection [1]	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0	
189	oLG2	OUT2 logic calculation selection [2]	Same as OUT1 logic calculation selection	Based on Model code	
190	oLG3	OUT3 logic calculation selection [3]	Same as OUT1 logic calculation selection	0	
191	ExC	Energized/De-energized selection	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0	
192	ILS	Interlock selection	0 to 4095 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0	

[1] Displayed when OUT1 is supplied.

[2] Displayed when OUT2 is supplied.

[3] Displayed when OUT3 is supplied.

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
193	SS	Output action at control stop	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0	
194	UNI o	Universal output type selection (OUT3) *	0: Voltage pulse output 1: Current output (4 to 20 mA DC) 2: Current output (0 to 20 mA DC)	1	

* Displayed when OUT3 is supplied.

■ Function block No. 31: Retransmission output 1 (Ao 1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn31	Function block No. 31 *	This is the first parameter symbol of Function block No. 31	—	—
195	Ao1	Retransmission output 1 type *	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Current transformer 1 (CT1) input value 14: Current transformer 2 (CT2) input value 15: Measured value (PV) of differential temperature input	0	
196	AHS1	Retransmission output 1 scale high *	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: −(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: −5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high (Control with PV select: PV select input range high) Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 100.0 Measured value (PV) of differential temperature input: 100	

* Displayed when OUT1 type is Current output or Continuous voltage output.

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No.	Symbol	Name	Data range	Factory set value	User set value
197	AL51	Retransmission output 1 scale low *	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: −(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: −5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) Input 1_Deviation: −(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: −(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 0.0 Measured value (PV) of differential temperature input: −100	

* Displayed when OUT1 type is Current output or Continuous voltage output.

■ Function block No. 32: Retransmission output 2 (Ao2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn32	Function block No. 32 *	This is the first parameter symbol of Function block No. 32	—	—
198	Ao2	Retransmission output 2 type *	Same as Retransmission output 1 type	0	
199	AHS2	Retransmission output 2 scale high *	Same as Retransmission output 1 scale high		
200	AL52	Retransmission output 2 scale low *	Same as Retransmission output 1 scale low		

* Displayed when OUT2 type is Current output or Continuous voltage output.

■ Function block No. 33: Retransmission output 3 (Ao3)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn33	Function block No. 33 *	This is the first parameter symbol of Function block No. 33	—	—
201	Ao3	Retransmission output 3 type *	Same as Retransmission output 1 type	1	
202	AHS3	Retransmission output 3 scale high *	Same as Retransmission output 1 scale high		
203	AL53	Retransmission output 3 scale low *	Same as Retransmission output 1 scale low		

* Displayed when OUT3 is supplied and “Universal output type selection” is “Current output.”

■ Function block No. 34: Digital output (do)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn34	Function block No. 34 [1]	This is the first parameter symbol of Function block No. 34	—	—
204	doSL1	DO1 function selection [1]	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output	Based on Model code	
205	doSL2	DO2 function selection [2]	Same as DO1 function selection	Based on Model code	
206	doSL3	DO3 function selection [3]	Same as DO1 function selection	Based on Model code	
207	doSL4	DO4 function selection [3]	Same as DO1 function selection	Based on Model code	
208	doLG1	DO1 logic calculation selection [1]	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	Based on Model code	
209	doLG2	DO2 logic calculation selection [2]	Same as DO1 logic calculation selection	Based on Model code	
210	doLG3	DO3 logic calculation selection [3]	Same as DO1 logic calculation selection	Based on Model code	
211	doLG4	DO4 logic calculation selection [3]	Same as DO1 logic calculation selection	Based on Model code	

Displayed in case of FZ400/900.

[1] Displayed when Digital output (DO) is supplied.

[2] For FZ400/900, this parameter is displayed when four Digital outputs (DO) are supplied.
For FZ110, this parameter is displayed when two Digital outputs (DO) are supplied.

[3] Displayed when four Digital outputs (DO) are supplied.

■ Function block No. 41: Event 1 (EH1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn41	Function block No. 41	This is the first parameter symbol of Function block No. 41	—	—
212	EVA1	Event 1 assignment *	1: Input 1 2: Input 2 3: Differential temperature input	1	
213	ES1	Event 1 type	0: None 1: Deviation high (Using SV monitor value) [a] 2: Deviation low (Using SV monitor value)[a] 3: Deviation high/low (Using SV monitor value) [a] 4: Band (Using SV monitor value) [a] 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] [a] 6: Band (Using SV monitor value) [High/Low individual setting] [a] 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high [b] 10: Process low [b] 11: Deviation high (Using local SV) [a] 12: Deviation low (Using local SV) [a] 13: Deviation high/low (Using local SV) [a] 14: Band (Using local SV) [a] 15: Deviation high/low (Using local SV) [High/Low individual setting] [a] 16: Band (Using local SV) [High/Low individual setting] [a] 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] [b, c] 20: MV low [heat-side] [b, c] 21: MV high [cool-side] [b] 22: MV low [cool-side] [b] 23: Process high/low [High/Low individual setting] [b] 24: Process band [High/Low individual setting] [b] [a] Event hold and re-hold action is available. [b] Event hold action is available. [c] When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1	
214	EHo1	Event 1 hold action	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0	
215	EH1	Event 1 differential gap	Deviation, Process and SV: • If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) • If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2	
216	EVT1	Event 1 timer	0.0 to 600.0 seconds	0.0	

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 42: Event 2 (EH2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn42	Function block No. 42	This is the first parameter symbol of Function block No. 42	—	—
217	EvA2	Event 2 assignment *	Same as Event 1 assignment		
218	ES2	Event 2 type	Same as Event 1 type		
219	EHo2	Event 2 hold action	Same as Event 1 hold action		
220	EH2	Event 2 differential gap	Same as Event 1 differential gap		
221	Evr2	Event 2 timer	Same as Event 1 timer		

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 43: Event 3 (EH3)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn43	Function block No. 43	This is the first parameter symbol of Function block No. 43	—	—
222	EvA3	Event 3 assignment *	Same as Event 1 assignment		
223	ES3	Event 3 type	Same as Event 1 type		
224	EHo3	Event 3 hold action	Same as Event 1 hold action		
225	EH3	Event 3 differential gap	Same as Event 1 differential gap		
226	Evr3	Event 3 timer	Same as Event 1 timer		

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 44: Event 4 (EH4)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn44	Function block No. 44	This is the first parameter symbol of Function block No. 44	—	—
227	EvA4	Event 4 assignment *	Same as Event 1 assignment		
228	ES4	Event 4 type	Same as Event 1 type		
229	EHo4	Event 4 hold action	Same as Event 1 hold action		
230	EH4	Event 4 differential gap	Same as Event 1 differential gap		
231	Evr4	Event 4 timer	Same as Event 1 timer		

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 45: CT1 (CT 1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn45	Function block No. 45 *	This is the first parameter symbol of Function block No. 45	—	—
232	CTA1	CT1 assignment *	0: None 1: OUT1 2: OUT2 3: OUT3	1	
233	CTt1	CT1 type *	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code	
234	CTR1	CT1 ratio *	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000	
235	CLC1	CT1 low input cut-off *	0.0 to 1.0 A	0.0	

* Displayed when Current transformer (CT) input is supplied.

■ Function block No. 46: CT2 (CT2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn46	Function block No. 46 *	This is the first parameter symbol of Function block No. 46	—	—
236	CTA2	CT2 assignment *	0: None 1: OUT1 2: OUT2 3: OUT3	Based on Model code	
237	CTt2	CT2 type *	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code	
238	CTR2	CT2 ratio *	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000	
239	CLC2	CT2 low input cut-off *	0.0 to 1.0 A	0.0	

Displayed in case of FZ400/900.

* Displayed when two Current transformer (CT) inputs are supplied.

■ Function block No. 50: Control (conF)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn50	Function block No. 50	This is the first parameter symbol of Function block No. 50	—	—
240	Pd	Hot/Cold start	0: Hot start 1 1: Hot start 2 2: Cold start 3: STOP start	0	
241	MVrS	Manual manipulated output value selection	0: The last manipulated output value (Balanceless-bumpless function) 1: Manual manipulated output value	0	
242	trK	SV tracking	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/ Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1	
243	IddP	Integral/Derivative time decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places	0	
244	SrS	ST start condition	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0	

■ Function block No. 51: Input 1_Control (I.ConF)

No.	Symbol	Name	Data range	Factory set value	User set value
—	FnS1	Function block No. 51	This is the first parameter symbol of Function block No. 51	—	—
245	I. oS	Input 1_Control action	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.	
246	I. oRU	Input 1_Output change rate limiter (up) [heat-side] [1]	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
247	I. oRd	Input 1_ Output change rate limiter (down) [heat-side] [1]	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
248	I.AoVE	Input 1_Action (high) input error	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
249	I.AUNE	Input 1_Action (low) input error	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
250	I. PSM	Input 1_Manipulated output value at input error	PID control, Position proportioning PID control: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 %	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control: 0.0	
251	I. RMV	Input 1_ Manipulated output value at STOP [heat-side]	−5.0 to +105.0 %	−5.0	
252	I. PdA	Input 1_Start determination point	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 1_Input span (Control with PV select: 3 % of PV select input span)	
253	I.LPI d	Input 1_Level PID action selection [2]	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0	
254	I. LHS	Input 1_Level PID differential gap [2]	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span)	

[1] Not displayed when Control action is Position proportioning PID action.

[2] Displayed when any code other than “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 52: Input 2_Control (2.Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn52	Function block No. 52 [1]	This is the first parameter symbol of Function block No. 52	—	—
255	2. oS	Input 2_Control action [1]	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action)	Same as Input 1_ Control action	
256	2. oRU	Input 2_Output change rate limiter (up) [2]	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
257	2. oRd	Input 2_Output change rate limiter (down) [2]	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
258	2.AoVE	Input 2_Action (high) input error [2]	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 2_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 2_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
259	2.AUNE	Input 2_Action (low) input error [2]	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 2_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 2_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
260	2. PSM	Input 2_Manipulated output value at input error [2]	−5.0 to +105.0 %	−5.0	
261	2. RMV	Input 2_Manipulated output value at STOP [2]	−5.0 to +105.0 %	−5.0	
262	2. PdA	Input 2_Start determination point [1]	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 2_Input span	
263	2.LPI d	Input 2_Level PID action selection [2]	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0	
264	2. LHS	Input 2_Level PID differential gap [2]	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 2_input span	

Displayed in case of FZ400/900.

[1] Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

[2] Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

■ Function block No. 55: Position proportioning control (PoSI r)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn55	Function block No. 55 [1]	This is the first parameter symbol of Function block No. 55	—	—
265	YbR	Action at feedback resistance (FBR) input error [1, 2]	0: Action depending on the value action at STOP 1: Control action continued	0	
266	PoS	Feedback adjustment [1, 2]	When the <MODE key is pressed and held for 5 seconds, Feedback adjustment is automatically started. AdJ: Adjustment end oPEn: During adjustment on the open-side CLoSE: During adjustment on the close-side Err: Adjustment error	AdJ	—
267	MoT	Control motor time [1]	5 to 1000 seconds	10	
268	oLA	Integrated output limiter [1]	0.0 to 200.0 % of control motor time 0.0: OFF	150.0	
269	VAL	Valve action at STOP [1]	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0	
270	YASo	Action at saturated output [1, 2]	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0	

Displayed in case of FZ400/900.

[1] Displayed when the Control action is a Position proportioning PID control.

[2] Displayed when a Feedback resistance (FBR) input is supplied.

■ Function block No. 56: Input 1_Cooling control (I.CooL)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn56	Function block No. 56 *	This is the first parameter symbol of Function block No. 56	—	—
271	I.oRUc	Input 1_Output change rate limiter (up) [cool-side] *	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
272	I.oRdc	Input 1_Output change rate limiter (down) [cool-side] *	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
273	I.RMVc	Input 1_Manipulated output value at STOP [cool-side] *	–5.0 to +105.0 %	–5.0	
274	US	Undershoot suppression factor *	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000	
275	dbPA	Overlap/Deadband reference point *	0.0 to 1.0	0.0	

* Displayed when the Control action is Heat/Cool PID control.

■ Function block No. 57: Proactive (PACT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn57	Function block No. 57 *	This is the first parameter symbol of Function block No. 57	—	—
276	bTMSP	Bottom suppression function *	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0	

* Displayed when the Control action is other than Position proportioning PID control.

■ Function block No. 58: 2-input function (2PID)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn58	Function block No. 58 [1]	This is the first parameter symbol of Function block No. 58	—	—
277	2PIn	Select function for input 2 [1]	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1	
278	MAS.AT	Cascade_AT mode (master-side) [2]	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1	
279	SLV.AT	Cascade_AT mode (slave-side) [2]	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1	
280	2PV.TG	Selection of PV select trigger [3]	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0	
281	ICA	Input circuit error alarm set value [4]	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	

Displayed in case of FZ400/900.

[1] For FZ400/900, this parameter is displayed when Remote setting input or Measured input 2 ** is supplied.
For FZ110, this parameter is displayed when Remote setting input is supplied.

** Even if Measured input 2 is specified at the time of order, the Remote setting input can be selected later. In this case, thermocouple (TC) or RTD can be selected as a Remote setting input type. (If Remote setting input is specified, selecting a thermocouple or an RTD is not available.)

[2] Displayed when “Cascade control” is selected in “Select function for input 2.”

[3] Displayed when “Control with PV select” is selected in “Select function for input 2.”

[4] Displayed when “Input circuit error alarm” is selected in “Select function for input 2.”

■ Function block No. 60: Communication (SCI)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn60	Function block No. 60 *	This is the first parameter symbol of Function block No. 60	—	—
282	CMPS	Communication protocol *	0: RKC communication 1: Modbus (Order of data transfer: upper word to lower word) 2: Modbus (Order of data transfer: lower word to upper word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA-compatible 3C frame [format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory preset value. With communication, communication protocol not specified: 0	
283	Add	Device address *	RKC communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	RKC communication: 0 Modbus: 1 PLC communication: 0	
284	bPS	Communication speed *	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3	
285	bIT	Data bit configuration *	0 to 11 Refer to Data bit configuration table	0	
286	INT	Interval time *	0 to 250 ms	10	
287	CMRM	Communication response monitor *	0000 ← SV display unit Communication response monitor 0: Normal response 1: Overrun error 2: Parity error 4: Framing error 8: Receive buffer overflow If two or more errors occur, the error values are summed up. Errors are displayed in the hexadecimal format (0 to F). 0 (fixed) Reception status monitor * Transmission status monitor * * Each time signal is sent or received, 0 and 1 are displayed in turns. Lights off	—	—

* Displayed when Communication function is supplied.

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

■ Function block No. 62: PLC communication (nAP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn62	Function block No. 62 [1]	This is the first parameter symbol of Function block No. 62	—	—
288	MP.REG	Register type [1]	Mitsubishi PLC 0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.)	0	
289	MP.SRH	Register start number (High-order 4-bit) [1]	0 to 15	0	
290	MP.SRL	Register start number (Low-order 16-bit) [1]	0 to 65535	1000	
291	MP.Mod	Monitor item register bias [1]	12 to 65535	12	
292	MP.SRb	Setting item register bias [1]	0 to 65535	0	
293	MP.LRM	Instrument link recognition time [1]	0 to 255 seconds	5	
294	MP.RMo	PLC response waiting time [1]	0 to 3000 ms	255	
295	MP.SRM	PLC communication start time [1]	1 to 255 seconds	5	
296	MP.SLb	Slave register bias [1]	0 to 65535	80	
297	MP.MAd	Number of recognizable devices [1]	0 to 30	8	

[1] Displayed when both Communication function and PLC communication protocol are supplied.

■ Function block No. 70: Memory area (AreA)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn70	Function block No. 70	This is the first parameter symbol of Function block No. 70	—	—
298	SVRT	Setting change rate limiter unit time	1 to 3600 seconds	60	
299	SrdP	Soak time unit	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 0 minutes 0 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1	

■ Function block No. 71: Input 1_Setting limiter (I. SHL)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn71	Function block No. 71	This is the first parameter symbol of Function block No. 71	—	—
300	I. SLH	Input 1_Setting limiter high	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select Input 1_Setting limiter low to PV select input range high) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high (Control with PV select: PV select input range high)	
301	I. SLL	Input 1_Setting limiter low	Input 1_Input range low to Input 1_Setting limiter high (When Control with PV select PV select input range low to Input 1_Setting limiter high) [Varies with the setting of the Decimal point position.]	Input 1_ Input range low (Control with PV select: PV select input range low)	

■ Function block No. 72: Input 2_Setting limiter (2. SHL)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn72	Function block No. 72 *	This is the first parameter symbol of Function block No. 72	—	—
302	2. SLH	Input 2_Setting limiter high *	Input 2_Setting limiter low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_ Input range high	
303	2. SLL	Input 2_Setting limiter low *	Input 2_Input range low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_ Input range low	

Displayed in case of FZ400/900.

* Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

■ Function block No. 91: System (SYS)

No.	Symbol	Name	Data range	Factory set value	User set value
—	Fn91	Function block No. 91	This is the first parameter symbol of Function block No. 91	—	—
—	dEF	Initialization	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0	—
—	WT	Integrated operating time	0 to 65535 hours	—	—
—	TCJ	Peak hold monitor of ambient temperature	−120 to +120 °C	—	—
—	RoM	ROM version	The installed ROM version is displayed	—	—
—	FZ900	Model code monitor	Model code is displayed. Use the UP or DOWN key to scroll the display horizontally (left or right).	—	—
—	00000 The serial number of the instrument is displayed.	Instrument number monitor	Instrument number is displayed.	—	—

PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED

4

This chapter describes the parameters that are initialized/modified when setting is changed.

4.1 Parameters to Be Initialized 4-2

4.2 Parameters to Be Automatically Converted..... 4-20

4.1 Parameters to Be Initialized

Changing any of the following parameters will require initialization * of the related settings.

* Settings are reset to the factory preset values. Some parameters may not be set to a factory preset value (such as change of input type).

NOTE

Make sure all settings are recorded before changing the set values.

NOTE

Check all set values after having changed the settings.

			See page
• Select function for input 2	Engineering Mode	Function block No. 58	4-3
• Input 1_Input type	Engineering Mode	Function block No. 21	4-6
• Input 1_Display unit	Engineering Mode	Function block No. 21	4-6
• Input 1_Decimal point position	Engineering Mode	Function block No. 21	4-9
• Input 2_Input type	Engineering Mode	Function block No. 22	4-10
• Input 2_Display unit	Engineering Mode	Function block No. 22	4-10
• Input 1_Control action	Engineering Mode	Function block No. 51	4-12
• Open/Close output neutral zone	Setup Setting Mode	Setting group No. 55	4-13
• OUT1 function selection	Engineering Mode	Function block No. 30	4-13
• OUT2 function selection	Engineering Mode	Function block No. 30	4-13
• OUT3 function selection	Engineering Mode	Function block No. 30	4-14
• Universal output type selection	Engineering Mode	Function block No. 30	4-14
• Retransmission output 1 type	Engineering Mode	Function block No. 31	4-14
• Retransmission output 2 type	Engineering Mode	Function block No. 32	4-15
• Retransmission output 3 type	Engineering Mode	Function block No. 33	4-15
• Event 1 type	Engineering Mode	Function block No. 41	4-15
• Event 1 assignment	Engineering Mode	Function block No. 41	4-15
• Event 2 type	Engineering Mode	Function block No. 42	4-16
• Event 2 assignment	Engineering Mode	Function block No. 42	4-16
• Event 3 type	Engineering Mode	Function block No. 43	4-16
• Event 3 assignment	Engineering Mode	Function block No. 43	4-16
• Event 4 type	Engineering Mode	Function block No. 44	4-17
• Event 4 assignment	Engineering Mode	Function block No. 44	4-17
• CT1 type	Engineering Mode	Function block No. 45	4-17
• CT2 type	Engineering Mode	Function block No. 46	4-18
• Integral/Derivative time decimal point position	Engineering Mode	Function block No. 50	4-18
• Communication protocol	Engineering Mode	Function block No. 60	4-18
• Register type	Engineering Mode	Function block No. 62	4-19
• Soak time unit	Engineering Mode	Function block No. 70	4-19
• Initialization	Engineering Mode	Function block No. 91	4-19

4.1.1 When Select function for input 2 (2PV) is changed [Engineering Mode: Function block No. 58]

The following parameters will be initialized.
Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-5)

Mode		Items	Symbol	Initial value	Condition
Operation Transfer Mode		Remote/Local transfer When “Remote setting input” is selected at Select function for Input 2	R/L	LoC	—
		Remote/Local transfer When “Cascade control” is selected at Select function for input 2	R/L	SnGL	—
		Remote/Local transfer When “Control with PV select” is selected at Select function for input 2	R/L	InPI	—
		Remote/Local transfer When “2-loop control/Differential temperature control” is selected at Select function for input 2	R/L	2LooP	—
Monitor & SV Setting Mode		Input 1_Set value (SV)		0	1
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	1. SV	0	1
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0	4
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2		4
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3		4
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4		4
		Event 1 set value (EV1’) [low]	EV 1'	TC/RTD inputs: −10 V/I inputs: −5 % of input span	4
		Event 2 set value (EV2’) [low]	EV2'		4
		Event 3 set value (EV3’) [low]	EV3'		4
		Event 4 set value (EV4’) [low]	EV4'		4
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	TC/RTD inputs: 30 V/I inputs: 3.0	1
		Input 1_Integral time [heat-side]	1. I	240	1
		Input 1_Derivative time [heat-side]	1. d	60	1
		Input 1_Control response parameter	1. RPr	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	1
		Input 1_Proactive intensity	1.PACr	2	1
		Input 1_Manual reset	1. MR	0.0	1
		Input 1_FF amount	1. FF	0.0	1
		Input 1_Control loop break alarm (LBA) time	1. LbA	LBA function is spaecified: 480 LBA function is not specified: 0	1
		Input 1_LBA deadband (LBD)	1. Lbd	0	1
		Input 1_ON/OFF action differential gap (upper)	1. oHH	TC/RTD inputs: 1 V/I inputs: 0.1	1
		Input 1_ON/OFF action differential gap (lower)	1. oHL		1
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	TC/RTD inputs: 30 V/I inputs: 3.0	1
		Input 1_Integral time [cool-side]	1. Ic	240	1
		Input 1_Derivative time [cool-side]	1. dc	60	1
		Input 1_Overlap/Deadband	1. db	TC/RTD inputs: 0 V/I inputs: 0.0	1
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1.SVRU	0	1
		Input 1_Setting change rate limiter (down)	1.SVRd	0	1
Setup Setting Mode	Setting group No. 21	Input 2_PV bias	1. Pb	0	1
	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	0	2

Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 22	Input 2_PV digital filter (RS digital filter)	2. dF	0.0	2
		Input 2_PV ratio (RS ratio)	2. PR	1.000	2
	Setting group No. 51	Input 1_Level PID setting 1	1.LEV 1	Input 1_Input range high {Control with PV select: PV select input range high}	1
		Input 1_Level PID setting 2	1.LEV2		1
		Input 1_Level PID setting 3	1.LEV3		1
		Input 1_Level PID setting 4	1.LEV4		1
		Input 1_Level PID setting 5	1.LEV5		1
		Input 1_Level PID setting 6	1.LEV6		1
		Input 1_Level PID setting 7	1.LEV7		1
	Setting group No. 53	Input 1_AT bias	1. ATb	0	1
	Setting group No. 57	Input 1_Determination point of external disturbance	1.ExdJ	–1	1
Engineering Mode	Function block No. 21	Input 1_Decimal point position	1.PGdP	0	1
	Function block No. 22	Input 2_Input type	2. 1 NP	Same as Input 1_Input type When Remote setting input is specified at the time of order: 17	3
		Input 2_Display unit	2.UNI T	Same as Input 1_Display unit Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Not initialized in other cases.	5
		Input 2_Decimal point position	2.PGdP	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	5
		Input 2_Input range high	2.PGSH	·TC/RTD inputs Input 2_Maximum value of input range ·V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	6
		Input 2_Input range low	2.PGSL	·TC/RTD inputs Input 2_Minimum value of input range ·V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	6
	Function block No. 31	Retransmission output 1 scale high	AHS 1	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high {Control with PV select: PV select input range high} Input 1_Deviation: +(Input 1_Input span) Measured value (PV) of differential temperature input: 100	1 and 7
		Retransmission output 1 scale low	ALS 1	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low {Control with PV select: PV select input range low} Input 1_Deviation: –(Input 1_Input span) Measured value (PV) of differential temperature input: –100	1 and 7
	Function block No. 32	Retransmission output 2 scale high	AHS2	Same as Retransmission output 1 scale high	1 and 7
		Retransmission output 2 scale low	ALS2	Same as Retransmission output 1 scale low	1 and 7

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 33	Retransmission output 3 scale high	AHS3	Same as Retransmission output 1 scale high	1 and 7
		Retransmission output 3 scale low	ALS3	Same as Retransmission output 1 scale low	1 and 7
	Function block No. 41	Event 1 assignment	EVA1	1	—
		Event 1 differential gap	EH1	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span) MV: 0.2	4
	Function block No. 42	Event 2 assignment	EVA2	1	—
		Event 2 differential gap	EH2	Same as Event 1 differential gap	4
	Function block No. 43	Event 3 assignment	EVA3	1	—
		Event 3 differential gap	EH3	Same as Event 1 differential gap	4
	Function block No. 44	Event 4 assignment	EVA4	1	—
		Event 4 differential gap	EH4	Same as Event 1 differential gap	4
	Function block No. 51	Input 1_Start determination point	I. PdA	3 % of Input 1_Input span (Control with PV select: 3 % of PV select input span)	1
	Function block No. 51	Input 1_Level PID differential gap	I. LHS	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span)	1
	Function block No. 58	Input circuit error alarm set value	ICA	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	3
	Function block No. 71	Input 1_Setting limiter high	I. SLH	Input 1_Input range high (Control with PV select: PV select input range high)	1
		Input 1_Setting limiter low	I. SLL	Input 1_Input range low (Control with PV select: PV select input range low)	1

Condition

1: "Select function for input 2" is switched between "Control with PV select" and "Others *."
   * No function, Remote setting input, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.

2: "Select function for input 2" is switched between "Remote setting input" and "Others *."
   * No function, Control with PV select, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.

3: "Select function for input 2" is switched between "Input circuit error alarm" and "Others *."
   * No function, Remote setting input, Control with PV select, 2-loop control/Differential temperature control, and Cascade control.

4: Event type is other than Manipulated output value AND "Select function for input 2" is switched between "Control with PV select" and "Others *."
   * No function, Remote setting input, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.

5: "Select function for input t 2" is switched to any one of "Remote setting input," "Control with PV select," or "Input circuit error alarm" and "Others *."
   * No function, 2-loop control/Differential temperature control, and Cascade control.

6: "Select function for input 2" is switched to any one of "Remote setting input" or "Input circuit error alarm" and "Others *."
   * No function, Control with PV select, 2-loop control/Differential temperature control, and Cascade control.

7: Retransmission output is "No retransmission output," "Input 1_Measured value (PV)," "Input 1_Set value (SV)," "Input 1_Deviation," "Input 1_Remote setting input value," OR Measured value (PV) of differential temperature input.

4.1.2 When Input 1_Input type (I. INP) and Input 1_Display unit (I.UNI T) are changed [Engineering Mode: Function block No. 21]

The following parameters will be initialized.
Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-9)

Mode		Items	Symbol	Initial value	Condition
Monitor & SV Setting Mode		Input 1_Set value (SV)		Input 1_Set value (SV)	—
		Set value (SV) of differential temperature input		Set value (SV) of differential temperature input	—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	I. SV	0	—
		Set value (SV) of differential temperature input	dSV	0	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0	3
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2		3
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3		3
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4		3
		Event 1 set value (EV1') [low]	EV 1'	TC/RTD inputs: −10 V/I inputs: −5 % of input span	3
		Event 2 set value (EV2') [low]	EV2'		3
		Event 3 set value (EV3') [low]	EV3'		3
		Event 4 set value (EV4') [low]	EV4'		3
	Parameter group No. 51	Input 1_Proportional band [heat-side]	I. P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [heat-side]	I. I	240	—
		Input 1_Derivative time [heat-side]	I. d	60	—
		Input 1_Control response parameter	I. RPT	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	—
		Input 1_Proactive intensity	I.PACT	2	—
		Input 1_Manual reset	I. MR	0.0	—
		Input 1_FF amount	I. FF	0.0	—
		Input 1_Control loop break alarm (LBA) time	I. LbA	LBA function is spaecified: 480 LBA function is not specified: 0	—
		Input 1_LBA deadband (LBD)	I. Lbd	0	—
		Input 1_ON/OFF action differential gap (upper)	I. oHH	TC/RTD inputs: 1 V/I inputs: 0.1	—
		Input 1_ON/OFF action differential gap (lower)	I. oHL		—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	I. Pc	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [cool-side]	I. Ic	240	—
		Input 1_Derivative time [cool-side]	I. dc	60	—
		Input 1_Overlap/Deadband	I. db	TC/RTD inputs: 0 V/I inputs: 0.0	—
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	I.SVRU	0	—
		Input 1_Setting change rate limiter (down)	I.SVRd	0	—
Setup Setting Mode	Setting group No. 21	Input 1_PV bias	I. Pb	0	—
		Input 1_PV digital filter	I. dF	0.0	—
		Input 1_PV ratio	I. PR	1.000	—
		Input 1_PV low input cut-off *	I. PLC	0.00	—
	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	0	1
		Input 2_PV digital filter (RS digital filter)	2. dF	0.0	1
		Input 2_PV ratio (RS ratio)	2. PR	1.000	1

* When the Input 1_Input type was changed.

Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	1.LEV 1	Input 1_Input range high (Control with PV select: PV select input range high)	—
		Input 1_Level PID setting 2	1.LEV2		—
		Input 1_Level PID setting 3	1.LEV3		—
		Input 1_Level PID setting 4	1.LEV4		—
		Input 1_Level PID setting 5	1.LEV5		—
		Input 1_Level PID setting 6	1.LEV6		—
		Input 1_Level PID setting 7	1.LEV7		—
	Setting group No. 53	Input 1_AT bias	1. ATb	0	—
	Setting group No. 57	Input 1_Determination point of external disturbance	1.ExdJ	–1	—
	Setting group No. 58	Cascade_Proportional band (master-side)	MAS.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (master-side)	MAS.I	240	—
		Cascade_Derivative time (master-side)	MAS.d	60	—
		Cascade_Proportional band (slave-side)	SLV.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (slave-side)	SLV.I	240	—
		Cascade_Derivative time (slave-side)	SLV.d	60	—
		Cascade_Digital filter	C.dF	10.0	—
		Cascade_Scale high	C.SCH	Input 2_Setting limiter high	—
		Cascade_Scale low	C.SCL	Input 2_Setting limiter low	—
		PV select transfer level	2PV.LV	Input 1_Input range high	—
	Setting group No. 91	Input 1_Peak hold monitor	1.PHLd		—
		Input 1_Bottom hold monitor	1.bHLd		—
Engineering Mode	Function block No. 21	Input 1_Decimal point position [1]	1.PGdP	0	—
		Input 1_Input range high	1.PGSH	・TC/RTD inputs: Input 1_Maximum value of input range ・V/I inputs: 100	—
		Input 1_Input range low	1.PGSL	・TC/RTD inputs: Input 1_Minimum value of input range ・V/I inputs: 0	—
		Input 1_Input error determination point (high)	1. PoV	Input 1_Input range high + (Input 1_5 % of input span)	—
		Input 1_Input error determination point (low)	1. PUN	Input 1_Input range low – (Input 1_5 % of input span)	—
	Function block No. 22	Input 2_Display unit [2]	2.UNI T	Same as Input 1_Display unit Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Not initialized in other cases.	2
		Input 2_Decimal point position [1]	2.PGdP	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	2
		Input 2_Input range high	2.PGSH	・TC/RTD inputs Input 2_Maximum value of input range ・V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	1
		Input 2_Input range low	2.PGSL	・TC/RTD inputs Input 2_Minimum value of input range ・V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	1

[1] When the Input 1_Input type was changed.

[2] When the Input 1_Display unit was changed.

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 31	Retransmission output 1 scale high	AHS1	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high (Control with PV select: PV select input range high) Input 1_Deviation: +(Input 1_Input span) Measured value (PV) of differential temperature input: 100	4
		Retransmission output 1 scale low	ALS1	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) Input 1_Deviation: –(Input 1_Input span) Measured value (PV) of differential temperature input: –100	4
	Function block No. 32	Retransmission output 2 scale high	AHS2	Same as Retransmission output 1 scale high	4
		Retransmission output 2 scale low	ALS2	Same as Retransmission output 1 scale low	4
	Function block No. 33	Retransmission output 3 scale high	AHS3	Same as Retransmission output 1 scale high	4
		Retransmission output 3 scale low	ALS3	Same as Retransmission output 1 scale low	4
	Function block No. 41	Event 1 differential gap	EH1	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span) MV: 0.2	3
	Function block No. 42	Event 2 differential gap	EH2		3
	Function block No. 43	Event 3 differential gap	EH3		3
	Function block No. 44	Event 4 differential gap	EH4		3
	Function block No. 51	Input 1_Start determination point	I.PdA	3 % of Input 1_Input span (Control with PV select: 3 % of PV select input span)	—
		Input 1_Level PID differential gap	I.LHS	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span)	—
	Function block No. 58	Cascade_AT mode (master-side)	MAS.AT	TC/RTD inputs: 0 V/I inputs: 1	—
		Cascade_AT mode (slave-side)	SLV.AT		—
		Input circuit error alarm set value	ICA	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	—
	Function block No. 71	Input 1_Setting limiter high	I.SLH	Input 1_Input range high (Control with PV select: PV select input range high)	—
		Input 1_Setting limiter low	I.SLL	Input 1_Input range low (Control with PV select: PV select input range low)	—

Condition

1: "Select function for input 2" is Remote setting input AND Input 2_Input type is either voltage input or current input.
2: "Select function for input 2" is Remote setting input AND Input 2_Input type is either voltage input or current input, or Select function for input 2 is Control with PV select.
3: The condition is either of the following.
   ・Event type is other than Manipulated output value AND "Select function for input 2" is set to "Control with PV select."
   ・Event type is other than Manipulated output value AND Event assignment is either "Input 1" or "Differential temperature input."
4: Retransmission output is "No retransmission output," "Input 1_Measured value (PV)," "Input 1_Set value (SV)," "Input 1_Deviation," "Input 1_Remote setting input value," OR Measured value (PV) of differential temperature input.

4.1.3 When Input 1_Decimal point position (1.PGdP) is changed [Engineering Mode: Function block No. 21]

The following parameters will be initialized.
If Select function for input 2 is "Remote setting input" AND Input 2_Input type is Voltage/Current input, OR Select function for input 2 is "Control with PV select."

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 22	Input 2_Decimal point position	2.PGdP	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.

4.1.4 When Input 2_Input type (2. INP) and Input 2_Display unit (2.UNIT) are changed [Engineering Mode: Function block No. 22]

The following parameters will be initialized.
Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-12)

Mode		Items	Symbol	Initial value	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		0	—
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. SV	0	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV1	Deviation, Process and SV: TC/RTD inputs: 10 V/I inpusts: 5 % of input span MV: 50.0	3
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2		3
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3		3
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4		3
		Event 1 set value (EV1') [low]	EV1'	TC/RTD inputs: −10 V/I inpust: −5 % of input span	3
		Event 2 set value (EV2') [low]	EV2'		3
		Event 3 set value (EV3') [low]	EV3'		3
		Event 4 set value (EV4') [low]	EV4'		3
	Parameter group No. 52	Input 2_Proportional band	2. P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 2_Integral time	2. I	240	—
		Input 2_Derivative time	2. d	60	—
		Input 2_Control response parameter	2. RPT	0	—
		Input 2_Proactive intensity	2.PACT	2	—
		Input 2_Manual reset	2. MR	0.0	—
		Input 2_FF amount	2. FF	0.0	—
		Input 2_Control loop break alarm (LBA) time	2. LbA	LBA function is spaecified: 480 LBA function is not specified: 0	—
		Input 2_LBA deadband (LBD)	2. Lbd	0	—
		Input 2_ON/OFF action differential gap (upper)	2. oHH	TC/RTD inputs: 1 V/I inputs: 0.1	—
		Input 2_ON/OFF action differential gap (lower)	2. oHL		—
	Parameter group No. 70	Input 2_Setting change rate limiter (up)	2.SVRU	0	—
		Input 2_Setting change rate limiter (down)	2.SVRd	0	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	0	—
		Input 2_PV digital filter (RS digital filter)	2. dF	0.0	—
		Input 2_PV ratio (RS ratio)	2. PR	1.000	—
		Input 2_PV low input cut-off *	2. PLC	0.00	—
	Setting group No. 52	Input 2_Level PID setting 1	2.LEV1	Input 2_Input range high	—
		Input 2_Level PID setting 2	2.LEV2		—
		Input 2_Level PID setting 3	2.LEV3		—
		Input 2_Level PID setting 4	2.LEV4		—
		Input 2_Level PID setting 5	2.LEV5		—
		Input 2_Level PID setting 6	2.LEV6		—
		Input 2_Level PID setting 7	2.LEV7		—
	Setting group No. 54	Input 2_AT bias	2. ATb	0	—

* When the Input 2_Input type was changed.

Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 57	Input 2_Determination point of external disturbance	2.Ex dJ	–1	—
	Setting group No. 58	Cascade_Proportional band (master-side)	MAS.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (master-side)	MAS.I	240	—
		Cascade_Derivative time (master-side)	MAS.d	60	—
		Cascade_Proportional band (slave-side)	SLV.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (slave-side)	SLV.I	240	—
		Cascade_Derivative time (slave-side)	SLV.d	60	—
		Cascade_Digital filter	C.dF	10.0	—
		Cascade_Scale high	C.SCH	Input 2_Setting limiter high	—
		Cascade_Scale low	C.SCL	Input 2_Setting limiter low	—
	Setting group No. 91	Input 2_Peak hold monitor	2.PHLd		—
		Input 2_Bottom hold monitor	2.bHLd		—
Engineering Mode	Function block No. 21	Input 1_Decimal point position *	1.PGdP	0	1
	Function block No. 22	Input 2_Decimal point position *	2.PGdP	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	2
		Input 2_Input range high	2.PGSH	・TC/RTD inputs Input 2_Maximum value of input range ・V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	—
		Input 2_Input range low	2.PGSL	・TC/RTD inputs Input 2_Minimum value of input range ・V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	—
		Input 2_Input error determination point (high)	2. PoV	Input 2_Input range high + (Input 2_5 % of input span)	—
		Input 2_Input error determination point (low)	2. PUN	Input 2_Input range low – (Input 2_5 % of input span)	—
	Function block No. 31	Retransmission output 1 scale high	AHS 1	Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span)	4
		Retransmission output 1 scale low	ALS 1	Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: –(Input 2_Input span)	4
	Function block No. 32	Retransmission output 2 scale high	AHS2	Same as Retransmission output 1 scale high	4
		Retransmission output 2 scale low	ALS2	Same as Retransmission output 1 scale low	4
	Function block No. 33	Retransmission output 3 scale high	AHS3	Same as Retransmission output 1 scale high	4
		Retransmission output 3 scale low	ALS3	Same as Retransmission output 1 scale low	4

* When the Input 2_Input type was changed.

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 41	Event 1 differential gap	EH1	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 2_input span MV: 0.2	3
	Function block No. 42	Event 2 differential gap	EH2		3
	Function block No. 43	Event 3 differential gap	EH3		3
	Function block No. 44	Event 4 differential gap	EH4		3
	Function block No. 52	Input 2_Start determination point	2. PdA	3 % of Input 2_Input span	—
		Input 2_Level PID differential gap	2. LHS	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 2_input span	—
	Function block No. 58	Cascade_AT mode (master-side)	MAS.AT	TC/RTD inputs: 0 V/I inputs: 1	—
		Cascade_AT mode (slave-side)	SLV.AT		—
	Function block No. 72	Input 2_Setting limiter high	2. SLH	Input 2_Input range high	—
		Input 2_Setting limiter low	2. SLL	Input 2_Input range low	—

Condition

1: If "Select function for input 2" is "Control with PV select."
2: If "Select function for input 2" is other than "Control with PV select."
3: If Event type is other than manipulated output AND "Select function for input 2" is other than "Control with PV select," AND Event assignment is "Input 2."
4: Retransmission output is "Input 1_Measured value (PV)," "Input 1_Set value (SV)," or "Input 1_Deviation."

4.1.5 When Input 1_Control action (1. oS) is changed [Engineering Mode: Function block No. 51]

The following parameters will be initialized.
Some parameters may have prerequisites for initialization. (See following for the prerequisites)

Mode		Items	Symbol	Initial value	Condition
Parameter Setting Mode	Parameter group No. 51	Input 1_Control response parameter	1. RPT	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	1
Engineering Mode	Function block No. 56	Undershoot suppression factor	US	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000	—

Condition

1: When Input 1_Control action is other than switching between Dir/Rev action and Cooling action.

4.1.6 When Open/Close output neutral zone (Ydb) is changed [Setup Setting Mode: Setting group No. 55]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 55	Open/Close output differential gap	YHS	1/2 (a half) of Open/Close output neutral zone

4.1.7 When OUT1 function selection (oSL 1) is changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT1 proportional cycle time	r 1	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1

Note1: In case OUT1 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

4.1.8 When OUT2 function selection (oSL2) is changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT2 proportional cycle time	r2	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

4.1.9 When OUT3 function selection (oSL3) and Universal output type selection (UNI o) are changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT3 proportional cycle time	r3	Voltage pulse output: Note3

Note3: In case OUT3 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

4.1.10 When Retransmission output 1 type (Ao1) is changed [Engineering Mode: Function block No. 31]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 31	Retransmission output 1 scale high	AHS1	• Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high (Control with PV select: PV select input range high) • Input 1_Deviation: +(Input 1_Input span) • Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high • Input 2_Deviation: +(Input 2_Input span) • Manipulated output value, and Current transformer (CT) input value: 100.0 • Measured value (PV) of differential temperature input: 100
		Retransmission output 1 scale low	ALS1	• Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) • Input 1_Deviation: –(Input 1_Input span) • Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low • Input 2_Deviation: –(Input 2_Input span) • Manipulated output value, and Current transformer (CT) input value: 0.0 • Measured value (PV) of differential temperature input: –100

4.1.11 When Retransmission output 2 type (Ao2) is changed [Engineering Mode: Function block No. 32]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 32	Retransmission output 2 scale high	AHS2	Same as Retransmission output 1 scale high
		Retransmission output 2 scale low	ALS2	Same as Retransmission output 1 scale low

4.1.12 When Retransmission output 3 type (Ao3) is changed [Engineering Mode: Function block No. 33]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 33	Retransmission output 3 scale high	AHS3	Same as Retransmission output 1 scale high
		Retransmission output 3 scale low	ALS3	Same as Retransmission output 1 scale low

4.1.13 When Event 1 type (ES1) and Event 1 assignment (EVA1) are changed [Engineering Mode: Function block No. 41]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV1	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 1 set value (EV1') [low]	EV1'	TC/RTD inputs: –10 V/I inputs: –5 % of input span
Engineering Mode	Function block No. 41	Event 1 hold action	EHo1	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 1 differential gap	EH1	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2
		Event 1 timer	EVT1	0.0

4.1.14 When Event 2 type (E52) and Event 2 assignment (EvA2) are changed [Engineering Mode: Function block No. 42]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 2 set value (EV2) Event 2 set value (EV2) [high]	Ev2	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 2 set value (EV2') [low]	Ev2'	TC/RTD inputs: –10 V/I inputs: –5 % of input span
Engineering Mode	Function block No. 42	Event 2 hold action	EHo2	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 2 differential gap	EH2	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2
		Event 2 timer	EvT2	0.0

4.1.15 When Event 3 type (E53) and Event 3 assignment (EvA3) are changed [Engineering Mode: Function block No. 43]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 3 set value (EV3) Event 3 set value (EV3) [high]	Ev3	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 3 set value (EV3') [low]	Ev3'	TC/RTD inputs: –10 V/I inputs: –5 % of input span
Engineering Mode	Function block No. 43	Event 3 hold action	EHo3	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 3 differential gap	EH3	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2
		Event 3 timer	EvT3	0.0

4.1.16 When Event 4 type (E54) and Event 4 assignment (EvA4) are changed [Engineering Mode: Function block No. 44]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 4 set value (EV4) Event 4 set value (EV4) [high]	Ev4	Deviation, Process and SV: TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 4 set value (EV4') [low]	Ev4'	TC/RTD inputs: −10 V/I input: −5 % of input span
Engineering Mode	Function block No. 43	Event 4 hold action	EHo4	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 4 differential gap	EH4	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2
		Event 4 timer	Evt4	0.0

4.1.17 When CT1 type (CtE 1) is changed [Engineering Mode: Function block No. 45]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 45	CT1 ratio	CtR1	CTL-6-P-N or CTL-6-P-Z: 800 CTL-12-S56-10L-N: 1000

4.1.18 When CT2 type (CTt2) is changed [Engineering Mode: Function block No. 46]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 46	CT2 ratio	CTR2	CTL-6-P-N or CTL-6-P-Z: 800 CTL-12-S56-10L-N: 1000

4.1.19 When Integral/Derivative time decimal point position (I ddP) is changed [Engineering Mode: Function block No. 50]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 51	Input 1_Integral time [heat-side]	I. I	240
		Input 1_Derivative time [heat-side]	I. d	60
	Parameter group No. 52	Input 2_Integral time	2. I	240
		Input 2_Derivative time	2. d	60
	Parameter group No. 56	Input 1_Integral time [cool-side]	I. Ic	240
		Input 1_Derivative time [cool-side]	I. dc	60
Setup Setting Mode	Setting group No. 58	Cascade _Integral time (master-side)	MAS.I	240
		Cascade _Derivative time (master-side)	MAS.d	60
		Cascade _Integral time (slave-side)	SLV.I	240
		Cascade _Derivative time (slave-side)	SLV.d	60

4.1.20 When Communication protocol (CMPS) is changed [Engineering Mode: Function block No. 60]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 60	Device address	Add	RKC communication: 0 Modbus: 1 PLC communication: 0
		Data bit configuration	bIT	0
	Function block No. 62	Register type	MP.REG	0

4.1.21 When Register type (MP.REG) is changed [Engineering Mode: Function block No. 62]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 62	Register start number (High-order 4-bit)	MP.SRH	0
		Register start number (Low-order 16-bit)	MP.SRL	1000

4.1.22 When Soak time unit (SrdP) is changed [Engineering Mode: Function block No. 70]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 70	Area soak time	ASr	0:00 (0 minutes 00 seconds)

4.1.23 When Initialization (dEF) is changed [Engineering Mode: Function block No. 91]

If Initialization is done by setting “1225” at [Engineering Mode: Function block No. 91], all the settings will be set to the factory set values.

NOTE

Make sure all settings are recorded before Initializing.

4.2 Parameters to Be Automatically Converted

If the data of the following parameter is changed, related set values are also automatically converted.

NOTE

Make sure all settings are recorded before changing the set values.

NOTE

Check all set values after having changed the settings.

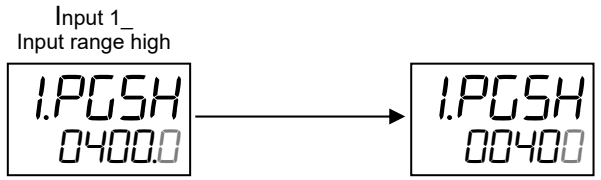
☞ Refer to ■ **Example of automatic conversion (P. 4-21)** for details of automatic conversion.

			See page
• Input data type	Engineering Mode	Function block No. 21	4-22
• Input 1_Decimal point position	Engineering Mode	Function block No. 21	4-24
• Input 1_Input range high/low	Engineering Mode	Function block No. 21	4-24
• Input 1_Control action	Engineering Mode	Function block No. 51	4-26
• Input 1_Setting limiter high/low	Engineering Mode	Function block No. 71	4-26
• Input 1_Output limiter high/low [heat-side]	Parameter Setting Mode	Parameter group No. 51	4-27
• Input 1_Output limiter high/low [cool-side]	Parameter Setting Mode	Parameter group No. 56	4-27
• Input 2_Decimal point position	Engineering Mode	Function block No. 22	4-28
• Input 2_Input range high/low	Engineering Mode	Function block No. 22	4-30
• Input 2_Setting limiter high/low	Engineering Mode	Function block No. 72	4-32
• Input 2_Output limiter high/low	Parameter Setting Mode	Parameter group No. 52	4-32
• Memory area transfer	Monitor & SV Setting Mode (FZ110) Memory Area Transfer Mode (FZ400/900)		4-32
• Input 1_Level PID setting 1	Setup Setting Mode	Setting group No. 51	4-32
• Input 1_Level PID setting 2	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 3	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 4	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 5	Setup Setting Mode	Setting group No. 51	4-34
• Input 1_Level PID setting 6	Setup Setting Mode	Setting group No. 51	4-34
• Input 1_Level PID setting 7	Setup Setting Mode	Setting group No. 51	4-34
• Input 2_Level PID setting 1	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 2	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 3	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 4	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 5	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 6	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 7	Setup Setting Mode	Setting group No. 52	4-37

■ Example of automatic conversion

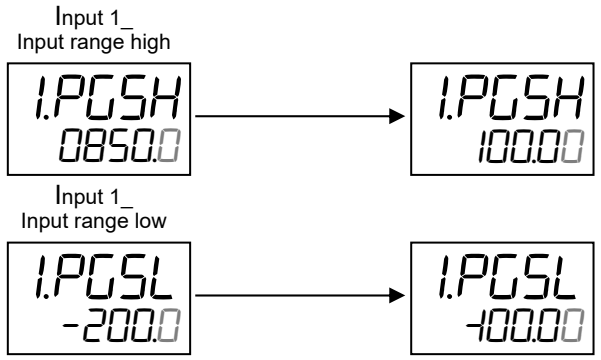
• If the position of a decimal point is changed, the decimal point is shifted according to the setting.

Example 1: When the Input 1_Input range high is set to 400.0 °C, changing the decimal point position to 0 from 1 will change the Input 1_Input range high to 400 °C.



The value will be rounded off to a positive integer. (400.5 °C is rounded off to 401 °C)

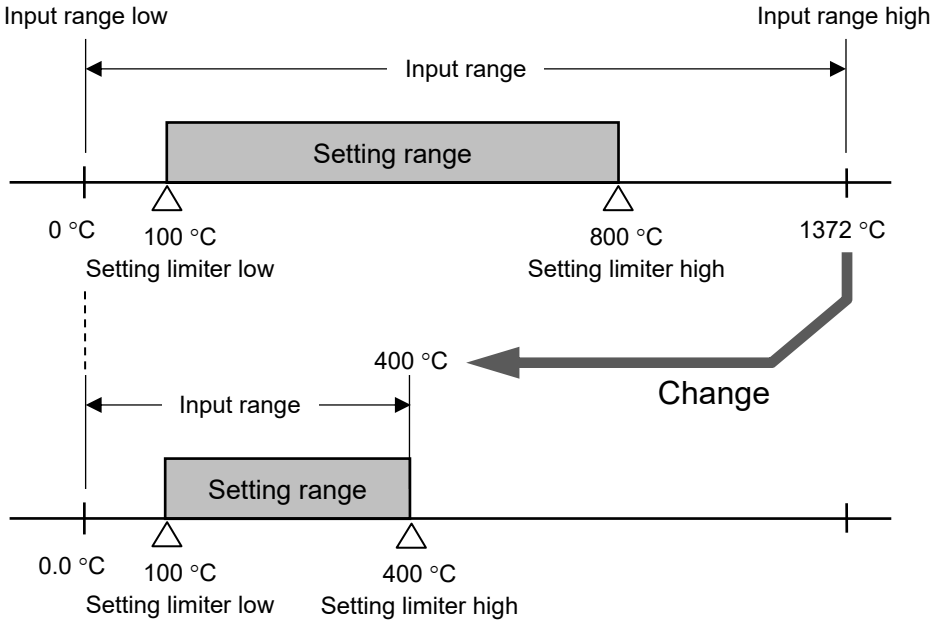
Example 2: When the Input 1_input range is –200.0 to +850.0 °C (Input type: RTD Pt100), changing the decimal point position to 2 from 1 will change the input range to –100.0 to +100.0 °C.



In case of RTD Pt100, as the maximum measuring range with decimal place of 2 is –100.0 to +100.0 °C, this value will not be exceeded.

• When the input range is changed, the setting limiter will be also changed according to the setting.

Example: Input 1_Input range is 0 to 1372 °C, Input 1_Setting limiter high is 800 °C. Changing the Input 1_ Input range high to 400 °C will change the Setting limiter high to 400 °C accordingly.



4.2.1 When Input data type (I NdΓ) is changed [Engineering Mode: Function block No. 21]

The following parameters will be automatically converted.
Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-23)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Set value (SV) of differential temperature input		—
Parameter Setting Mode	Parameter group No. 00	Set value (SV) of differential temperature input	dSV	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	4
		Event 1 set value (EV1') [low]	EV 1'	4
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2	4
		Event 2 set value (EV2') [low]	EV2'	4
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3	4
		Event 3 set value (EV3') [low]	EV3'	4
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4	4
		Event 4 set value (EV4') [low]	EV4'	4
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	1
		Input 1_ON/OFF action differential gap (upper)	1. oHH	1
		Input 1_ON/OFF action differential gap (lower)	1. oHL	1
		Input 1_LBA deadband (LBD)	1. Lbd	—
	Parameter group No. 52	Input 2_Proportional band	2. P	1
		Input 2_ON/OFF action differential gap (upper)	2. oHH	1
		Input 2_ON/OFF action differential gap (lower)	2. oHL	1
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	1
		Input 1_Overlap/Deadband	1. db	1
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1.SVRU	—
		Input 1_Setting change rate limiter (down)	1.SVRd	—
		Input 2_Setting change rate limiter (up)	2.SVRU	—
		Input 2_Setting change rate limiter (down)	2.SVRd	—
Setup Setting Mode	Setting group No. 21	Input 1_PV bias	1. Pb	—
	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	—
	Setting group No. 53	Input 1_AT bias	1. ATb	—
	Setting group No. 54	Input 2_AT bias	2. ATb	—
	Setting group No. 57	Input 1_Determination point of external disturbance	1.ExdJ	—
		Input 2_Determination point of external disturbance	2.ExdJ	—
	Setting group No. 91	Input 1_Peak hold monitor	1.PHLd	—
		Input 1_Bottom hold monitor	1.bHLd	—
		Input 2_Peak hold monitor	2.PHLd	—
		Input 2_Bottom hold monitor	2.bHLd	—
Engineering Mode	Function block No. 21	Input 1_Input error determination point (high)	1. PoV	—
		Input 1_Input error determination point (low)	1. PUN	—
	Function block No. 22	Input 2_Input error determination point (high)	2. PoV	—
		Input 2_Input error determination point (low)	2. PUN	—
	Function block No. 31	Retransmission output 1 scale high	AHS1	2
		Retransmission output 1 scale low	ALS1	2

Mode		Items	Symbol	Condition
Engineering Mode	Function block No. 32	Retransmission output 2 scale high	AH52	2
		Retransmission output 2 scale low	AL52	2
	Function block No. 33	Retransmission output 3 scale high	AH53	2
		Retransmission output 3 scale low	AL53	2
	Function block No. 41	Event 1 differential gap	EH1	3
	Function block No. 42	Event 2 differential gap	EH2	3
	Function block No. 43	Event 3 differential gap	EH3	3
	Function block No. 44	Event 4 differential gap	EH4	3
	Function block No. 51	Input 1_Start determination point	1.PdA	—
		Input 1_Level PID differential gap	1.LHS	—
	Function block No. 52	Input 2_Start determination point	2.PdA	—
		Input 2_Level PID differential gap	2.LHS	—
	Function block No. 58	Input circuit error alarm set value	ICA	—

Condition

1: When Input type is Thermocouple/RTD input.

2: When Retransmission output is “Input 1_Deviation,” “Input 2_Deviation,” or Measured value (PV) of differential temperature input.

3: Event type is other than Manipulated output value

4: In any one of the following cases

- Event type is a deviation action
- Evet type is an input value action, AND Event assignment is “Differential temperature input.”
- Event type is a set value action, AND Event assignment is “Differential temperature input.”

4.2.2 When Input 1_Decimal point position (I.PGdP), Input 1_Input range high (I.PGSH) and Input 1_Input range low (I.PGSL) are changed [Engineering Mode: Function block No. 21]

The following parameters will be automatically converted.
Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-25)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 1_Set value (SV)		—
		Set value (SV) of differential temperature input		—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	1. SV	—
		Set value (SV) of differential temperature input	dSV	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	3
		Event 1 set value (EV1') [low]	EV 1'	3
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2	3
		Event 2 set value (EV2') [low]	EV2'	3
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3	3
		Event 3 set value (EV3') [low]	EV3'	3
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4	3
		Event 4 set value (EV4') [low]	EV4'	3
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	2
		Input 1_ON/OFF action differential gap (upper)	1. oHH	2
		Input 1_ON/OFF action differential gap (lower)	1. oHL	2
		Input 1_LBA deadband (LBD)	1. Lbd	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	2
		Input 1_Overlap/Deadband	1. db	2
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1.SVRU	—
		Input 1_Setting change rate limiter (down)	1.SVRd	—
Setup Setting Mode	Setting group No. 21	Input 1_PV bias	1. Pb	—
	Setting group No. 22	Input 2_PV bias (RS bias) *	2. Pb	1
	Setting group No. 51	Input 1_Level PID setting 1	1.LEV 1	—
		Input 1_Level PID setting 2	1.LEV2	—
		Input 1_Level PID setting 3	1.LEV3	—
		Input 1_Level PID setting 4	1.LEV4	—
		Input 1_Level PID setting 5	1.LEV5	—
		Input 1_Level PID setting 6	1.LEV6	—
		Input 1_Level PID setting 7	1.LEV7	—
	Setting group No. 53	Input 1_AT bias	1. ATb	—
	Setting group No. 57	Input 1_Determination point of external disturbance	1.ExdJ	—
	Setting group No. 58	Cascade_Proportional band (master-side)	MAS.P	2
		PV select transfer level	2PV.LV	—
	Setting group No. 91	Input 1_Peak hold monitor	1.PHLd	—
		Input 1_Bottom hold monitor	1.bHLd	—
Engineering Mode	Function block No. 21	Input 1_Input range high *	1.PGSH	—
		Input 1_Input range high *	1.PGSL	—

* Only if the Input 1_Decimal point position has been changed. (Not applicable to high and low limit of Input 1)

Mode		Items	Symbol	Condition
Engineering Mode	Function block No. 21	Input 1_Input error determination point (high)	I. PoV	—
		Input 1_Input error determination point (low)	I. PUN	—
	Function block No. 22	Input 2_Input range high *	2.PGSH	1
		Input 2_Input range high *	2.PGSL	1
	Function block No. 31	Retransmission output 1 scale high	AHS1	4
		Retransmission output 1 scale low	ALS1	4
	Function block No. 32	Retransmission output 2 scale high	AHS2	4
		Retransmission output 2 scale low	ALS2	4
	Function block No. 33	Retransmission output 3 scale high	AHS3	4
		Retransmission output 3 scale low	ALS3	4
	Function block No. 41	Event 1 differential gap	EH1	3
	Function block No. 42	Event 2 differential gap	EH2	3
	Function block No. 43	Event 3 differential gap	EH3	3
	Function block No. 44	Event 4 differential gap	EH4	3
	Function block No. 51	Input 1_Start determination point	I. PdA	—
		Input 1_Level PID differential gap	I. LHS	—
	Function block No. 58	Input circuit error alarm set value	ICA	—
	Function block No. 71	Input 1_Setting limiter high	I. SLH	—
		Input 1_Setting limiter low	I. SLL	—

* Only if the Input 1_Decimal point position has been changed. (Not applicable to high and low limit of Input 1)

Condition

1: "Select function for input 2" is not Remote setting input AND Input 2_Input type is not either voltage output or current output.

2: When Input 1_Input type is Thermocouple/RTD input.

3: The condition is either of the following.

・Event type is other than Manipulated output value AND "Select function for input 2" is set to "Control with PV select."

・Event type is other than Manipulated output value AND Event assignment is either "Input 1" or "Differential temperature input."

4: Retransmission output is "No retransmission output," "Input 1_Measured value (PV)," "Input 1_Set value (SV)," "Input 1_Deviation," "Input 1_Remote setting input value," OR Measured value (PV) of differential temperature input.

4.2.3 When Input 1_Control action (I. oS) is changed [Engineering Mode: Function block No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Parameter Setting Mode	Parameter group No. 51	Input 1_Integral time [heat-side]	I. I
	Parameter group No. 70	Input 1_Manipulated output value (Area)	I. MV.A
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	I. M.MV
Engineering Mode	Function block No. 51	Input 1_Manipulated output value at input error	I. PSM

4.2.4 When Input 1_Setting limiter high/low (I. SLH, I. SLL) is changed [Engineering Mode: Function block No. 71]

The following parameters will be automatically converted.

Mode		Items	Symbol
Monitor & SV Setting Mode		Input 1_Set value (SV)	
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	I. SV

4.2.5 When Input 1_Output limiter high/low [heat-side] (I. oLH, I. oLL) is changed [Parameter Setting Mode: Parameter group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	I. MMV

4.2.6 When Input 1_Output limiter high/low [cool-side] (I.oLHc, I.oLLc) is changed [Parameter Setting Mode: Parameter group No. 56]

The following parameters will be automatically converted.
If the control action is set to “Heat/Cool PID control,” the data of the following parameter will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	I. MMV

4.2.7 When Input 2_Decimal point position (2.PGdP) is changed [Engineering Mode: Function block No. 22]

The following parameters will be automatically converted.
Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-29)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		—
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. SV	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	3
		Event 1 set value (EV1') [low]	EV 1'	3
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2	3
		Event 2 set value (EV2') [low]	EV2'	3
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3	3
		Event 3 set value (EV3') [low]	EV3'	3
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4	3
		Event 4 set value (EV4') [low]	EV4'	3
	Parameter group No. 52	Input 2_Proportional band	2. P	2
		Input 2_ON/OFF action differential gap (upper)	2. oHH	2
		Input 2_ON/OFF action differential gap (lower)	2. oHL	2
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 70	Input 2_Setting change rate limiter (up)	2.SVRU	—
		Input 2_Setting change rate limiter (down)	2.SVRd	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	1
	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1	—
		Input 2_Level PID setting 2	2.LEV2	—
		Input 2_Level PID setting 3	2.LEV3	—
		Input 2_Level PID setting 4	2.LEV4	—
		Input 2_Level PID setting 5	2.LEV5	—
		Input 2_Level PID setting 6	2.LEV6	—
		Input 2_Level PID setting 7	2.LEV7	—
	Setting group No. 54	Input 2_AT bias	2. ATb	—
	Setting group No. 57	Input 2_Determination point of external disturbance	2.ExdJ	—
	Setting group No. 58	Cascade_Proportional band (master-side)	SLV.P	2
		Cascade_Scale high	C.SCH	—
		Cascade_Scale low	C.SCL	—
	Setting group No. 91	Input 2_Peak hold monitor	2.PHLd	—
		Input 2_Bottom hold monitor	2.bHLd	—
Engineering Mode	Function block No. 22	Input 2_Input range high	2.PGSH	1
		Input 2_Input range low	2.PGSL	1
		Input 2_Input error determination point (high)	2. PoV	—
		Input 2_Input error determination point (low)	2. PUN	—
	Function block No. 31	Retransmission output 1 scale high	AHS 1	4
		Retransmission output 1 scale low	ALS 1	4
	Function block No. 32	Retransmission output 2 scale high	AHS2	4
		Retransmission output 2 scale low	ALS2	4

Mode		Items	Symbol	Condition
Engineering Mode	Function block No. 33	Retransmission output 3 scale high	AH53	4
		Retransmission output 3 scale low	AL53	4
	Function block No. 41	Event 1 differential gap	EH1	3
	Function block No. 42	Event 2 differential gap	EH2	3
	Function block No. 43	Event 3 differential gap	EH3	3
	Function block No. 44	Event 4 differential gap	EH4	3
	Function block No. 52	Input 2_Start determination point	2. PdA	—
		Input 2_Level PID differential gap	2. LHS	—
	Function block No. 72	Input 2_Setting limiter high	2. SLH	—
		Input 2_Setting limiter low	2. SLL	—

Condition

1: "Select function for input 2" is not Remote setting input AND Input 2_Input type is not either voltage output or current output.

2: When Input 1_Input type is Thermocouple/RTD input.

3: If Event type is other than manipulated output AND "Select function for input 2" is other than "Control with PV select," AND Event assignment is "Input 2."

4: Retransmission output is "Input 2_Measured value (PV)," "Input 2_Set value (SV)," or "Input 2_Deviation."

4.2.8 When Input 2_Setting limiter high/low (2PGSH, 2PGSL) is changed [Engineering Mode: Function block No. 22]

The following parameters will be automatically converted.
Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-31)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	1. SV	1
		Input 2_Set value (SV)	2. SV	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV 1	5
		Event 1 set value (EV1') [low]	EV 1'	5
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2	5
		Event 2 set value (EV2') [low]	EV2'	5
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3	5
		Event 3 set value (EV3') [low]	EV3'	5
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4	5
		Event 4 set value (EV4') [low]	EV4'	5
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	3
		Input 1_ON/OFF action differential gap (upper)	1. oHH	3
		Input 1_ON/OFF action differential gap (lower)	1. oHL	3
		Input 1_LBA deadband (LBD)	1. Lbd	1
	Parameter group No. 52	Input 2_Proportional band	2. P	2
		Input 2_ON/OFF action differential gap (upper)	2. oHH	2
		Input 2_ON/OFF action differential gap (lower)	2. oHL	2
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	3
		Input 1_Overlap/Deadband	1. db	3
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1SVRU	1
		Input 1_Setting change rate limiter (down)	1SVRd	1
		Input 2_Setting change rate limiter (up)	2SVRU	—
		Input 2_Setting change rate limiter (down)	2SVRd	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	4
	Setting group No. 51	Input 1_Level PID setting 1	1LEV 1	1
		Input 1_Level PID setting 2	1LEV2	1
		Input 1_Level PID setting 3	1LEV3	1
		Input 1_Level PID setting 4	1LEV4	1
		Input 1_Level PID setting 5	1LEV5	1
		Input 1_Level PID setting 6	1LEV6	1
		Input 1_Level PID setting 7	1LEV7	1
	Setting group No. 52	Input 2_Level PID setting 1	2LEV 1	—
		Input 2_Level PID setting 2	2LEV2	—
		Input 2_Level PID setting 3	2LEV3	—
		Input 2_Level PID setting 4	2LEV4	—
		Input 2_Level PID setting 5	2LEV5	—
		Input 2_Level PID setting 6	2LEV6	—
		Input 2_Level PID setting 7	2LEV7	—

Mode		Items	Symbol	Condition
Setup Setting Mode	Setting group No. 53	Input 1_AT bias	1. AT b	1
	Setting group No. 54	Input 2_AT bias	2. AT b	—
	Setting group No. 57	Input 1_Determination point of external disturbance	1.Exdu	1
		Input 2_Determination point of external disturbance	2.Exdu	—
	Setting group No. 58	Cascade_Proportional band (slave-side)	SLV.P	2
		Cascade_Scale high	C.SCH	—
		Cascade_Scale low	C.SCL	—
	Setting group No. 91	Input 2_Peak hold monitor	2.PHLd	—
		Input 2_Bottom hold monitor	2.bHLd	—
Engineering Mode	Function block No. 22	Input 2_Input error determination point (high)	2. PoV	—
		Input 2_Input error determination point (low)	2. PUN	—
	Function block No. 31	Retransmission output 1 scale high	AHS1	6
		Retransmission output 1 scale low	ALS1	6
	Function block No. 32	Retransmission output 2 scale high	AHS2	6
		Retransmission output 2 scale low	ALS2	6
	Function block No. 33	Retransmission output 3 scale high	AHS3	6
		Retransmission output 3 scale low	ALS3	6
	Function block No. 41	Event 1 differential gap	EH1	5
	Function block No. 42	Event 2 differential gap	EH2	5
	Function block No. 43	Event 3 differential gap	EH3	5
	Function block No. 44	Event 4 differential gap	EH4	5
	Function block No. 51	Input 1_Start determination point	1. PdA	1
		Input 1_Level PID differential gap	1.LPId	1
	Function block No. 52	Input 2_Start determination point	2. PdA	—
		Input 2_Level PID differential gap	2. LHS	—
	Function block No. 71	Input 1_Setting limiter high	1. SLH	1
		Input 1_Setting limiter low	1. SLL	1
	Function block No. 72	Input 2_Setting limiter high	2. SLH	—
		Input 2_Setting limiter low	2. SLL	—

Condition

1: If “Select function for input 2” is “Control with PV select.”

2: When Input type is Thermocouple/RTD input.

3: “Select function for input 2” is “Control with PV select” AND Input 2_Input type is Thermocouple/RTD input.

4: “Select function for input 2” is other than Remote setting input

5: If Event type is other than manipulated output AND “Select function for input 2” is other than “Control with PV select,” AND Event assignment is “Input 2.”

6: The condition is either of the following.

- Retransmission output is “Input 2_Measured value (PV),” “Input 2_Set value (SV),” or “Input 2_Deviation.”
- When “Select function for Input 2” is “Control with PV select,” the Retransmission output will be as follows. “No retransmission output,” “Input 1_Measured value (PV),” “Input 1_Set value (SV),” “Input 1_Deviation,” “Input 1_Remote setting input value,” OR Measured value (PV) of differential temperature input.

4.2.9 When Input 2_Setting limiter high/low (2. SLH, 2. SLL) is changed [Engineering Mode: Function block No. 72]

The following parameters will be automatically converted.

Mode		Items	Symbol
Monitor & SV Setting Mode		Input 2_Set value (SV)	
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. SV
Setup Setting Mode	Setting group No. 58	Cascade_Scale high	C.SCH
		Cascade_Scale low	C.SCL

4.2.10 When Input 2_Output limiter high/low (2. oLH, 2. oLL) is changed [Parameter Setting Mode: Parameter group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Manual manipulated output value	2. MMV

4.2.11 When Memory area transfer (AREA) is changed [Monitor & SV Setting Mode (FZ110), Memory Area Transfer Mode (FZ400/900)]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	1. MMV
	Setting group No. 52	Input 2_Manual manipulated output value	2. MMV

4.2.12 When Input 1_Level PID setting 1 (1.LEV 1) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 2	1.LEV2
		Input 1_Level PID setting 3	1.LEV3
		Input 1_Level PID setting 4	1.LEV4
		Input 1_Level PID setting 5	1.LEV5
		Input 1_Level PID setting 6	1.LEV6
		Input 1_Level PID setting 7	1.LEV7

4.2.13 When Input 1_Level PID setting 2 (I.LEV2) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV1
		Input 1_Level PID setting 3	I.LEV3
		Input 1_Level PID setting 4	I.LEV4
		Input 1_Level PID setting 5	I.LEV5
		Input 1_Level PID setting 6	I.LEV6
		Input 1_Level PID setting 7	I.LEV7

4.2.14 When Input 1_Level PID setting 3 (I.LEV3) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV1
		Input 1_Level PID setting 2	I.LEV2
		Input 1_Level PID setting 4	I.LEV4
		Input 1_Level PID setting 5	I.LEV5
		Input 1_Level PID setting 6	I.LEV6
		Input 1_Level PID setting 7	I.LEV7

4.2.15 When Input 1_Level PID setting 4 (I.LEV4) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV1
		Input 1_Level PID setting 2	I.LEV2
		Input 1_Level PID setting 3	I.LEV3
		Input 1_Level PID setting 5	I.LEV5
		Input 1_Level PID setting 6	I.LEV6
		Input 1_Level PID setting 7	I.LEV7

4.2.16 When Input 1_Level PID setting 5 (I.LEV5) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV 1
		Input 1_Level PID setting 2	I.LEV2
		Input 1_Level PID setting 3	I.LEV3
		Input 1_Level PID setting 4	I.LEV4
		Input 1_Level PID setting 6	I.LEV6
		Input 1_Level PID setting 7	I.LEV7

4.2.17 When Input 1_Level PID setting 6 (I.LEV6) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV 1
		Input 1_Level PID setting 2	I.LEV2
		Input 1_Level PID setting 3	I.LEV3
		Input 1_Level PID setting 4	I.LEV4
		Input 1_Level PID setting 5	I.LEV5
		Input 1_Level PID setting 7	I.LEV7

4.2.18 When Input 1_Level PID setting 7 (I.LEV7) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	I.LEV 1
		Input 1_Level PID setting 2	I.LEV2
		Input 1_Level PID setting 3	I.LEV3
		Input 1_Level PID setting 4	I.LEV4
		Input 1_Level PID setting 5	I.LEV5
		Input 1_Level PID setting 6	I.LEV6

4.2.19 When Input 2_Level PID setting 1 (2.LEV 1) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.20 When Input 2_Level PID setting 2 (2.LEV2) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.21 When Input 2_Level PID setting 3 (2.LEV3) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.22 When Input 2_Level PID setting 4 (2.LEV4) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.23 When Input 2_Level PID setting 5 (2.LEV5) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.24 When Input 2_Level PID setting 6 (2.LEV6) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 7	2.LEV7

4.2.25 When Input 2_Level PID setting 7 (2.LEV7) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6

MEMO

5 INPUT FUNCTION

This chapter describes input related functions, setting contents and setting procedure based on the key words related to inputs.

5.1 Changing Input 5-2
5.2 Switching Functions Using Digital Inputs (DI) 5-16
5.3 Correcting Input (PV Bias and PV Ratio) 5-28
5.4 Preventing the Input Flicker 5-31
5.5 Inverting the Input 5-33
5.6 Extracting Square Root of Input 5-35
5.7 Changing Error Handling at Input Error 5-39
5.8 Using Dual Input Function 5-48

5.1 Changing Input

Measured input can be changed at following parameters. Set the input according to the sensor and the application.

– Input type
– Dispaly unit
– Decimal point position
– Input range high/Input range low
– Input data type

■ Description of function

Input type

Input type can be easily configured to thermocouple, RTD, current or voltage only by changing the settings.

- TC input type: K, J, R, S, B, E, N, T, W5Re/W26Re, PL II, U, L, PR40-20
- RTD input type: Pt100, JPt100
- Current input type: 0 to 20 mA DC, 4 to 20 mA DC
- Voltage input type: 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 1 V DC, −10 to +10 V DC, −5 to +5 V DC, 0 to 100 mV DC, 0 to 10 mV DC

Display unit

In case of thermocouple or RTD input, the measurement unit can be selected from °C and °F.

Decimal point position

The decimal point position depends on the input type.

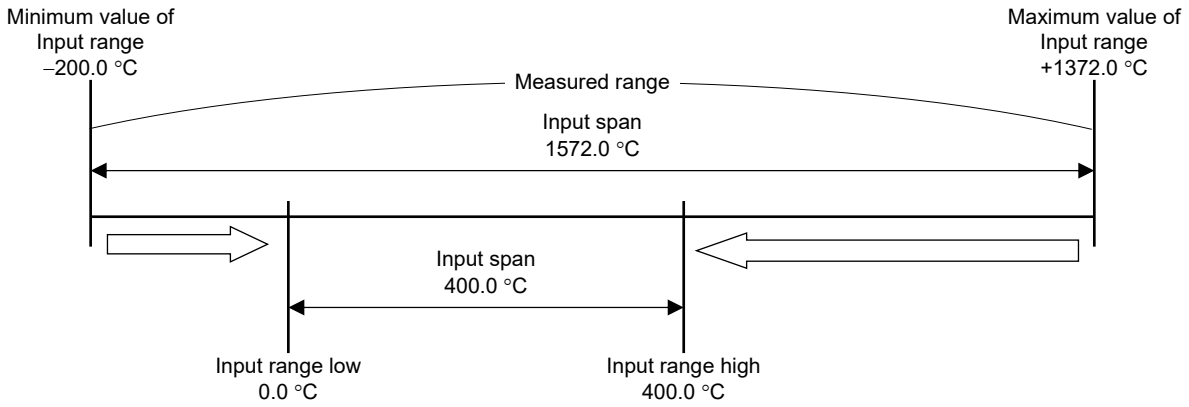
- TC input: K, J, R, S, B, E, N, T, PL II, U, L: No decimal place or One decimal place
  Thermocouples other than those shown above: No decimal place (fixed)
- RTD input: No decimal place, One decimal place or Two decimal places
- Voltage/Current input: In case of Input data type 0: No decimal place, One decimal place, Two decimal places, Three decimal places or Four decimal places
  In case of Input data type 1: No decimal place, One decimal place, Two decimal places or Three decimal places

☞ For the Input data type, refer to **Input range table (P. 5-11)**.

Input range high/low

In the case of temperature input (TC and RTD), input ranges can be changed. In the case of voltage (V) and current (I) inputs, the display range is programmable within −19999 and +99999.
(The input range specified when ordered can be changed by setting the input range high and low.)

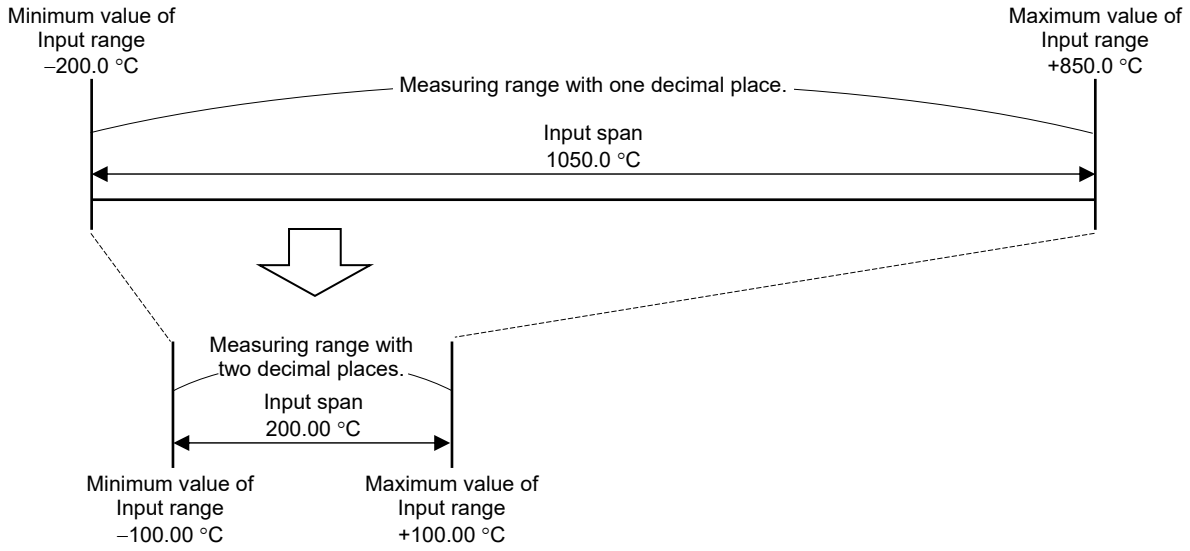
Example of input change 1:
Changing thermocouple K “−200.0 to +1372.0 °C” to “0.0 to 400.0 °C”



Example of input change 2:

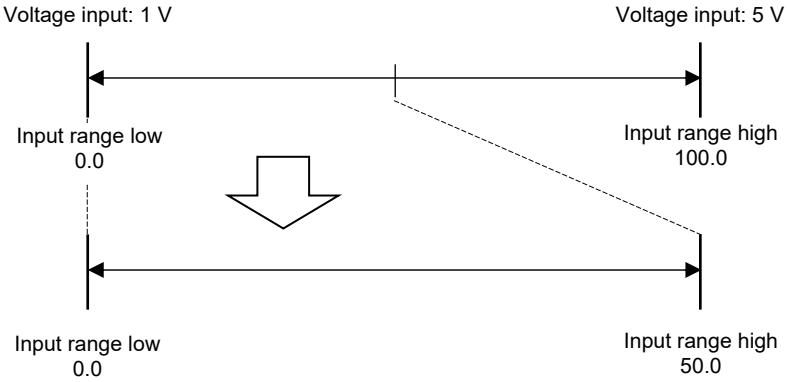
When the input range is −200.0 to +850.0 °C (Input type: RTD Pt100), changing the decimal point position to 2 from 1 will change the input range to −100.00 to +100.00 °C.

The maximum range with an RTD Pt100 input with two decimal places is −100.00 to +100.00 °C. Accordingly setting beyond this range is not possible.



Example of input change 3:

In the case of Voltage input (1 to 5 V DC), the input range has been reduced from “0.0 to 100.0” to “0.0 to 50.0.”



Input data type

The number of digits of the Measured value (PV), the number of data digits in RKC communication, the data type in Modbus communication (double word or single word) can be changed.

■ Parameter setting

☞ Refer to the **Input range table (P. 5-11)** for the input range of each input type.

☞ For the input range code, refer to **Input range code table (P. 5-13)**.

● Input 1_Input type [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range		Factory set value
1.1NP	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PL II 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100	15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as the input type of the input range code specified at the time of order.

NOTE

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

* High voltage input: 0 to 10 V DC, 0 to 5 V DC, 1to 5 V DC, 0 to 1 V DC, −10 to +10 V DC, −5 to +5 V DC
  Low voltage input: 0 to 100 mV DC, 0 to 10 mV DC

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the input type is changed.

● Input 2_Input type [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. INP	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PL II 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC ● When Measured input 2 is selected for FZ400/900: 0 to 24 ● When Remote setting input is selected for FZ400/900: 15 to 24 ● When Remote setting input is selected for FZ110: 15 to 22	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17

NOTE

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

***** High voltage input: 0 to 10 V DC, 0 to 5 V DC, 1to 5 V DC, 0 to 1 V DC, −10 to +10 V DC, −5 to +5 V DC
Low voltage input: 0 to 100 mV DC, 0 to 10 mV DC

To display Input 2_Input type, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized or changed when the input type is changed.

● Input 1_Display unit [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.UNIT	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.

To show "Input 1_Display unit," thermocouple or RTD must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the display unit is changed.

● Input 2_ Display unit [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.UNIT	0: °C 1: °F	Same as Input 1_Temperature unit

To show "Input 2_Display unit," "Measured input 2" must be specified at the time of order and thermocouple or RTD must be selected at "Input 2_Input type" in Function block No. 22 in the Engineering mode.

Input 2_Input type is not displayed if "No function" is selected at Select function for input 2 in Function block No. 58 in the Engineering mode. The setting cannot be changed if Remote setting input and Control with PV select are set.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the display unit is changed.

● Input 1_Decimal point position [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PGdP	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 to 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or automatically converted when the decimal point position is changed.

● Input 2_Decimal point position [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PGdP	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 to 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3	Same as Input 1_ Decimal point position

📖 To show the "Input 2_Decimal point position," "Measured input 2" must be specified at the time of order.

📖 Input 2_Input type is not displayed if "No function" is selected at Select function for input 2 in Function block No. 58 in the Engineering mode. The setting cannot be changed if Remote setting input and Control with PV select are set.

📖 When Control with PV select is set in "Select function for input 2" in Function block No. 58 in the Engineering mode, a smaller value (of Decimal point position setting for Input 1 and Input 2) will be used.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or automatically converted when the decimal point position is changed.

● Input 1_Input range high [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PGSH	(Input 1_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input range high is changed.

● Input 2_Input range high [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PGSH	• TC/RTD inputs and Voltage (V)/Current (I) inputs (For other than Remote setting input): (Input 2_Input range low + 1 digit) to Input 2_Maximum value of input range [Varies with the setting of the Decimal point position.] • Voltage (V)/Current (I) inputs (For Remote setting input): (Input 2_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Same as Input 1_Input range high

📖 To display Input 2_Input range high, "Measured input 2" or "Remote setting input" must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input range high is changed.

● Input 1_Input range low [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PGSL	Input 1_Minimum value of input range to (Input 1_Input range high – 1 digit) [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input range low is changed.

● Input 2_Input range low [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PGSL	• TC/RTD inputs and Voltage (V)/Current (I) inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1 digit) [Varies with the setting of the Decimal point position.] • Voltage (V)/Current (I) inputs (For Remote setting input): Input 1_Minimum value of input range to (Input 2_Input range high – 1 digit) [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Same as Input 1_Input range low

📖 To display Input 2_Input range low, "Measured input 2" or "Remote setting input" must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input range low is changed.

● Input data type [Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
INdT	0: Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication digits: 6 * Modbus: Single word ** PLC communication: Single word * Set "2" to handle the data of REX-D and its equivalent models in RKC communication. ** The data of the FB series and its equivalent are included. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Conforms to Input range code to specified at the time of ordering

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input data type is changed.

■ Input range table

The input range may vary with the Input data type.

The Input data types are as follows.

- Measured value (PV): 5 or 4 digits for the display
- RKC communication: 7 or 6 digits for the data
- Modbus: Double word or single word
- PLC communication: Double word or single word

The Input data type can be changed at "Input data type" in Function block No. 21 in the Engineering mode.

The input resolution may vary with the selected input range, display unit, and decimal point position.

● TC input

Input type	Decimal point position	In case of Input data type 0 (Number of measured value digits: 5; Number of RKC communication digits: 7; Modbus: Double word; PLC communication: Double word)		In case of Input data type 1 (Number of measured value digits: 4; Number of RKC communication digits: 6; Modbus: Single word; PLC communication: Single word)	
		°C	°F	°C	°F
K	No decimal place	−200 to +400 °C	−328 to +752 °F	−200 to +400 °C	−328 to +752 °F
		−200 to +1372 °C	−328 to +2502 °F	−200 to +1372 °C	−328 to +2502 °F
	One decimal place	−200.0 to +400.0 °C	−328.0 to +752.0 °F	−199.9 to +400.0 °C	−199.9 to +752.0 °F
		−200.0 to +1372.0 °C	−328.0 to +2502.0 °F	−199.9 to +999.9 °C	−199.9 to +999.9 °F
J	No decimal place	−200 to +400 °C	−328 to +752 °F	−200 to +400 °C	−328 to +752 °F
		−200 to +1200 °C	−328 to +2192 °F	−200 to +1200 °C	−328 to +2192 °F
	One decimal place	−200.0 to +400.0 °C	−328.0 to +752.0 °F	−199.9 to +400.0 °C	−199.9 to +752.0 °F
		−200.0 to +1200.0 °C	−328.0 to +2192.0 °F	−199.9 to +999.9 °C	−199.9 to +999.9 °F
T	No decimal place	−200 to +400 °C	−328 to +752 °F	−200 to +400 °C	−328 to +752 °F
	One decimal place	−200.0 to +400.0 °C	−328.0 to +752.0 °F	−199.9 to +400.0 °C	−199.9 to +752.0 °F
S *	No decimal place	−50 to +1768 °C	−58 to +3214 °F	−50 to +1768 °C	−58 to +3214 °F
	One decimal place	−50.0 to +1768.0 °C	−58.0 to +3214.0 °F	−50.0 to +999.9 °C	−58.0 to +999.9 °F
R *	No decimal place	−50 to +1768 °C	−58 to +3214 °F	−50 to +1768 °C	−58 to +3214 °F
	One decimal place	−50.0 to +1768.0 °C	−58.0 to +3214.0 °F	−50.0 to +999.9 °C	−58.0 to +999.9 °F
E *	No decimal place	−200 to +1000 °C	−328 to +1832 °F	−200 to +1000 °C	−328 to +1832 °F
	One decimal place	−200.0 to +1000.0 °C	−328.0 to +1832.0 °F	−199.9 to +999.9 °C	−199.9 to +999.9 °F
B *	No decimal place	0 to 1800 °C	0 to 3272 °F	0 to 1800 °C	0 to 3272 °F
	One decimal place	0.0 to 1800.0 °C	0.0 to 3272.0 °F	0.0 to 999.9 °C	0.0 to 999.9 °F
N *	No decimal place	0 to 1300 °C	0 to 2372 °F	0 to 1300 °C	0 to 2372 °F
	One decimal place	0.0 to 1300.0 °C	0.0 to 2372.0 °F	0.0 to 999.9 °C	0.0 to 999.9 °F
W5Re/W26Re	No decimal place	0 to 2300 °C	0 to 4200 °F	0 to 2300 °C	0 to 4200 °F
PL II *	No decimal place	0 to 1390 °C	0 to 2534 °F	0 to 1390 °C	0 to 2534 °F
	One decimal place	0.0 to 1390.0 °C	0.0 to 2534.0 °F	0.0 to 999.9 °C	0.0 to 999.9 °F
U	No decimal place	−200 to +600 °C	−328 to +1112 °F	−200 to +600 °C	−328 to +1112 °F
	One decimal place	−200.0 to +600.0 °C	−328.0 to +1112.0 °F	−199.9 to +600.0 °C	−199.9 to +999.9 °F
L	No decimal place	0 to 900 °C	0 to 1652 °F	0 to 900 °C	0 to 1652 °F
	One decimal place	0.0 to 900.0 °C	0.0 to 1652.0 °F	0.0 to 900.0 °C	0.0 to 999.9 °F
PR40-20	No decimal place	0 to 1800 °C	0 to 3200 °F	0 to 1800 °C	0 to 3200 °F

* The least significant digit (LSD) may flicker when the display resolution is set to 0.1°C (0.1°F).

If there is no decimal point, there is no difference in the input range by Input data type.

Thermcouple inputs K, J, T, S, R, E, B, N, PL II, U, and L are settable to one decimal place.

● RTD input

Input type	Decimal point position	In case of Input data type 0 (Number of measured value digits: 5, Number of RKC communication digits: 7, Modbus: Double word, PLC communication: Double word)		In case of Input data type 1 (Number of measured value digits: 4, Number of RKC communication digits: 6, Modbus: Single word, PLC communication: Single word)	
		°C	°F	°C	°F
Pt100	No decimal place	–200 to +850 °C	–328 to +1562 °F	–200 to +850 °C	–328 to +1562 °F
		–100 to +100 °C	–148 to +212 °F	–100 to +100 °C	–148 to +212 °F
		0 to 50 °C	32 to 122 °F	0 to 50 °C	32 to 122 °F
	One decimal place	–200.0 to +850.0 °C	–328.0 to +1562.0 °F	–199.9 to +850.0 °C	–199.9 to +999.9 °F
		–100.0 to +100.0 °C	–148.0 to +212.0 °F	–100.0 to +100.0 °C	–148.0 to +212.0 °F
		0.0 to 50.0 °C	32.0 to 122.0 °F	0.0 to 50.0 °C	32.0 to 122.0 °F
	Two decimal places	–100.00 to +100.00 °C	–148.00 to +212.00 °F	–19.99 to +99.99 °C	–19.99 to +99.99 °F
		0.00 to 50.00 °C	32.00 to 122.00 °F	0.00 to 50.00 °C	32.00 to 99.99 °F
JPt100	No decimal place	–200 to +649 °C	–328 to +1184 °F	–200 to +649 °C	–328 to +1184 °F
		–100 to +100 °C	–148 to +212 °F	–100 to +100 °C	–148 to +212 °F
		0 to 50 °C	32 to 122 °F	0 to 50 °C	32 to 122 °F
	One decimal place	–200.0 to +649.0 °C	–328.0 to +1184.0 °F	–199.9 to +649.0 °C	–199.9 to +999.9 °F
		–100.0 to +100.0 °C	–148.0 to +212.0 °F	–100.0 to +100.0 °C	–148.0 to +212.0 °F
		0.0 to 50.0 °C	32.0 to 122.0 °F	0.0 to 50.0 °C	32.0 to 122.0 °F
	Two decimal places	–100.00 to +100.00 °C	–148.00 to +212.00 °F	–19.99 to +99.99 °C	–19.99 to +99.99 °F
		0.00 to 50.00 °C	32.00 to 122.00 °F	0.00 to 50.00 °C	32.00 to 99.99 °F

If there is no decimal point, there is no difference in the input range by Input data type.

● Voltage/Current input

Input type	Decimal point position	In case of Input data type 0 (Number of measured value digits: 5, Number of RKC communication digits: 7, Modbus: Double word, PLC communication: Double word)	In case of Input data type 1 (Number of measured value digits: 4, Number of RKC communication digits: 6, Modbus: Single word, PLC communication: Single word)
Voltage/Current	No decimal place	–19999 to +99999	–1999 to +9999
	One decimal place	–1999.9 to +9999.9	–199.9 to +999.9
	Two decimal places	–199.99 to +999.99	–19.99 to +99.99
	Three decimal places	–19.999 to +99.999	–1.999 to +9.999
	Four decimal places	–1.9999 to +9.9999	

Input range code table (can be specified when ordering)

The Input range code table is a list of input range codes so that a user can specify the input range at the time of ordering. Even if the input range has been specified when ordered, the input range can be changed later within the measured range.

● TC Input

Type	Code	Range	See Note	Input data type (Factory set value)
K	K01	0 to 200 °C	4	1
	K02	0 to 400 °C	4	1
	K03	0 to 600 °C	4	1
	K04	0 to 800 °C	4	1
	K06	0 to 1200 °C	4	1
	K07	0 to 1372 °C	4	1
	K08	−199.9 to +300.0 °C	4	1
	K09	0.0 to 400.0 °C	4	1
	K10	0.0 to 800.0 °C	4	1
	K14	0 to 300 °C	4	1
	K41	−200 to +1372 °C	4	1
	K42	−200.0 to +1372.0 °C	5	0
	KA1	0 to 800 °F	4	1
	KA2	0 to 1600 °F	4	1
	KA3	0 to 2502 °F	4	1
J	J01	0 to 200 °C	4	1
	J02	0 to 400 °C	4	1
	J03	0 to 600 °C	4	1
	J04	0 to 800 °C	4	1
	J08	0.0 to 400.0 °C	4	1
	J29	−200.0 to +1200.0 °C	5	0
	JA1	0 to 800 °F	4	1
	JA3	0 to 2192 °F	4	1
	JA6	0 to 400 °F	4	1

Type	Code	Range	See Note	Input data type (Factory set value)
T	T01	−199.9 to +400.0 °C	4	1
	T02	−199.9 to +100.0 °C	4	1
	T03	−100.0 to +200.0 °C	4	1
	T19	−200.0 to +400.0 °C	5	0
R	R01	0 to 1600 °C	4	1
	R07	−50 to +1768 °C	4	1
	R08	−50.0 to +1768.0 °C	5	0
	R09	0.0 to 1600.0 °C	5	0
S	S06	−50 to +1768 °C	4	1
	S07	−50.0 to +1768.0 °C	5	0
B	B03	0 to 1800 °C	4	1
	B04	0.0 to 1800.0 °C	5	0
E	E01	0 to 800 °C	4	1
	E23	0.0 to 800.0 °C	4	1
N	N02	0 to 1300 °C	4	1
	N05	0.0 to 1300.0 °C	5	0
W5Re/ W26Re	W03	0 to 2300 °C	4	1
PL II	A01	0 to 1300 °C	4	1
	A05	0.0 to 1300.0 °C	5	0
U	U01	−199.9 to +600.0 °C	4	1
L	L04	0.0 to 900.0 °C	4	1
PR40-20	F02	0 to 1800 °C	5	0
	FA2	0 to 3200 °F	5	0

● RTD input

Type	Code	Range	See Note	Input data type (Factory set value)
Pt100	D01	−199.9 to +649.0 °C	4	1
	D04	−100.0 to +100.0 °C	4	1
	D05	−100.0 to +200.0 °C	4	1
	D06	0.0 to 50.0 °C	4	1
	D07	0.0 to 100.0 °C	4	1
	D08	0.0 to 200.0 °C	4	1
	D09	0.0 to 300.0 °C	4	1
	D10	0.0 to 500.0 °C	4	1
	D12	−199.9 to +600.0 °C	4	1

Type	Code	Range	See Note	Input data type (Factory set value)
Pt100	D21	−200.0 to +200.0 °C	5	0
	D27	0.00 to 50.00 °C	4	1
	D34	−100.00 to +100.00 °C	5	0
	D35	−200.0 to +850.0 °C	5	0
	DA1	−199.9 to +999.9 °F	4	1
	DA9	0.0 to 500.0 °F	4	1
JPt100	P08	0.0 to 200.0 °C	4	1
	P29	−100.00 to +100.00 °C	5	0
	P30	−200.0 to +640.0 °C	5	0

● Voltage/Current input

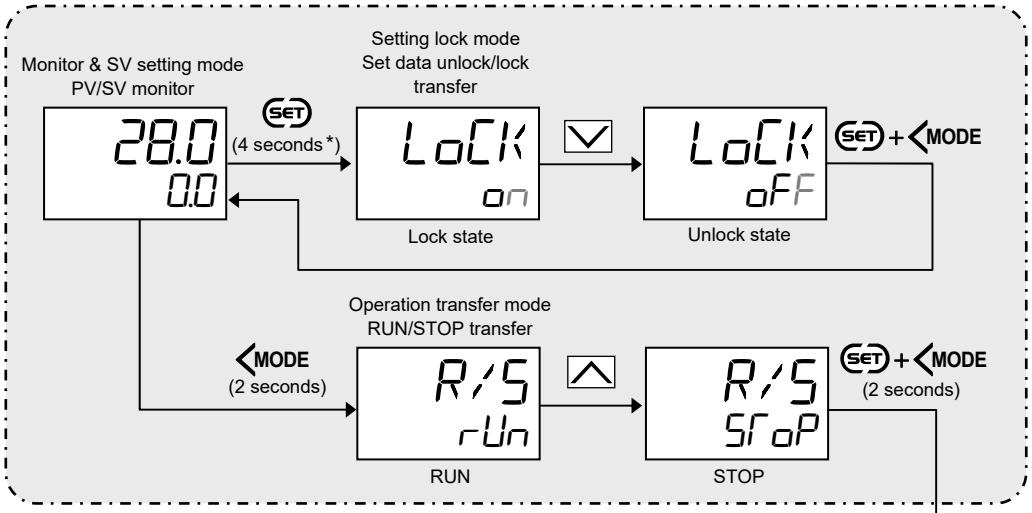
Type	Code	Range	See Note	Input data type (Factory set value)
Voltage/ Current	101	0 to 10 mV DC	5	0
	201	0 to 100 mV DC	5	0
	301	0 to 1 V DC	5	0
	401	0 to 5 V DC	5	0
	501	0 to 10 V DC	5	0

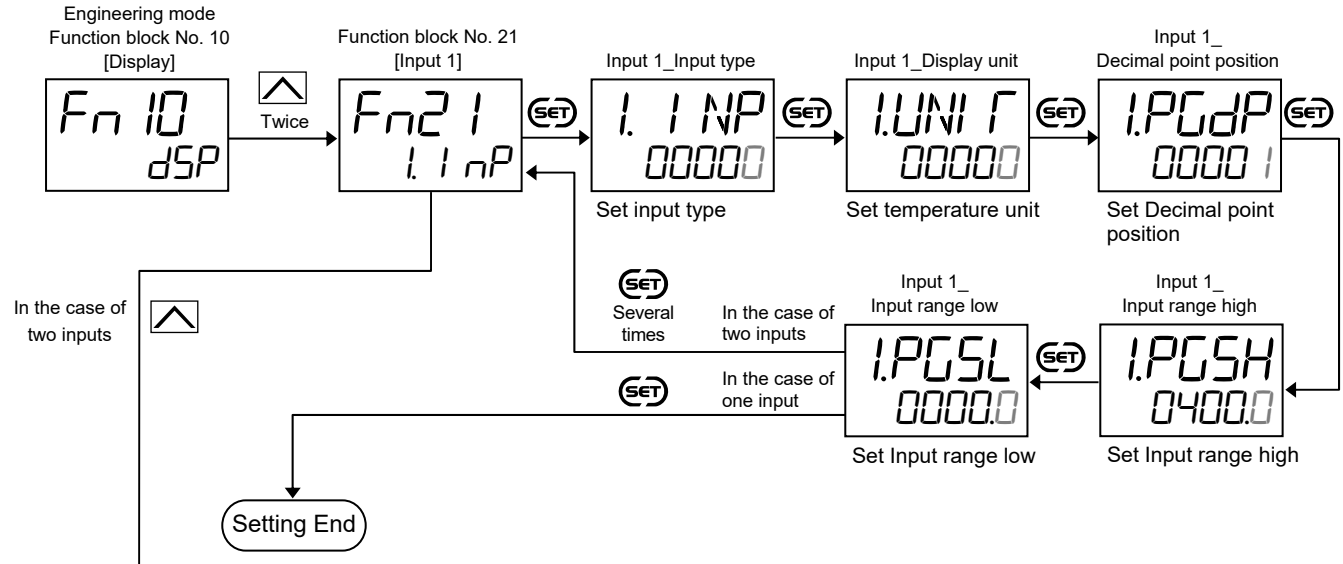
Type	Code	Range	See Note	Input data type (Factory set value)
Voltage/ Current	601	1 to 5 V DC	5	0
	701	0 to 20 mA DC	5	0
	801	4 to 20 mA DC	5	0
	904	−10 to +10 V DC	5	0
	905	−5 to +5 V DC	5	0

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

■ Setting procedure

To enter the Engineering mode





Setting End

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

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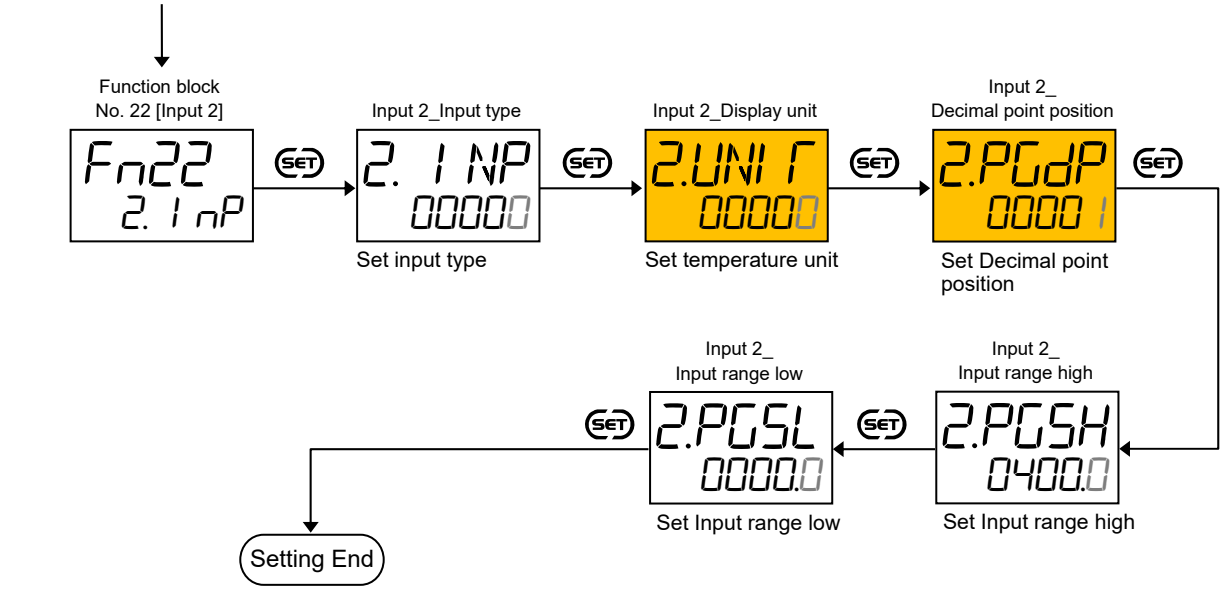

- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

5.2 Switching Functions Using Digital Inputs (DI)

With the use of Digital input (DI), switching between the following functions is available.

- RUN/STOP transfer
- Auto/Manual transfer
- Select function for input 2 transfer * (Remote/Local transfer, Cascade mode transfer, PV select transfer or 2-loop control/Differential temperature control)

  * For FZ400/900, the function selected at Select function for Input 2 is switchable.
  For FZ110, switching between remote and local only is available.

- Interlock release
- Peak/Bottom holds reset
- Selection of Autotuning (AT)
- Set data Unlock/Lock
- Direct/Reverse action
- Memory area

■ Number of Digital input (DI)

FZ400/900: Maximum 6 points (None, 4, or 6)
FZ110: Maximum 3 points (None, 4, or 6)

■ Functional setting of Digital input (DI)

Set the desired function at each Digital input (DI).

Setting	DI1	DI2	DI3	DI4	DI5	DI6
0	No function	No function	No function	No function	No function	No function
1	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP
2	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)
3	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)
4	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)
5	REM/LOC	REM/LOC	REM/LOC	REM/LOC	REM/LOC	REM/LOC
6	Interlock release	Interlock release	Interlock release	Interlock release	Interlock release	Interlock release
7	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)
8	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)
9	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)
10	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)
11	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)
12	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)
13	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock
14	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action
15	2 areas					
16	8 areas without SET					
17	8 areas with SET					
18	16 areas without SET					
19	16 areas with SET					
20	Area jump					

: The Setting range of DI2 to DI6 is from 0 to 14. Values 15 or larger cannot be set.

: When any of 16, 17, 18, and 19 is set for DI1, DI2 to DI5 (which are crossed out with) are used for switching the Memory area and not settable.

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[Explanation of functional setting]

RUN/STOP:	RUN/STOP transter
AUTO/MAN (1/2):	Auto/Manual transfer (Common to Input 1/Input 2)
AUTO/MAN (1):	Auto/Manual transfer (Input 1 only)
AUTO/MAN (2):	Auto/Manual transfer (Input 2 only) [1]
REM/LOC:	Remote/Local transfer * (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control)
	* For FZ400/900, the function selected at Select function for input 2 is switchable. For FZ110, switching between remote and local only is available.
Interlock release:	Release of Interlock
Hold reset (1/2):	Reset of Peak or Bottom hold value (Common to Input 1/Input 2)
Hold reset (1):	Reset of Peak or Bottom hold value (Input 1 only)
Hold reset (2):	Reset of Peak or Bottom hold value (Input 2 only) [1]
AT ON/OFF (1/2):	Autotuning (AT) ON/OFF (Common to Input 1/Input 2)
AT ON/OFF (1):	Autotuning (AT) ON/OFF (Input 1 only)
AT ON/OFF (2):	Autotuning (AT) ON/OFF (Input 2 only) [1]
Unlock/Lock:	Set data unlock/lock
Direct/Reverse action:	Switching between direct and reverse actions (Common to Input 1/Input 2) [2]
2 areas:	Memory area transfer 2 points (without area set signal)
8 areas without SET:	Memory area transfer 8 points (without area set signal) [3] DI2 and DI3 are not settable in this setting.
8 areas with SET:	Memory area transfer 8 points (with area set signal) [4] DI2, DI3 and DI4 are not settable in this setting.
16 areas without SET:	Memory area transfer 16 points (without area set signal) [4] DI2, DI3 and DI4 are not settable in this setting.
16 areas with SET:	Memory area transfer 16 points (with area set signal) [5] DI2, DI3, DI4 and DI5 are not settable in this setting.
Area jump:	Move to the linked area No. (If area is not specified, the jump destination is the current area No. + 1)

[1] Effective if two inputs are available (FZ400/900 only)
[2] Effective if setting of control action of Input 1 or Input 2 is any of 0, 1, 5, and 6.
[3] Effective if three or more Digital inputs (DI) are available
[4] Effective if four or more Digital inputs (DI) are available (FZ400/900 only)
[5] Effective if six or more Digital inputs (DI) are available (FZ400/900 only)

■ Open/Close action of Digital Input (DI)

● RUN/STOP transfer, Auto/Manual transfer, Remote/Local transfer, Set data unlock/lock transfer and Direct/Reverse action transfer

Functions are selected as follows using the open/close action of the contact.

Function		Contact close	Contact open
RUN/STOP transfer		RUN	STOP
Auto/Manual transfer		Auto mode	Manual mode
Remote/Local transfer [1]	Remote/Local transfer	Remoto mode	Local mode
	PV select transfer [2]	Input 2	Input 1
	2-loop control/Differential temperature control	Differential temperature control	2-loop control
	Cascade mode transfer (Slave single)	Cascade control	Slave single control
	Cascade mode transfer (Master single)	Cascade control	Master single control
Set data unlock/lock transfer		Lock	UnlocK
Direct/Reverse action transfer		Direct action	Reverse action

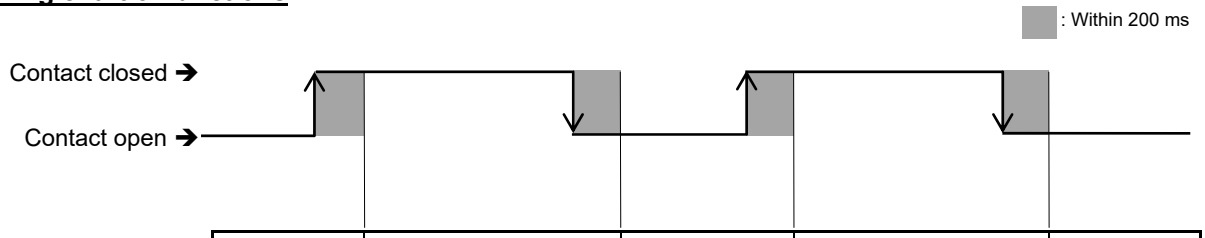
[1] Only one of the functions is available (Remote/Local only for FZ110)

[2] When [1: Switch by signal] is selected at Selection of PV select trigger (in Function block No. 58 in the Engineering mode)

Switching between Direct/Reverse action is available, only while the instrument is at STOP. Switching is not available during RUN. Setting the contact at RUN beforehand will perform switching when the instrument enters the STOP mode.
If "Input 1_Control action" or "Input 2_Control action" is set to "0: Brilliant II PID control (direct action)" or "1: Brilliant II PID control (reverse action)," PID action is switched between reverse and direction actions. In the case of "5: Brilliant II Position proportioning PID control (reverse action)" or "6: Brilliant II Position proportioning PID control (direct action)," Position proportioning PID action is switched between reverse and direction actions.

The above open/close action can be reversed (reversing the functions of open and close).
This setting can be done in DI logic invert (Function block No. 23 in the Engineering mode).

Timing chart of functions



RUN/STOP	STOP	RUN	STOP	RUN	STOP
Auto/Manual	Manual	Auto	Manual	Auto	Manual
Remoto/Local	Local	Remoto	Local	Remoto	Local
PV select transfer	Input 1	Input 2	Input 1	Input 2	Input 1
2-loop/Differential temperature	2-loop control	Differential temperature control	2-loop control	Differential temperature control	2-loop control
Cascade	Slave/Master single	Cascade	Slave/Master single	Cascade	Slave/Master single
Unlock/lock	Unlock	Lock	Unlock	Lock	Unlock
Direct/Reverse action	Reverse action	Direct action	Reverse action	Direct action	Reverse action

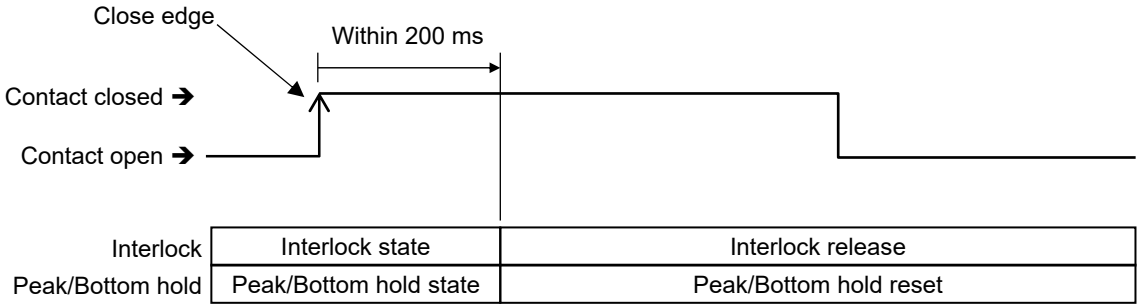
NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

● Interlock release, Peak/Bottom hold reset

Through the detection of close edge (rising edge), Interlock state and Peak (or Bottom) hold values are released.

Timing chart for releasing interlock, peak and bottom hold



NOTE

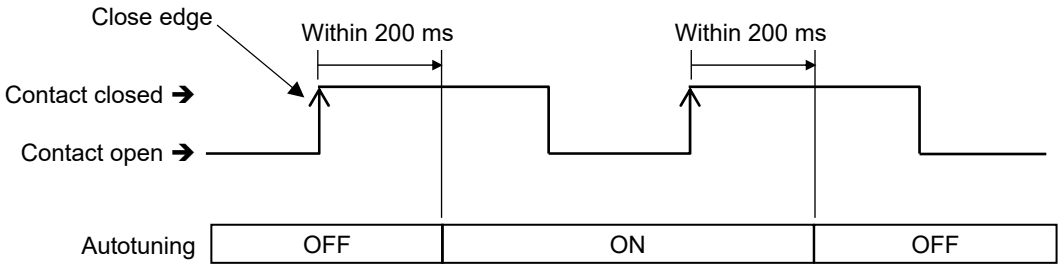
After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

● Autotuning (AT) ON/OFF

Through the detection of the close edge, Autotuning (AT) ON/OFF is switched.
If Input 1 and Input 2 are common, priority is given to the AT start. (Refer to the table below)

Status before AT on/off switching		Status after AT on/off switching	
Input 1	Input 2	Input 1	Input 2
in PID control	in PID control	AT start	AT start
during AT	in PID control	AT continues	AT start
in PID control	during AT	AT start	AT continues
during AT	during AT	PID control	PID control

ON/OFF timing chart of Autotuning (AT)



NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

● Memory area transfer

Selection of Memory area No. can be obtained through such contact status as shown below.

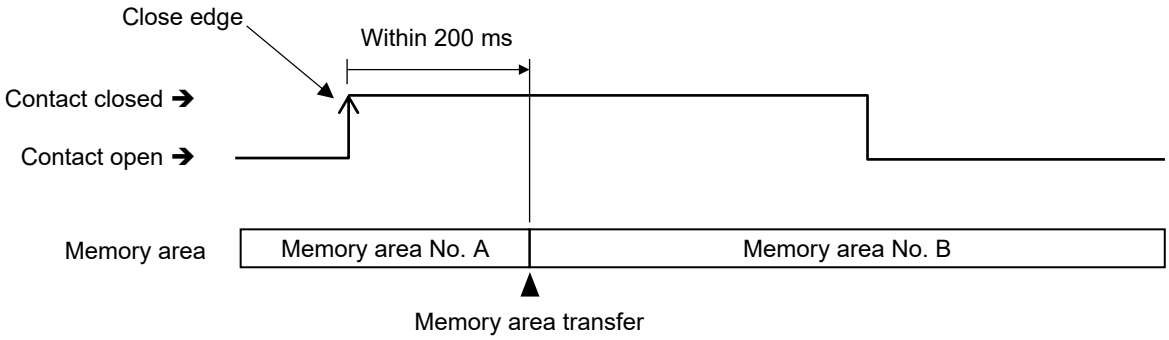
Memory area No.	DI1	DI2	DI3	DI4
1	—	—	—	—
2	×	—	—	—
3	—	×	—	—
4	×	×	—	—
5	—	—	×	—
6	×	—	×	—
7	—	×	×	—
8	×	×	×	—
9	—	—	—	×
10	×	—	—	×
11	—	×	—	×
12	×	×	—	×
13	—	—	×	×
14	×	—	×	×
15	—	×	×	×
16	×	×	×	×

—: Open
×: Closed

: Areas used by DI for 2 areas.
: Areas used by DI for 8 areas.
: Areas used by DI for 16 areas.

Memory area transfer timing

• With SET signal ·· First, change the contact status to a desired No. referring to the above table, and use a Close edge (Rising edge) of the area SET signal.
The area SET signal contact is: DI4 for 8 memory areas and DI5 for 16 memory areas.



NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

• Without SET signal ·· First select the memory area using contacts, then wait for 1 to 5 seconds (set in "Area switching time (without area set signal)" [Engineering mode, Function block No. 23]).

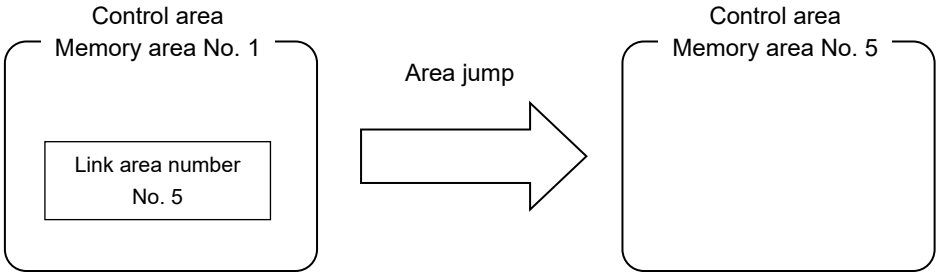
To change the Memory area without using the SET signal, "External mode" must be set at Control area Local/External transfer in the Operation transfer mode.

● Area jump

The memory area will be switched to the area set in the "Link area number" in the Parameter setting mode after the Close edge or Open edge has been detected. If the "Link area number" is not specified, the area number (which is the current number * + 1) will be selected.

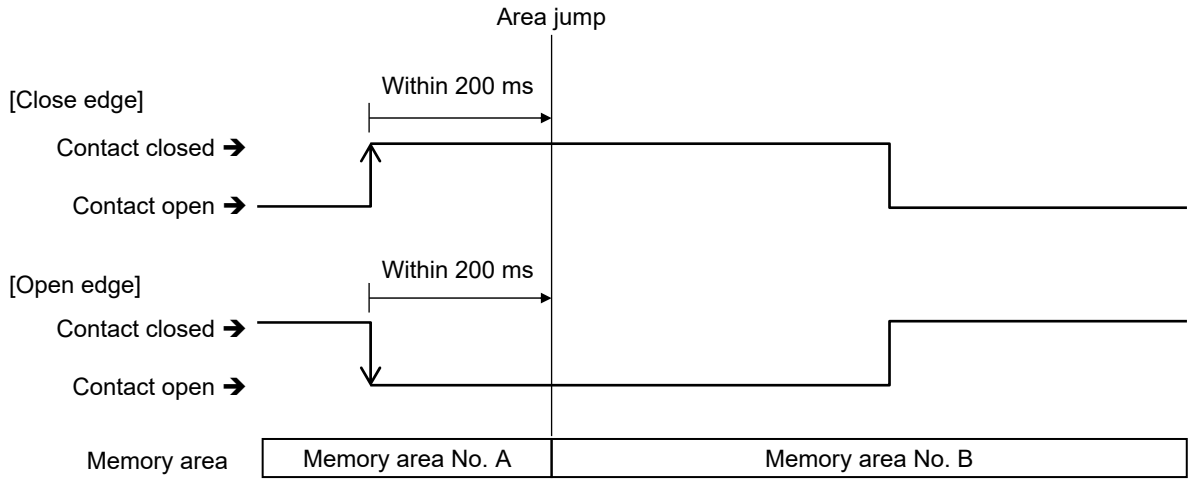
* In case the "Link area number" is not specified and the current control area No. is 16, the area will not be changed.

Example: If the current control area is "Memory area No. 1" and the "Link area number" (set in area No. 1) is "No. 5," the memory area will be changed to No. 5 from No. 1 after the Area jump.



To do the Area jump
"Digital input 1 (DI1) Close edge" or "Digital input 1 (DI1) Open edge," or both of these must be selected at Select Trigger type for Memory area transfer in the Parameter setting mode.

Timing chart of Area jump



NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

If "Event 1 to 4" are selected at the Select Trigger type for Memory area transfer in the Parameter setting mode of the memory area, the area jump will be conducted in case the preset event happens.

■ Relation between Digital Input (DI) and Setting via front keys (or through communication)

● RUN/STOP transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
RUN	RUN	RUN
	STOP	STOP
STOP	RUN	
	STOP	

Priority to STOP

● Auto/Manual transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Auto mode	Auto mode	Auto mode
	Manual mode	Manual mode
Manual mode	Auto mode	
	Manual mode	

Priority to manual mode

● Remote/Local transfer

Remote/Local transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Remoto mode	Remoto mode	Remoto mode
	Local mode	Local mode
Local mode	Remoto mode	
	Local mode	

Priority to Local mode

PV select transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Input 2	Input 2	Input 2
	Input 1	Input 1
Input 1	Input 2	
	Input 1	

Priority to Input 1

2-loop control/Differential temperature control transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Differential temperature control	Differential temperature control	Differential temperature control
	2-loop control	2-loop control
2-loop control	Differential temperature control	
	2-loop control	

Priority to 2-loop control

Cascade mode transfer (Slave/Master single control)

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Cascade control	Cascade control	Cascade control
	Slave/Master single control	Slave/Master single control
Slave/Master single control	Cascade control	
	Slave/Master single control	

Priority to Slave/Master single control

● Set data unlock/lock transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Unlock state	Unlock state	Unlock state
	Lock state	Lock state
Lock state	Unlock state	
	Lock state	

Priority is given to lock status

● Direct/Reverse action transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Reverse action	Reverse action	Reverse action
	Direct action	Direct action
Direct action	Reverse action	Reverse action
	Direct action	Direct action

Functions like “Interlock release,” “Peak hold/Bottom hold reset,” “Autotuning on/off,” “Memory area transfer (with SET signal),” and “Area jump” basically conform to the operation via front keys, through communication, or via digital inputs.

■ Parameter setting

● DI1 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI SL 1	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer [1] 5: Remote/Local transfer [2] (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset [1] 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) [1] 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, without area set signal) 16: Memory area transfer (8 points, without area set signal) [3] 17: Memory area transfer (8 points, with area set signal) [4] 18: Memory area transfer (16 points, without area set signal) [4] 19: Memory area transfer (16 points, with area set signal) [5] 20: Area jump	Based on Model code

[1] Effective if two inputs are available (FZ400/900 only)
[2] For FZ400/900, the function selected at Select function for input 2 is switchable.
For FZ110, switching between remote and local is only available.
[3] Effective if three or more Digital inputs (DI) are available
[4] Effective if four or more Digital inputs (DI) are available (FZ400/900 only)
[5] Effective if six or more Digital inputs (DI) are available (FZ400/900 only)

To display “DI1 function selection,” Digital input must be specified at the time of order.

● DI2 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI SL2	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer [1] 5: Remote/Local transfer [2] (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset [1] 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) [1] 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer	Based on Model code

[1] Effective if two inputs are available (FZ400/900 only)

[2] For FZ400/900, the function selected at Select function for input 2 is switchable.
For FZ110, switching between remote and local is only available.

To display "DI2 function selection," Digital input must be specified at the time of order.
For FZ110: Displayed when three Digital inputs (DI) are supplied.

● DI3 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI SL3	Same as DI2 function selection	Based on Model code

To display "DI3 function selection," Digital input must be specified at the time of order.
For FZ110: Displayed when three Digital inputs (DI) are supplied.

● DI4 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI SL4	Same as DI2 function selection	Based on Model code

To display "DI4 function selection," Digital input must be specified at the time of order.
(FZ400/900 only)

● DI5 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI 5L5	Same as DI2 function selection	Based on Model code

To display "DI5 Function selection," Digital inputs (6 points) must be specified at the time of order. (FZ400/900 only)

● DI6 function selection [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI 5L6	Same as DI2 function selection	Based on Model code

To display "DI6 Function selection," Digital inputs (6 points) must be specified at the time of order. (FZ400/900 only)

● DI logic invert [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI I NV	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer * (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0

* For FZ400/900, the function selected at Select function for input 2 is switchable.
For FZ110, switching between remote and local is only available.

To display "DI logic invert," Digital input must be specified at the time of order.

● Area switching time (without area set signal) [Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
dI rI M	1 to 5 seconds	2

To display "Area switching time (without area set signal)," Digital input must be specified at the time of order.

"Area switching time (without area set signal)" becomes valid when any one of 15, 16, and 18 is set at "DI1 function selection"

● Control area Local/External transfer [Operation Transfer Mode]

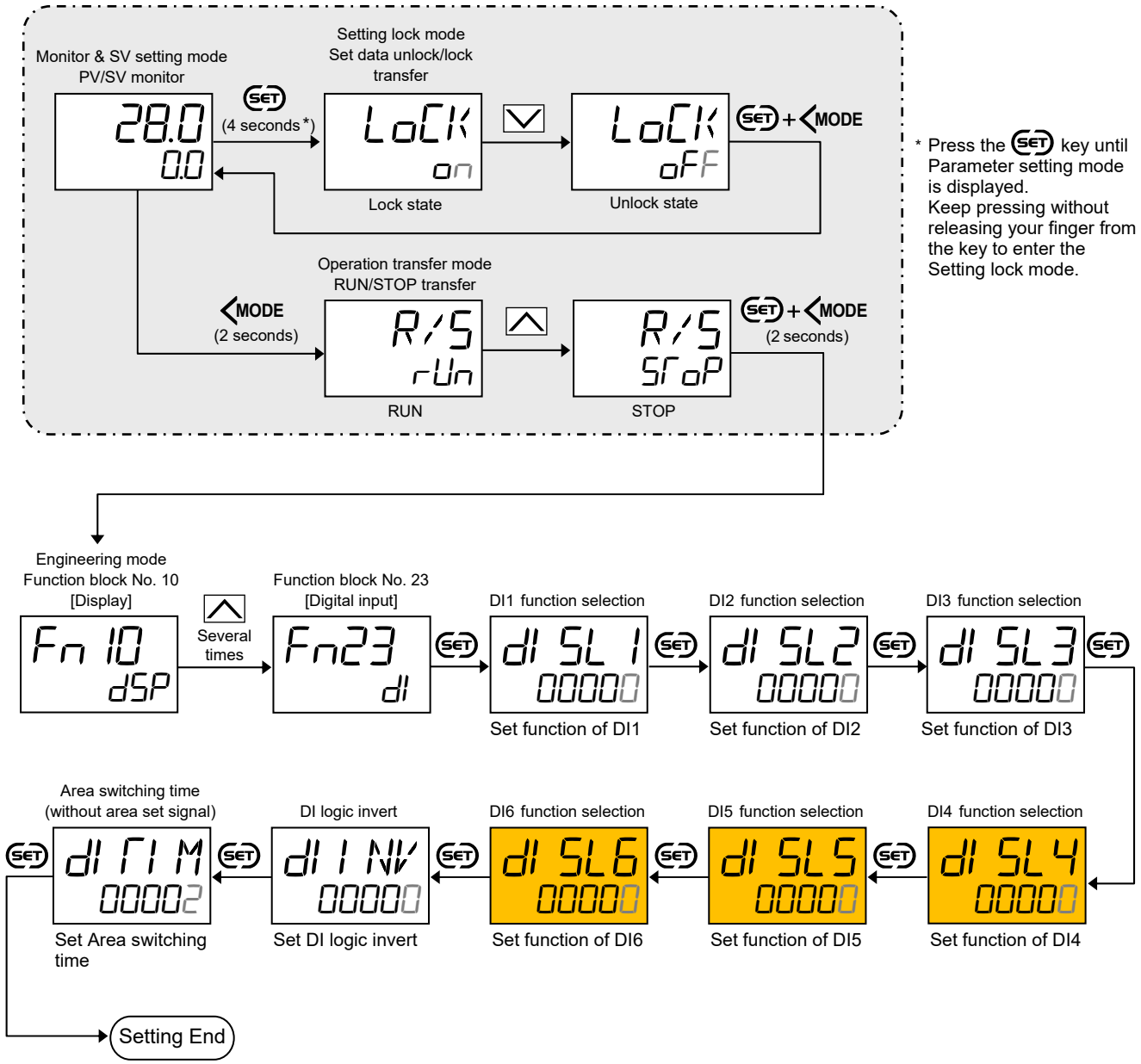
Parameter symbol	Data range	Factory set value
L/E	LoC: Local mode EUr: External mode	LoC

📖 To display “Control area Local/External transfer,” any one of 15, 16 and 18 must be set at “DI1 function selection.”

📖 If “External mode” is set at “Control area Local/External transfer,” control area cannot be switched via key operations.

■ Setting procedure

To enter the Engineering mode



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

5.3 Correcting Input (PV Bias and PV Ratio)

PV bias and PV ratio can be used for Input correction. The PV bias is used to compensate the individual variations of the sensors or correct the difference between the Measured value (PV) of other instruments.

■ Description of function

● PV bias

PV bias adds bias to the Measured value (PV).

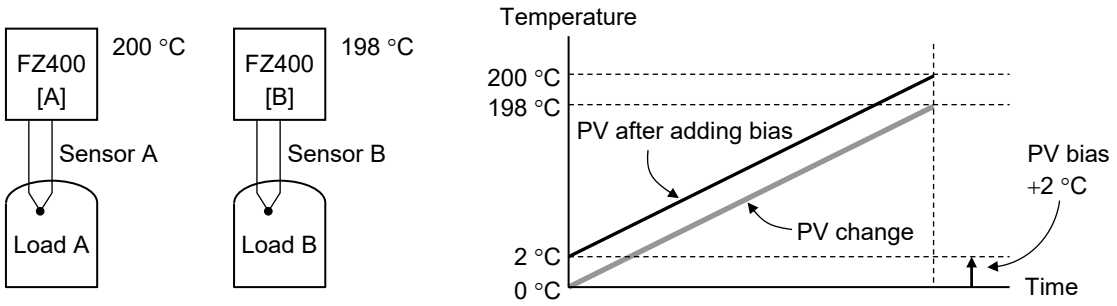
Setting example of PV bias:

When measuring the same type of load by using different sensors, the Measured value (PV) will be displayed differently based on the features of sensors:

FZ400 [A]: 200 °C FZ400 [B]: 198 °C

To correct the Measure value (PV) of FZ400 [B], add bias of +2 °C by PV bias:

Displayed value = Measured value (PV) + PV bias = 198 °C + 2 °C = 200 °C



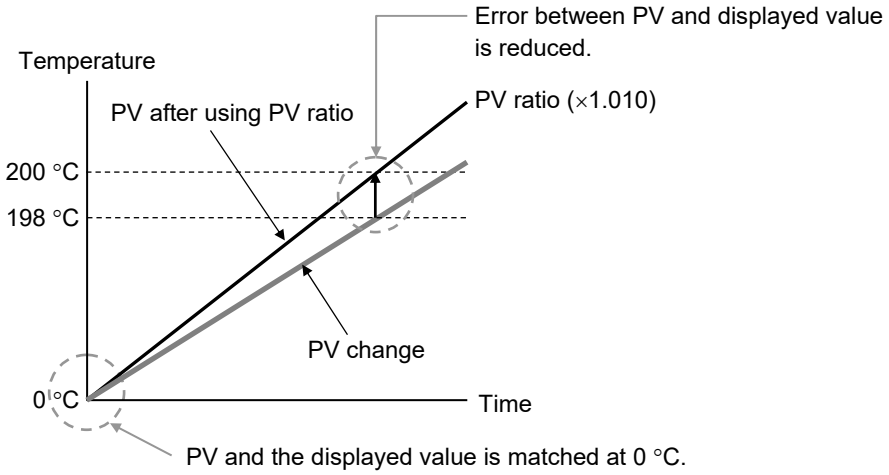
● PV ratio

PV ratio is a multiplier to be applied to the Measured value (PV).

Setting example of PV ratio:

PV ratio can be used to display 200 °C by adding 2 °C when the actual Measured value (PV) is 198 °C but the displayed value remains 0 °C when the actual PV is 0 °C. (The displayed value changes from 0 °C to 2 °C by PV bias setting.)

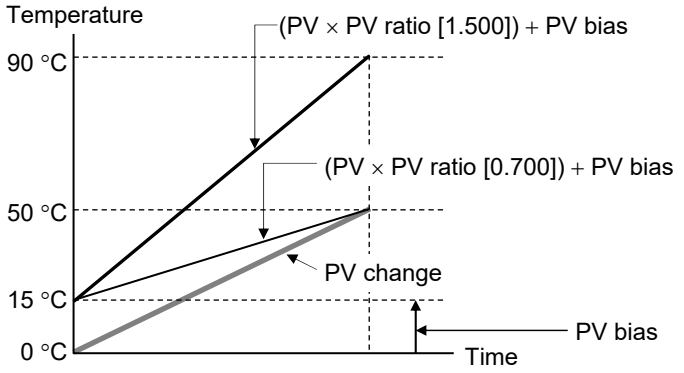
Displayed value = Measured value (PV) × PV ratio = 198 °C × 1.010 = 199.98 °C



● When setting PV bias and PV ratio at the same time

[Example]
When PV bias = 15 °C and
Measured value (PV) = 50 °C
If PV ratio = 0.700
Displayed value = 50 × 0.700 + 15
= 50 °C

PV ratio = 1.500
Displayed value = 50 × 1.500 + 15
= 90 °C



■ Parameter setting

● Input 1_PV bias
[Setup Setting Mode: Setting group No. 21 (Sn21)]

Parameter symbol	Data range	Factory set value
1. Pb	− (Input 1_Input span) to + (Input 1_Input span) (When Control with PV select: −(PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	0

● Input 2_PV bias (RS bias)
[Setup Setting Mode: Setting group No. 22 (Sn22)]

Parameter symbol	Data range	Factory set value
2. Pb	−(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position.	0

📖 To display Input 2_PV bias, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

📖 If Remote setting input is supplied, it is displayed as RS bias.

📖 Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

● Input 1_PV ratio
[Setup Setting Mode: Setting group No. 21 (Sn21)]

Parameter symbol	Data range	Factory set value
1. PR	0.500 to 1.500	1.000

● Input 2_PV ratio
[Setup Setting Mode: Setting group No. 22 (Sn22)]

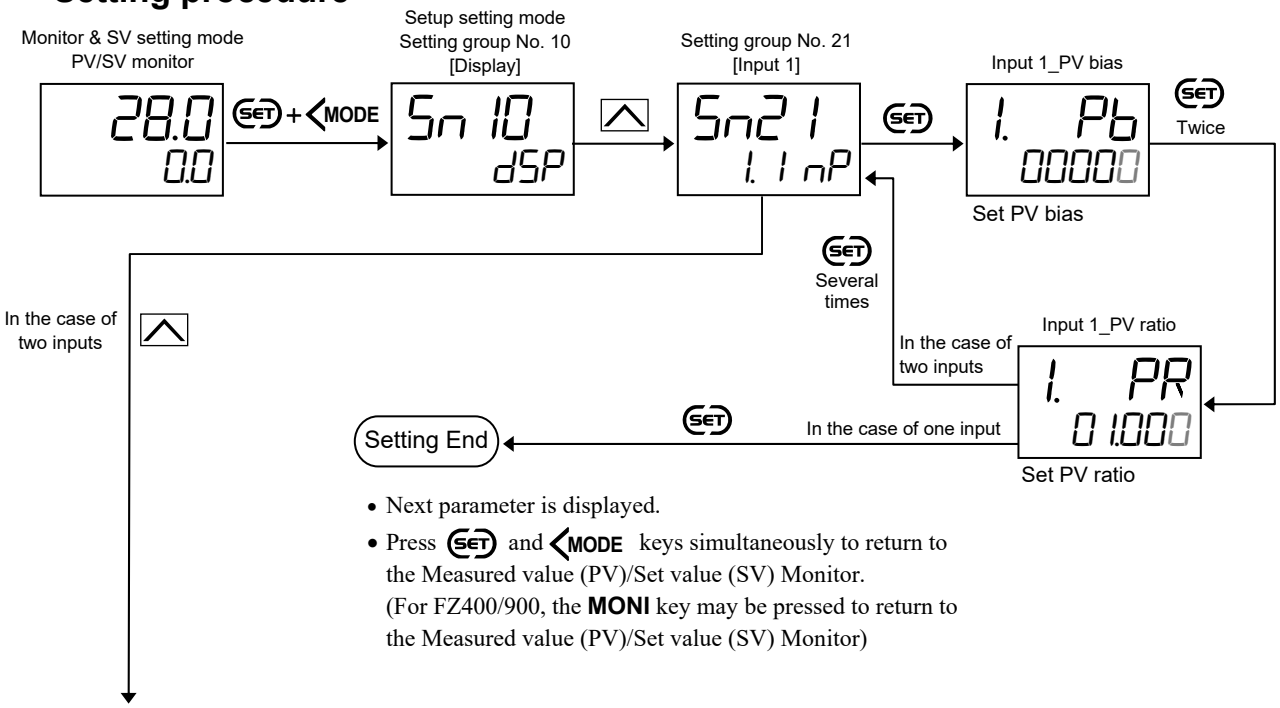
Parameter symbol	Data range	Factory set value
2. PR	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999	1.000

To display Input 2_PV ratio, "Measured input 2" or "Remote setting input" must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

If Remote setting input is supplied, it is displayed as PV ratio.

Input 2_Input type is not displayed if "No function" is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

■ Setting procedure

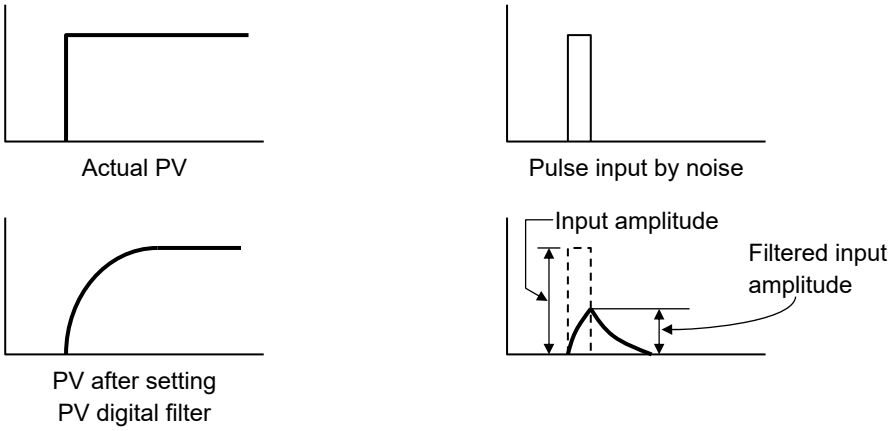


5.4 Preventing the Input Flicker

To prevent the input flicker, PV digital filter with the first-order lag calculation is provided.

■ Description of function

PV digital filter is software designed to reduce variance of PV caused by noise. Effect of Input noise can be reduced by setting time constant of PV digital filter based on the controlled object requirement and its level of noise. Setting a value too small leads to a poor result of PV digital filter; just as an input response will be poor when setting a value too large.



■ Parameter setting

● Input 1_PV digital filter [Setup Setting Mode: Setting group No. 21 (Sn21)]

Parameter symbol	Data range	Factory set value
1. dF	0.0 to 100.0 seconds 0.0: Filter OFF	0.0

● Input 2_PV digital filter (RS digital filter) [Setup Setting Mode: Setting group No. 22 (Sn22)]

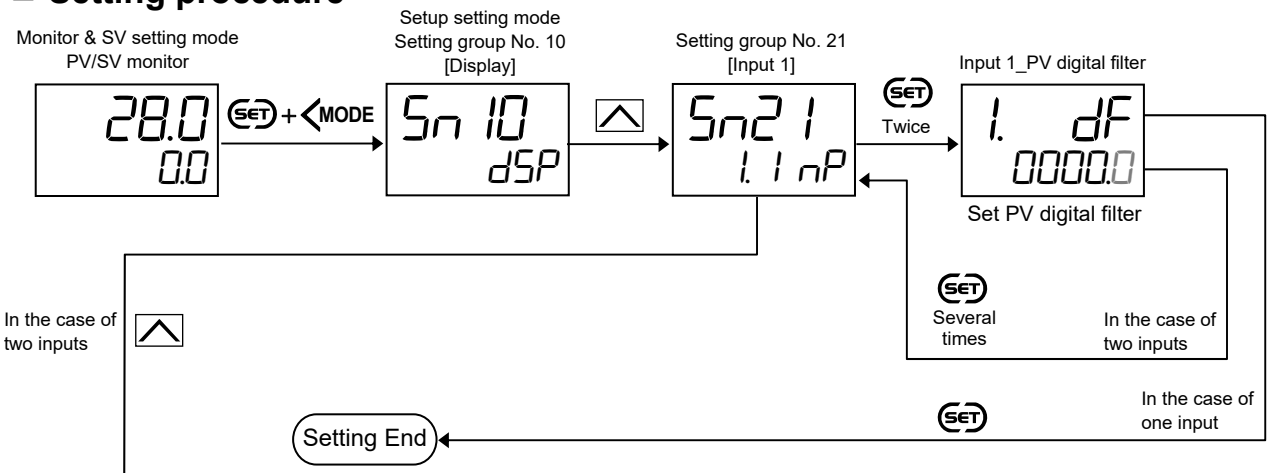
Parameter symbol	Data range	Factory set value
2. dF	0.0 to 100.0 seconds 0.0: Filter OFF	0.0

To display Input 2_PV digital filter, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

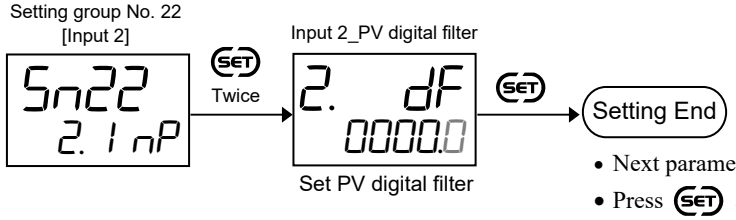
If Remote setting input is supplied, it is displayed as RS digital filter.

Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

■ Setting procedure



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



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

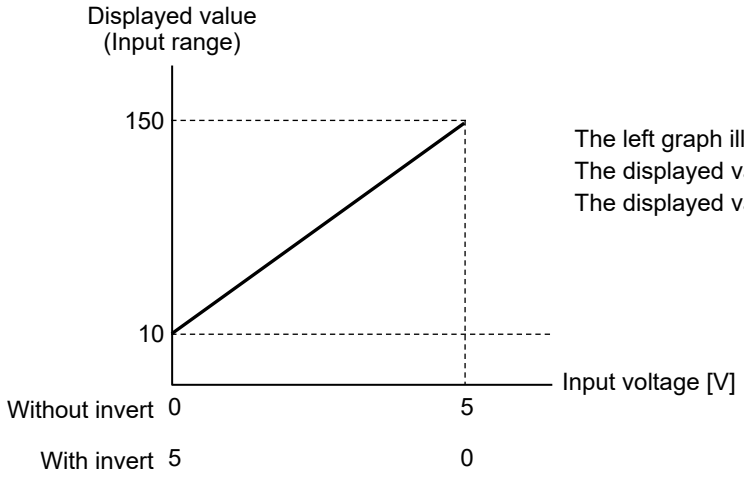
5.5 Inverting the Input

If the instrument is a current/voltage input type, the proportional relation between the input current (voltage) and the displayed value can be inverted.

■ Description of function

Reverse setting (Input range high < Input range low) of Input range high and low is not available on the instrument. However, with the Input invert function, the display relation to the input can be inverted.

Example: with/without invert function for voltage input 0 to 5 V



The left graph illustrates the signal when Input voltage is 5 V.
The displayed value without the Invert function is “150.”
The displayed value with the Invert function is “10.”

■ Parameter setting

● Input 1_Inverting input [Engineering mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.1NV	0: Unused 1: Used	0

To show “Input 1_Inverting input,” current or voltage must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Inverting input [Engineering mode: Function block No. 22 (Fn22)]

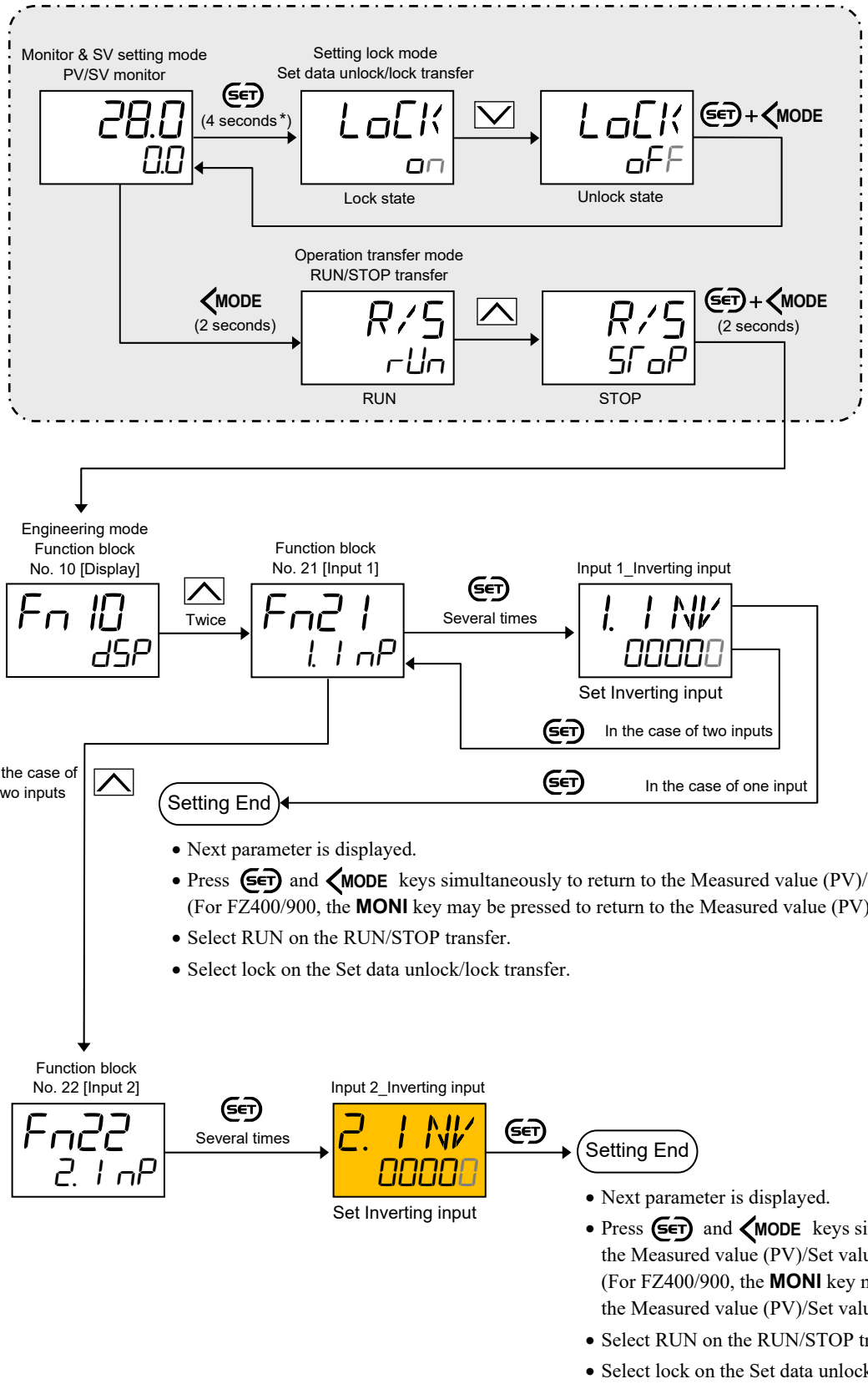
Parameter symbol	Data range	Factory set value
2.1NV	0: Unused 1: Used	0

To show “Input 2_Inverting input,” Measured input 2 must be specified at the time of order and voltage or current must be specified at “Input 2_Input type” in Function block No. 22 in the Engineering mode.

Not displayed if “Select function for input 2” is set in Function block No. 58 in the Engineering mode to “No function” or “Remote setting input.”

■ Setting procedure

To enter the Engineering mode



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

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

5.6 Extracting Square Root of Input

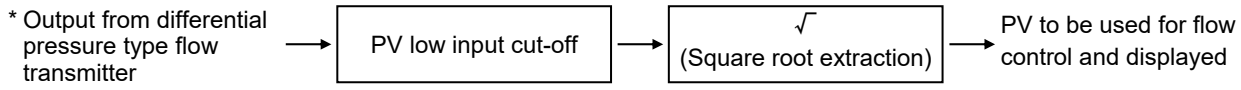
Square root extraction can control flow by sending the output signal directly from a differential pressure type flow transmitter to instrument. By setting PV low input cut-off, Square root extraction will not be performed for the Measured value below the set value of PV low input cut-off.

■ Description of function

● Square root extraction

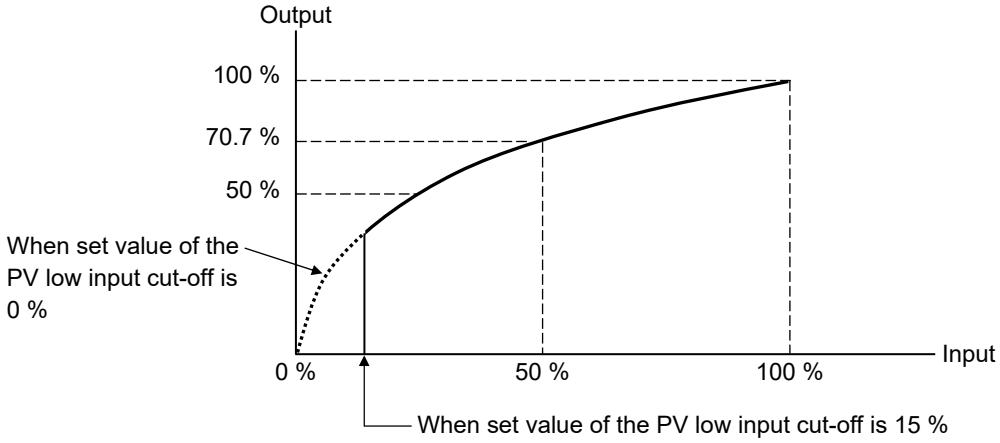
When using a differential pressure type flow transmitter, the Measured value (PV) is computed by Square root extraction.

Equation: Measured value (PV) = $\sqrt{(\text{Input value }^*)} \times \text{PV ratio} + \text{PV bias}$



● PV low input cut-off

The result of square root extraction become "0" when the Measured value (PV) drops below the set value of the PV low input cut-off. Output is not produced when the result of square root extraction is zero (0).
When input signal square root extraction is used for in flow control, etc., the Square root extraction result varies widely at the Low measured value range. The Measured value less than the PV low input cut-off is ignored to compute control output in order to prevent control disturbance caused by input variation at Low measured value range.



■ Parameter setting

● Input 1_Square root extraction [Engineering mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1. SQR	0: Unused 1: Used	0

To show "Input 1_Square root extraction," current or voltage must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Square root extraction [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. SQR	0: Unused 1: Used	0

To show "Input 2_Square root extraction," Measured input 2 must be specified at the time of order and voltage or current must be specified at "Input 2_Input type" in Function block No. 22 in the Engineering mode.

Not displayed if "Select function for input 2" is set in Function block No. 58 in the Engineering mode to "No function" or "Remote setting input."

● Input 1_PV low input cut-off [Setup Setting Mode: Setting group No. 21 (Sn21)]

Parameter symbol	Data range	Factory set value
1. PLC	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00

To display "Input 1_PV low input cut-off," input type is Voltage/Current input, AND "Input 1_Square root extraction" in Function block No. 21 in the Engineering mode must be set to "Used."

● Input 2_PV low input cut-off [Setup Setting Mode: Setting group No. 22 (Sn22)]

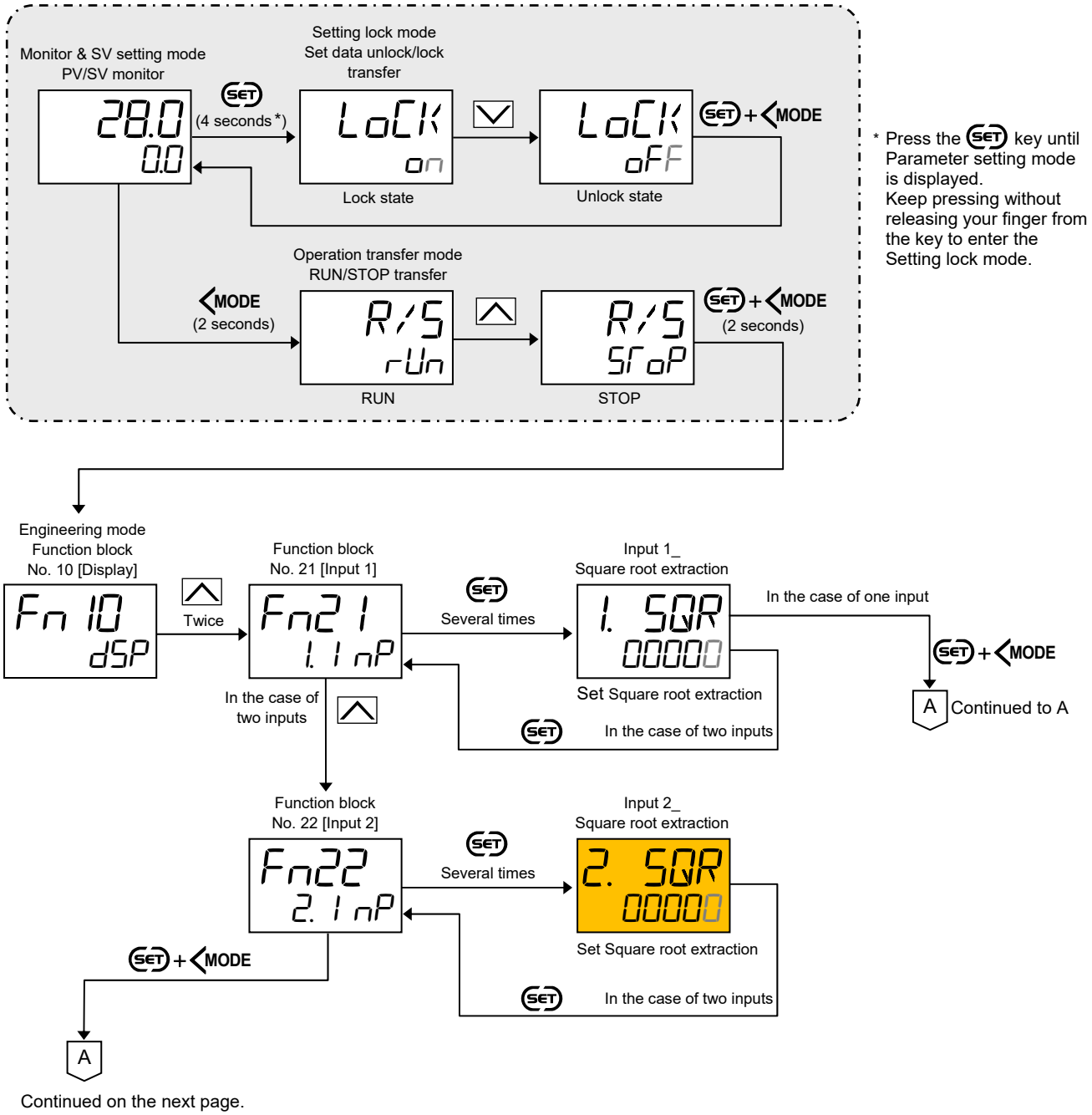
Parameter symbol	Data range	Factory set value
2. PLC	0.00 to 25.00 % of Input 2_Input span	0.00

To display "Input 2_PV low input cut-off," specify "Measured input 2" at the time of order, AND input type is Voltage/Current input, AND "Input 2_Square root extraction" in Function block No. 22 in the Engineering mode must be set to "Used."

Not displayed if "Select function for input 2" is set in Function block No. 58 in the Engineering mode to "No function" or "Remote setting input."

■ Setting procedure

To enter the Engineering mode



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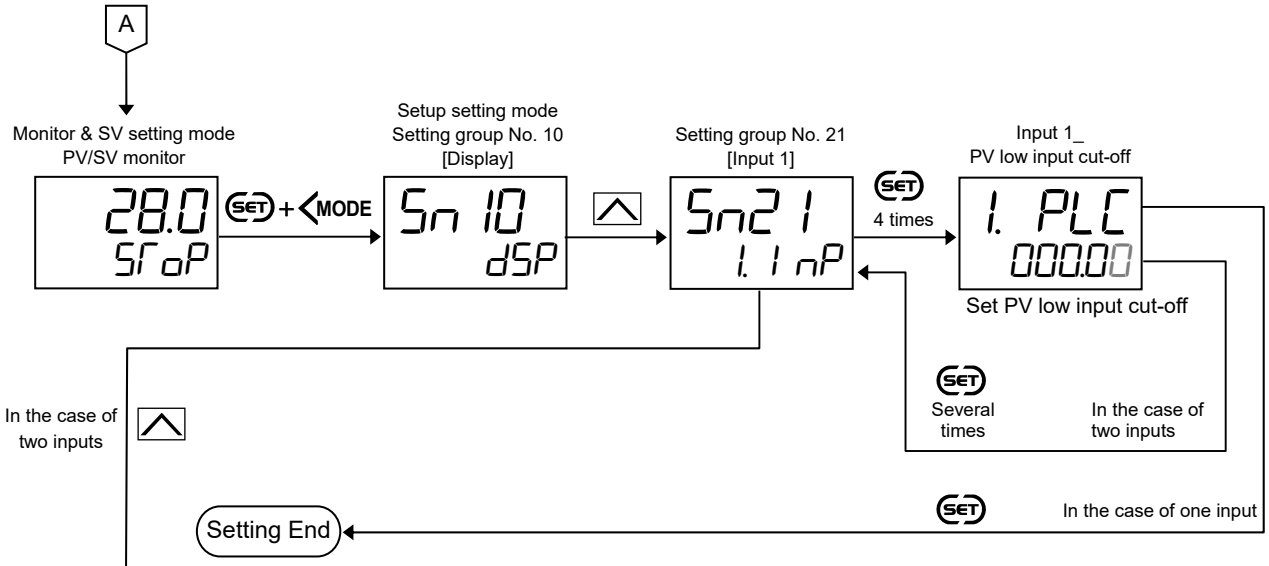
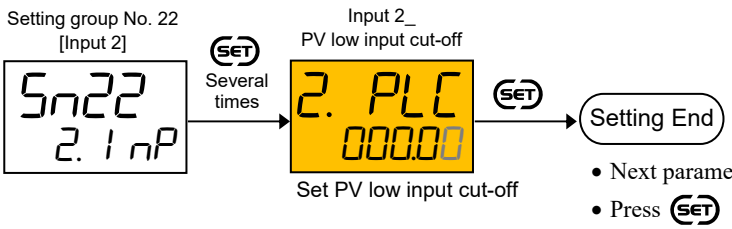


- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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



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

5.7 Changing Error Handling at Input Error

The measures for input errors can be selected from Input burnout direction, Input error determination point, Manipulated output value at Input error, PV flashing display at input error, and Input error status output.

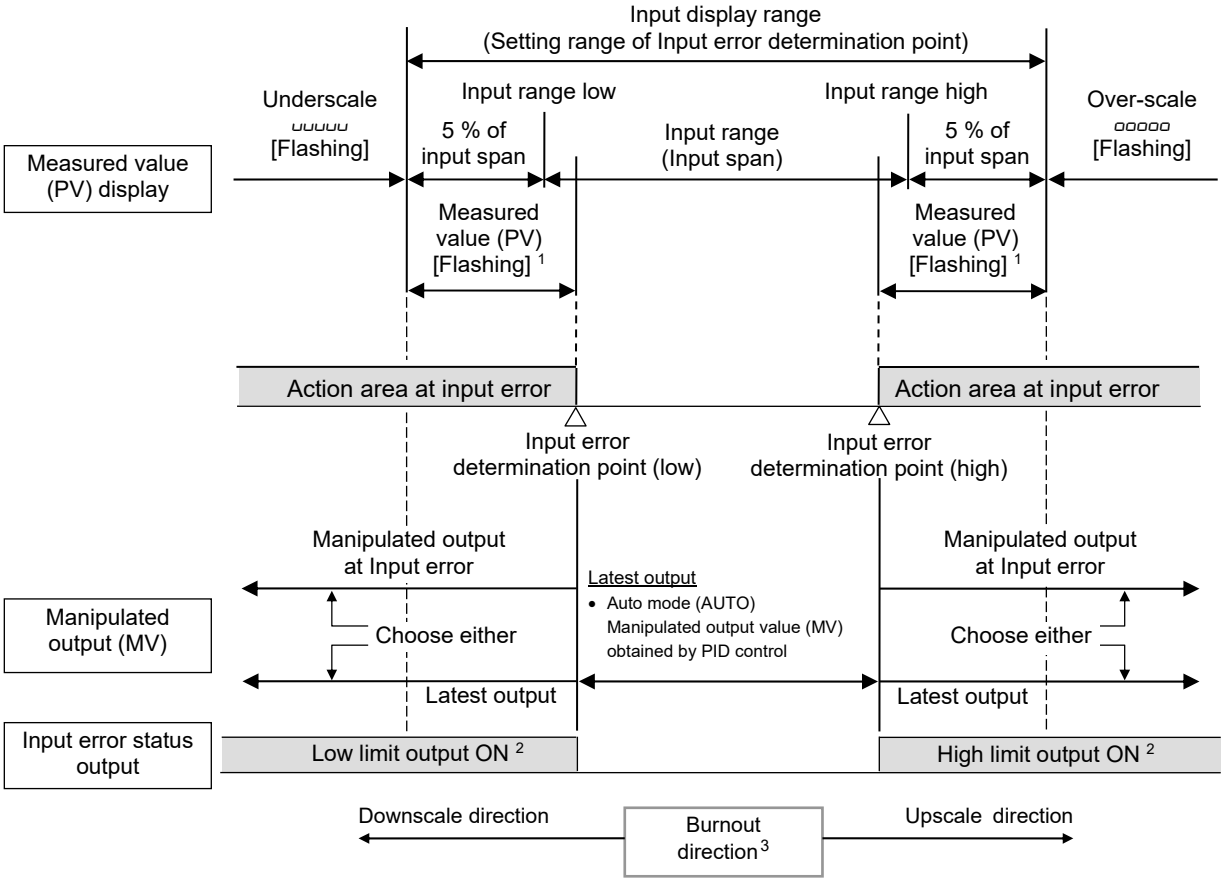
■ Description of function

If the measured value (PV) exceeds the Input error determination point (high or low), the action predefined at "Action (high and low) input error" will be taken. Input error status signal can be output from OUT1 to OUT3 and DO1 to DO4.

NOTE

In manual mode and control stop mode, action and output will not be taken for input errors.

● Input error determination point is set within the input range



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

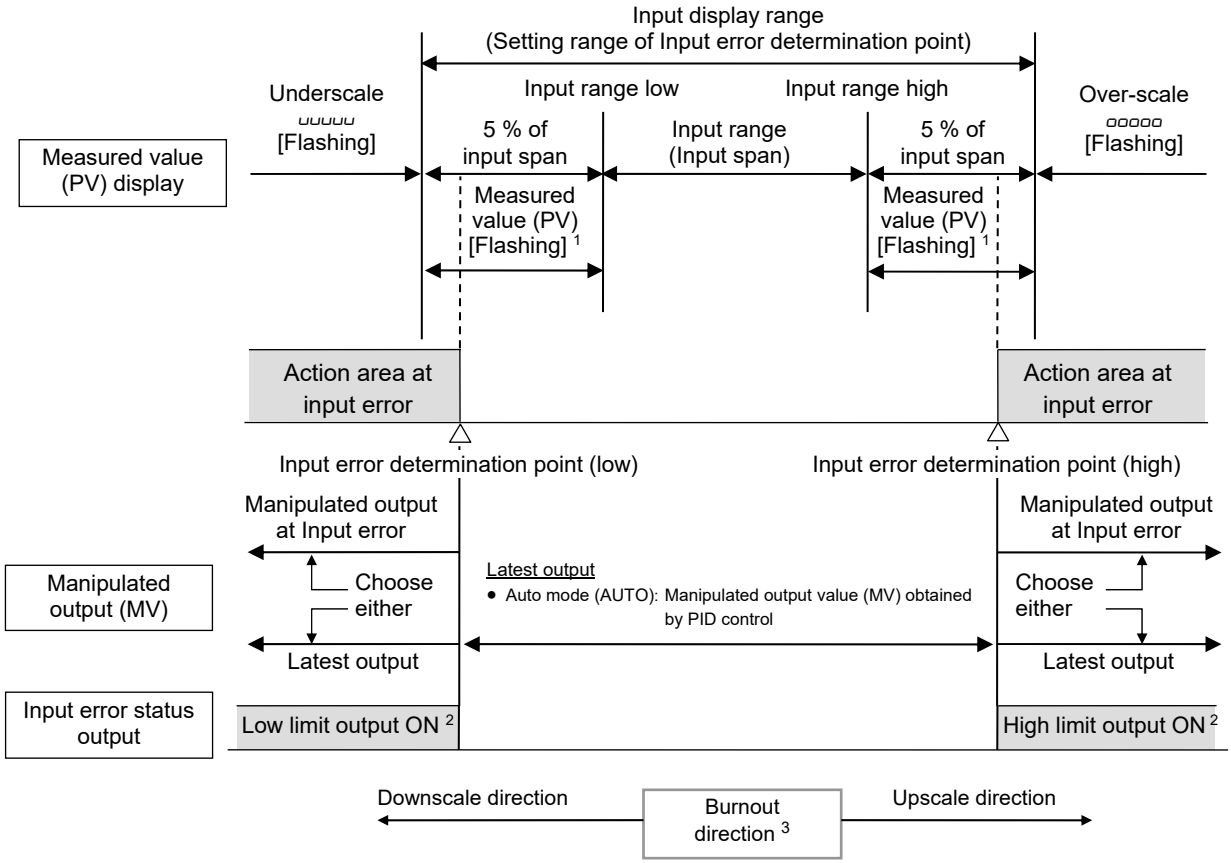
[2] For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (P. 6-4)**.

[3] Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)

☞ Refer to the **Input range table (P. 5-11)** for the input range of each input.

☞ For details of Input error status output, refer to **6.1 Changing Output Assignment (P. 6-2)**.

● Input error determination point is set outside the input range



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

[2] For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (P. 6-4)**.

[3] Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)

☞ Refer to the **Input range table (P. 5-11)** for the input range of each input.

☞ For details of Input error status output, refer to **6.1 Changing Output Assignment (P. 6-2)**.

In the case of control with dual inputs, the action at input error is conducted independently on each of Input 1 and Input 2. However, exceptional cases are shown below in which Action at input error may be slightly different.

● Cascade control

Switching is possible between Cascade control and Master single control or Cascade control and Slave single control. Action at input error of each case is as follows.

	Cascade control	Master single control	Slave single control
Input error determination	• Input 1 is determined at Input 1_Input error determination point. • Input 2 is determined at Input 2_Input error determination point. Whichever is triggered by input error.	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Action selected for Input 1_Action input error.	Action selected for Input 1_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error

[Action at input error for cascade control]

The settings of Action at input error high and low are conflicting each other and when both Input 1 and Input 2 go to an input error state.

Input 1_Action input error	Input 2_Action input error	Control action
1: Manipulated output value at input error (Manual mode)	2: Manipulated output value at input error (Auto mode)	Input 1_Manipulated output value at input error" is output in Manual mode
2: Manipulated output value at input error (Auto mode)	1: Manipulated output value at input error (Manual mode)	"Input 1_Manipulated output value at input error" is output in Auto mode
0: Control continues	1: Manipulated output value at input error (Manual mode)	Input 1_Manipulated output value at input error" is output in Manual mode
1: Manipulated output value at input error (Manual mode)	0: Control continues	Input 1_Manipulated output value at input error" is output in Manual mode
0: Control continues	2: Manipulated output value at input error (Auto mode)	"Input 1_Manipulated output value at input error" is output in Auto mode
2: Manipulated output value at input error (Auto mode)	0: Control continues	"Input 1_Manipulated output value at input error" is output in Auto mode

● 2-loop control/Differential temperature control

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Input 1 side: "Input 1_Manipulated output value at input error" is output [fixed] Input 2 side: Action selected for Input 2_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error Input 2_Manipulated output value at input error

● Input circuit error alarm

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Even if Input 2 is in input error, Action at input error will not be taken. *
Manipulated output value at input error	Input 1_Manipulated output value at input error	

* If (Input 2 – Input 1) exceeds the Input circuit error alarm set value, Action at input error is the action defined in Input 1_Action input error.

● **Control with PV select**

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	When the Input 1 is used: Action selected for Input 1_Action input error. When the Input 2 is used: No Action at input error	When the Input 1 is used: No Action at input error When the Input 2 is used: Action selected for Input 1_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error

■ Parameter setting

● PV flashing display at input error [Engineering mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
dSoP	0: Flashing display 1: Non-flashing display	0

● Input 1_Input error determination point (high) [Engineering mode: Function block No. 21 (Fn2 1)]

Parameter symbol	Data range	Factory set value
1. PoV	Input 1_Input error determination point (low) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	Input 1_Input range high + (Input 1_5 % of input span)

● Input 1_Input error determination point (low) [Engineering mode: Function block No. 21 (Fn2 1)]

Parameter symbol	Data range	Factory set value
1. PUN	Input 1_Input range low – (Input 1_5 % of input span) * to Input 1_Input error determination point (high) Varies with the setting of the Decimal point position. * When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input 1_Input range low – (Input 1_5 % of input span)

● Input 2_Input error determination point (high) [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. PoV	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	Input 2_Input range high + (Input 2_5 % of input span)

To show the "Input 2_Input error determination point (high)," "Measured input 2" must be specified at the time of order.

Not displayed when "No function" or "Remote setting input" is slected in "Select function for input 2" (Function block No. 58 in Engineering mode).

● Input 2_Input error determination point (low) [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. PUN	Input 2_Input range low – (Input 2_5 % of input span) * to Input 2_Input error determination point (high) Varies with the setting of the Decimal point position. * When Input type of Input 2 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F] , JPt100: –237.6 °C [–395.7 °F])	Input 2_Input range low – (Input 2_5 % of input span)

To show the "Input 2_Input error determination point (low)," "Measured input 2" must be specified at the time of order.

Not displayed when "No function" or "Remote setting input" is slected in "Select function for input 2" (Function block No. 58 in Engineering mode).

● Input 1_Burnout direction [Engineering mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1. boS	0: Upscale 1: Downscale	0

To show "Input 1_Burnout direction," thermocouple or voltage (low) [0 to 100 mV DC, 0 to 10 mV DC] must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Burnout direction [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. boS	0: Upscale 1: Downscale	0

To show "Input 2_Burnout direction," "Measured input 2" must be specified at the time of order and thermocouple or low voltage (0 to 100 mV DC, 0 to 10 mV DC) must be selected at "Input 2_Input type" in Function block No. 22 in the Engineering mode.

Input 2_Input type is not displayed if "No function" is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

● Input 1_Action (high) input error [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.AoVE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

● Input 1_Action (low) input error [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.AUNE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

● Input 2_Action (high) input error [Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2.AoVE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

To show "Input 2_Action (high) input error," "Measured input 2" must be specified at the time of order, and "Select function for input 2" (Function block No. 58 in the Engineering mode) must be set to "2-loop control/Differential temperature input" must be set up.

● Input 2_Action (low) input error [Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2.AUNE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

To show "Input 2_Action (low) input error," "Measured input 2" must be specified at the time of order, and "Select function for input 2" (Function block No. 58 in the Engineering mode) must be set to "2-loop control/Differential temperature input" must be set up.

● Input 1_Manipulated output value at input error [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. PSM	PID control, Position proportioning PID control: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 %	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control: 0.0

For Heat/Cool PID control, output is produced from the heat side if the setting is positive (+) and output is produced from the cool side if the setting is negative (–).

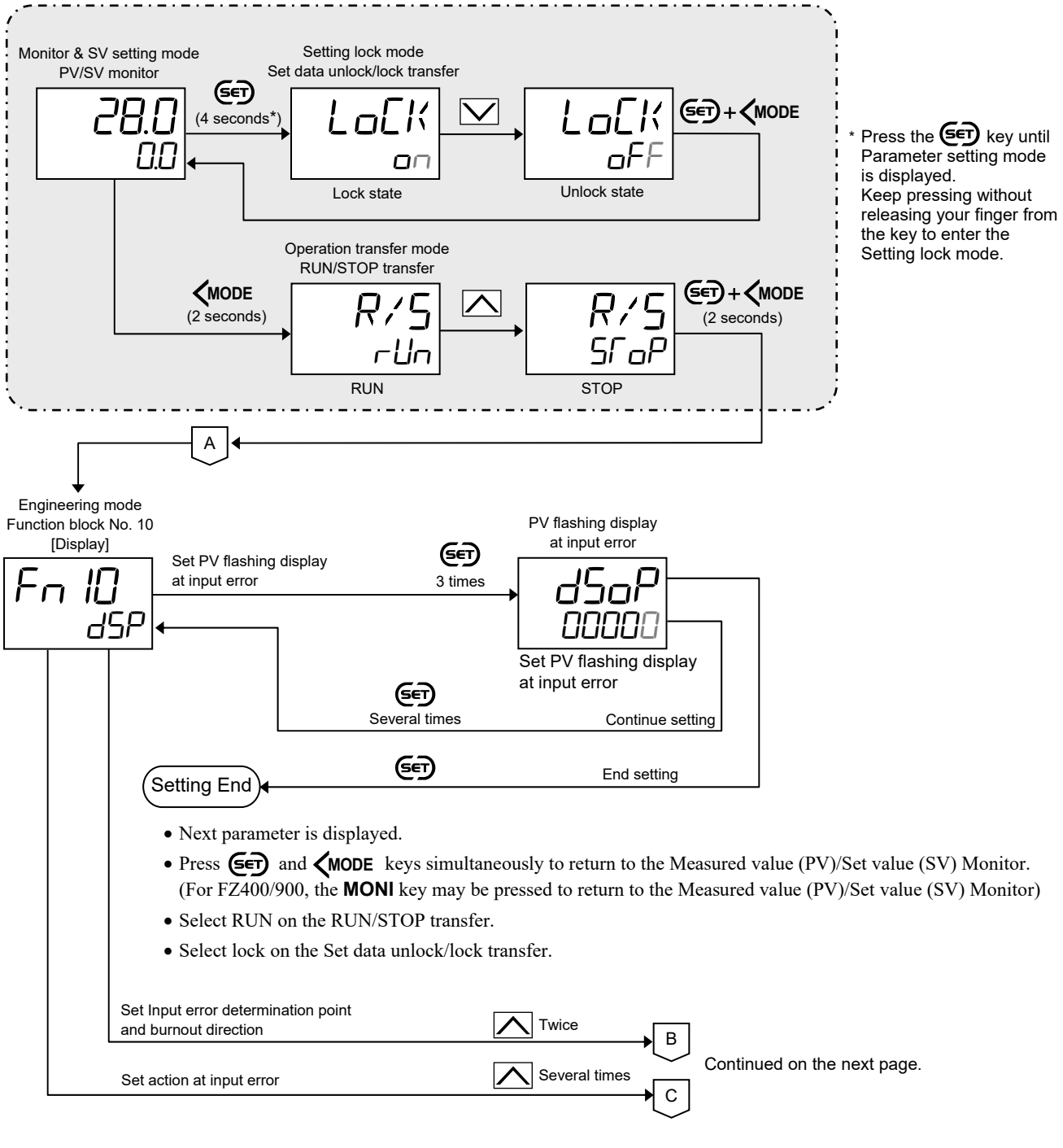
● Input 2_Manipulated output value at input error [Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. PSM	–5.0 to +105.0 %	–5.0

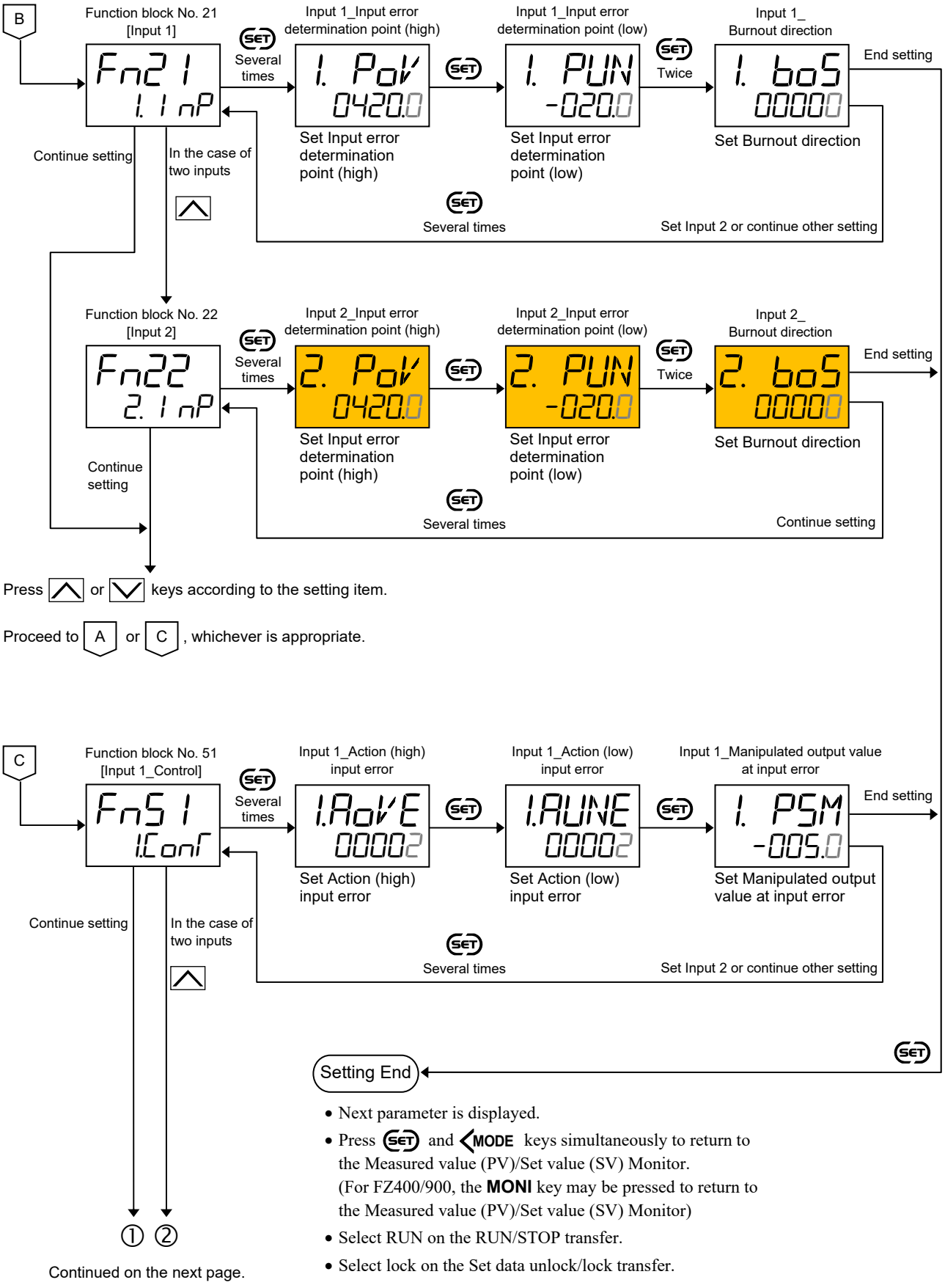
To show "Input 2_Manipulated output value at input error," "Measured input 2" must be specified at the time of order, and "Select function for input 2" (Function block No. 58 in the Engineering mode) must be set to "2-loop control/Differential temperature input" must be set up.

■ Setting procedure

To enter the Engineering mode



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



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

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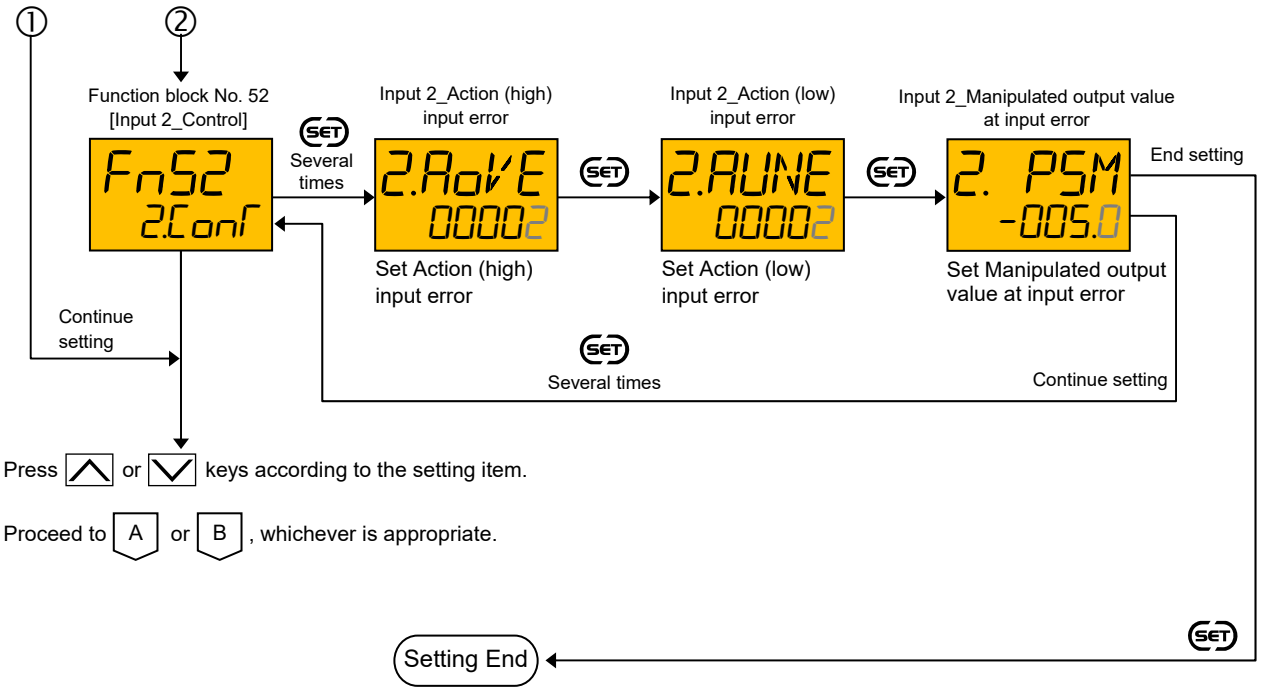


Press ∧ or ∨ keys according to the setting item.

Proceed to A or B, whichever is appropriate.

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

5.8 Using Dual Input Function

This instrument has an optional dual input function which can be configured as follows.

- **Remote setting input function**

  The instrument uses an input signal from Input 2 as a remote signal and sets it to the Input 1_Set value (SV). Remote setting input can be supplied on any of FZ110/400/900 if it is specified at the time of order.

  ☞ Refer to **8.10 Using Remote Setting Input (P. 8-61)** for more details.

- **2-loop control function**

  The instrument performs two independent control using Input 1 and 2. To have this function, "Measured input 2" must be specified at the time of order. Available only on FZ400/900.
  The 2-loop control can be configured to Differential temperature control, and vice versa.

  ☞ Refer to **8.11 Executing 2-Loop Control [FZ400/900] (P. 8-67)** for more details of 2-loop control.

- **Differential temperature control function**

  With this function, temperature control of Input 1 is performed by setting a temperature difference between Input 2 and Input 1. To have this function, "Measured input 2" must be specified at the time of order. Available only on FZ400/900.
  The 2-loop control can be configured to Differential temperature control, and vice versa.

  ☞ Refer to **8.12 Executing Differential Temperature Control [FZ400/900] (P. 8-70)** for details.

- **Control with PV select**

  This function uses two inputs and allows the sensors to be switched from one to another depending on the temperature of the controlled object (high or low temperatures). To have this function, "Measured input 2" must be specified at the time of order. Available only on FZ400/900.

  ☞ For Control with PV select, refer to **8.13 Executing Control with PV Select [FZ400/900] (P. 8-75)**.

- **Cascade control**

  Cascade control is available where Input 1 is used as a Master and Input 2 as a Slave.
  To have this function, "Measured input 2" must be specified at the time of order. Available only on FZ400/900.
  Cascade control is available in two control modes; "Slave single control or Cascade control" and "Master single control or Cascade control."

  ☞ For the Cascade control, refer to **8.14 Executing Cascade Control [FZ400/900] (P. 8-84)**.

- **Input circuit error alarm function**

  The instrument uses two inputs to detect an error from the difference in input between the two. To have this function, "Measured input 2" must be specified at the time of order. Available only on FZ400/900.

  ☞ For more details, refer to **7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900] (P. 7-46)**.

■ Parameter setting

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

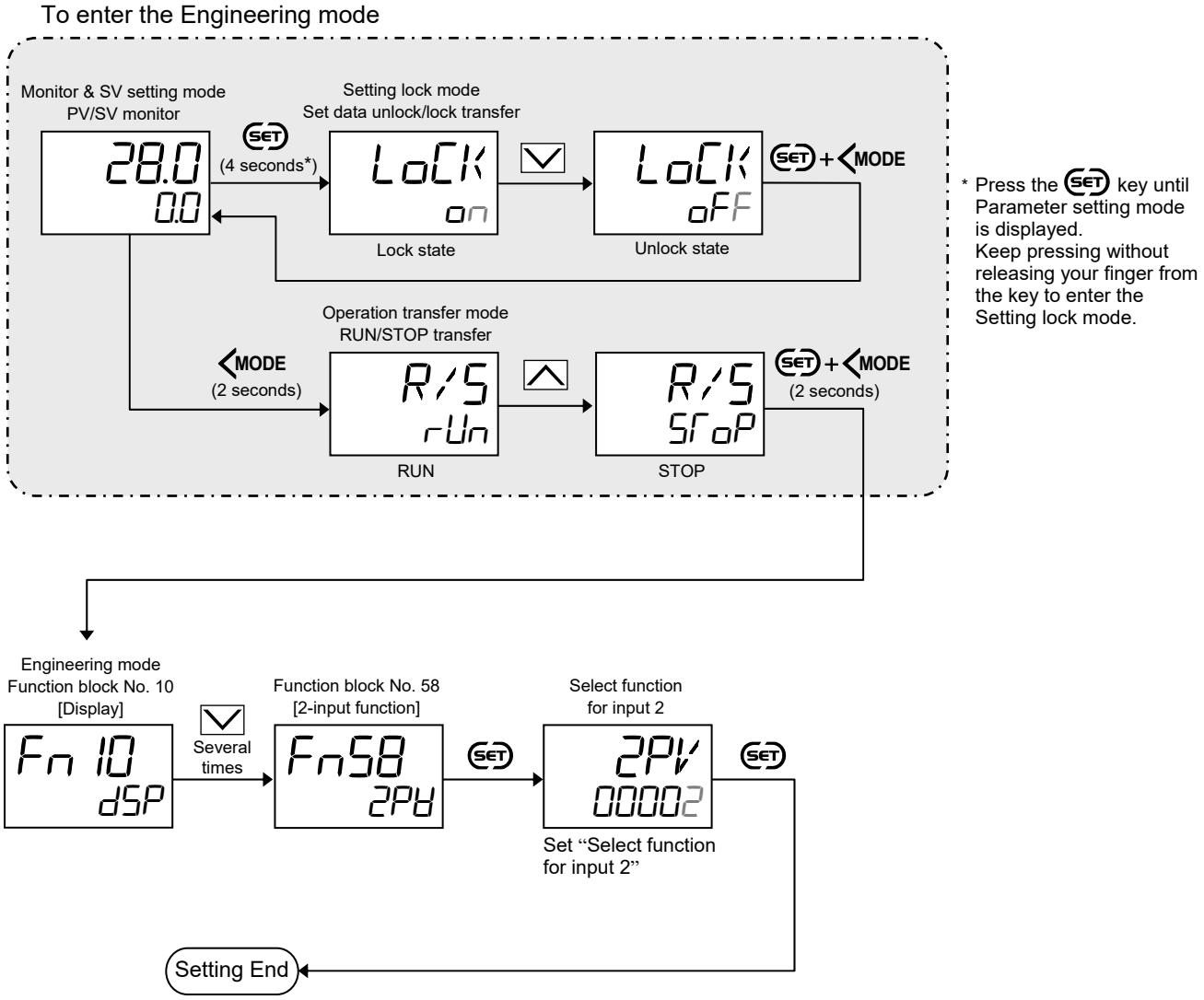
Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

■ Setting procedure

To enter the Engineering mode



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

6 OUTPUT FUNCTION

This chapter describes output related functions, setting contents and setting procedure based on the key words related to outputs.

6.1 Changing Output Assignment
[Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] 6-2

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6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output]

FZ110/400/900 has such hardware outputs as shown below.

- FZ110: OUT1 to 3 (max. 3), DO1 to 2 (max. 2)
- FZ400/900: OUT1 to 3 (max. 3), DO1 to 4 (max. 4)

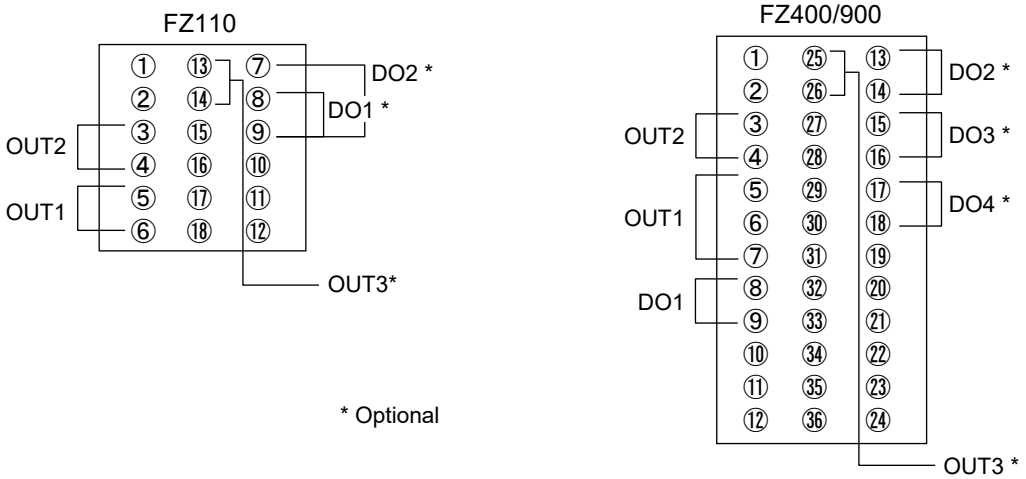
The following output signals are assigned to each output terminal.

- Control output (Settable only between OUT1 and OUT3)
- Retransmission output (Settable only between OUT1 and OUT3)
- Logic calculation output
  [Event, Heater break alarm (HBA), Control loop break alarm (LBA), Input error status]
- Instrument Status Output
  [RUN, Manual mode, Remote mode, Autotuning (AT), While Set value (SV) is changing, Communication monitoring result, FAIL]

■ Description of function

Output signals **[**Control output, Retransmission output, Logic calculation output, or Instrument status output**]** are assigned to the output terminals (OUT1 to 3, DO1 to 4).

● Position of output terminals



● Details of functions assigned to OUT1 to 3

Set value	Assigned functions
0	No assignment
1	Input 1_Control output [heat-side] or [open-side]
2	Input 1_Control output [cool-side] or [close-side]
3	Input 2_Control output
4	Retransmission output
5	Logic calculation output [Event, HBA, LBA, Input error status]
6	RUN state output
7	Input 1_Manual mode state output
8	Input 2_Manual mode state output
9	Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
10	Input 1_Autotuning (AT) state output
11	Input 2_Autotuning (AT) state output
12	Output while Set value of Input 1 is changing
13	Output while Set value of Input 2 is changing
14	Output of the communication monitoring result
15	FAIL output

Continued on the next page.

[Explanation of the setting]

- Input 1_Control output [heat-side] or [open-side]:
  Assignable to Input 1. If Heat/Cool PID control is selected for Input 1, this output is used as heating output. If Position proportioning PID control is selected, this output is used as an opening output.
- Input 1_Control output [cool-side] or [close-side]:
  This output is available if Heat/Cool PID control is selected for Input 1.
  If Heat/Cool PID control is selected, this output is used as a cooling output. If Position proportioning PID control is selected, this output is used as a closing output.
- Input 2_Control output
  Assignable to Input 2. This output is available if 2-loop control (including Differential temperature control) or Cascade control is selected for Select function for Input 2. (FZ400/900 only)
- Retransmission output:
  Retransmission output type needs to be specified later. Retransmission output scaling is also available.
  ☞ For more details of Retransmission output, refer to **6.3 Using Retransmission Output (P. 6-14)**.
- Logic calculation output [Event, HBA, LBA, Input error status]:
  Logic calculation needs to be specified separately. Multiple outputs can be output from a single output terminal as logical *OR* relation.
  ☞ Refer to the next page (P. 6-4) for Logic calculation selection.
- RUN state output:
  Output turns on while the instrument is in RUN mode.
- Input 1_Manual mode state output:
  Output turns on while the Input 1 is in Manual mode.
- Input 2_Manual mode state output:
  Output turns on while the Input 2 is in Manual mode. (FZ400/900 only)
- Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
  Output turns on while the instrument is in the remote mode, cascade control, differential temperature control, or when Input 2 of Control with PV select is used.
- Input 1_Autotuning (AT) state output:
  Output turns on while the Input 1 is in the Autotuning (AT).
- Input 2_Autotuning (AT) state output:
  Output turns on while the Input 2 is in the Autotuning (AT). (FZ400/900 only)
- Output while Set value of Input 1 is changing:
  Output turns on while the Input 1_Set value (SV) is changing due to Setting change rate limiter.
- Output while Set value of Input 2 is changing:
  Output turns on while the Input 2_Set value (SV) is changing due to Setting change rate limiter. (FZ400/900 only)
- Output of the communication monitoring result:
  Valid only when the communication function is supplied. Output turns on if improper communication continues for 10 seconds.
- FAIL output:
  Output turns on when the instrument is in FAIL state.
  When FAIL is selected, the output terminal is fixed to de-energizing, and the previous setting of energizing and de-energizing gets invalid.

● Details of functions assigned to DO1 to 4

Set value	Assigned functions
0	No assignment
1	Logic calculation output [Event, HBA, LBA, Input error status]
2	RUN state output
3	Input 1_Manual mode state output
4	Input 2_Manual mode state output
5	Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
6	Input 1_Autotuning (AT) state output
7	Input 2_Autotuning (AT) state output
8	Output while Set value of Input 1 is changing
9	Output while Set value of Input 2 is changing
10	Output of the communication monitoring result
11	FAIL output

[Explanation of the setting]
Refer to [Explanation of the setting] for OUT1 to 3

● Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection

Multiple functions can be selected in the logic operation. The selected functions are *OR*-output.
To select multiple functions, add the numbers of the desired functions.

Set value	Assigned functions
0	No assignment
1	Event 1
2	Event 2
4	Event 3
8	Event 4
16	Heater break alarm 1 (HBA1)
32	Heater break alarm 2 (HBA2)
64	Control loop break alarm 1 (LBA1)
128	Control loop break alarm 2 (LBA2)
256	Input 1_Input error high
512	Input 1_Input error low
1024	Input 2_Input error high
2048	Input 2_Input error low

Example
To select Event 1 output, Heater break alarm 1 (HBA1) output and Input 1_Input error output high, set as follows.
・Event 1 = 1
・Heater break alarm 1 (HBA1) = 16
・Input 1_Input error high = 256

1 + 16 + 256 = 273

So, set 273

[Explanation of the setting]

• Event: Output turns on when the instrument is in the event state.
You also need to set Event assignment, Event type, Event hold action, Event differential gap, Event timer, and Event set value.

☞ For details of Event, refer to **7.1 Using Event Function (P. 7-2)**.

• Heater break alarm (HBA):
Output turns on when the instrument is in Heater break alarm (HBA) state.
You also need to set CT assignment, HBA set value, and HBA delay time.

☞ For details of Heater break alarm (HBA), refer to **7.2 Using Heater Break Alarm (HBA) (P. 7-24)**.

• Control loop break alarm (LBA):
Output turns on when the instrument is in Control loop break alarm (LBA) state.
You also need to set LBA time and LBA deadband.

☞ For details of Control loop break alarm (LBA), refer to **7.3 Using Control loop break alarm (LBA) (P. 7-36)**.

• Input error high:
Output turns on when the Measured value (PV) exceeds the Input error determination point (high).
Under the conditions of a valid Input circuit error alarm, when the Measured value of Input 2 goes over the Set value of the Input circuit error alarm and the measured value of Input 1, the Input error high alarm of Input 1 will turn on.

• Input errorlow:
Output turns on when the Measured value (PV) exceeds the Input error determination point (low).
Under the conditions of a valid Input circuit error alarm, when the Measured value of Input 2 falls below over the Set value of the Input circuit error alarm and the measured value of Input 1, the Input error low alarm of Input 1 will turn on.

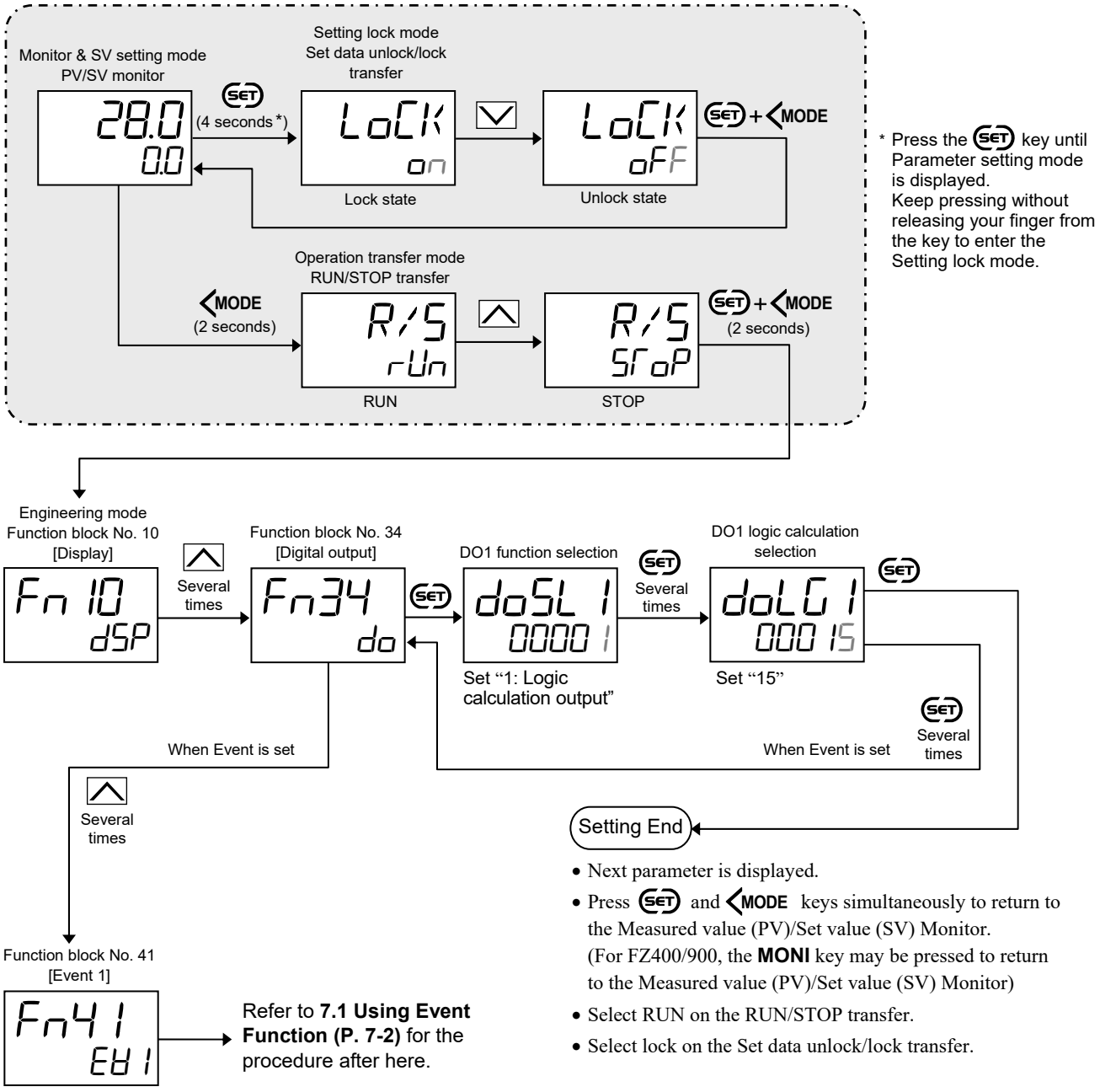
■ Setting example

To provide Event 1 to Event 4 from DO1 as a logic *OR* output.

1. Select "1: Logic calculation output" in DO1 assignment.
2. Set "15" for DO1_logic calculation selection.
   Enter "1" to output Event 1, "2" for Event 2, "4" for Event 3, and "8" for Event 4. Add the sum of these numbers (15), then the outputs of Event 1 to 4 are produced as a logical *OR*.

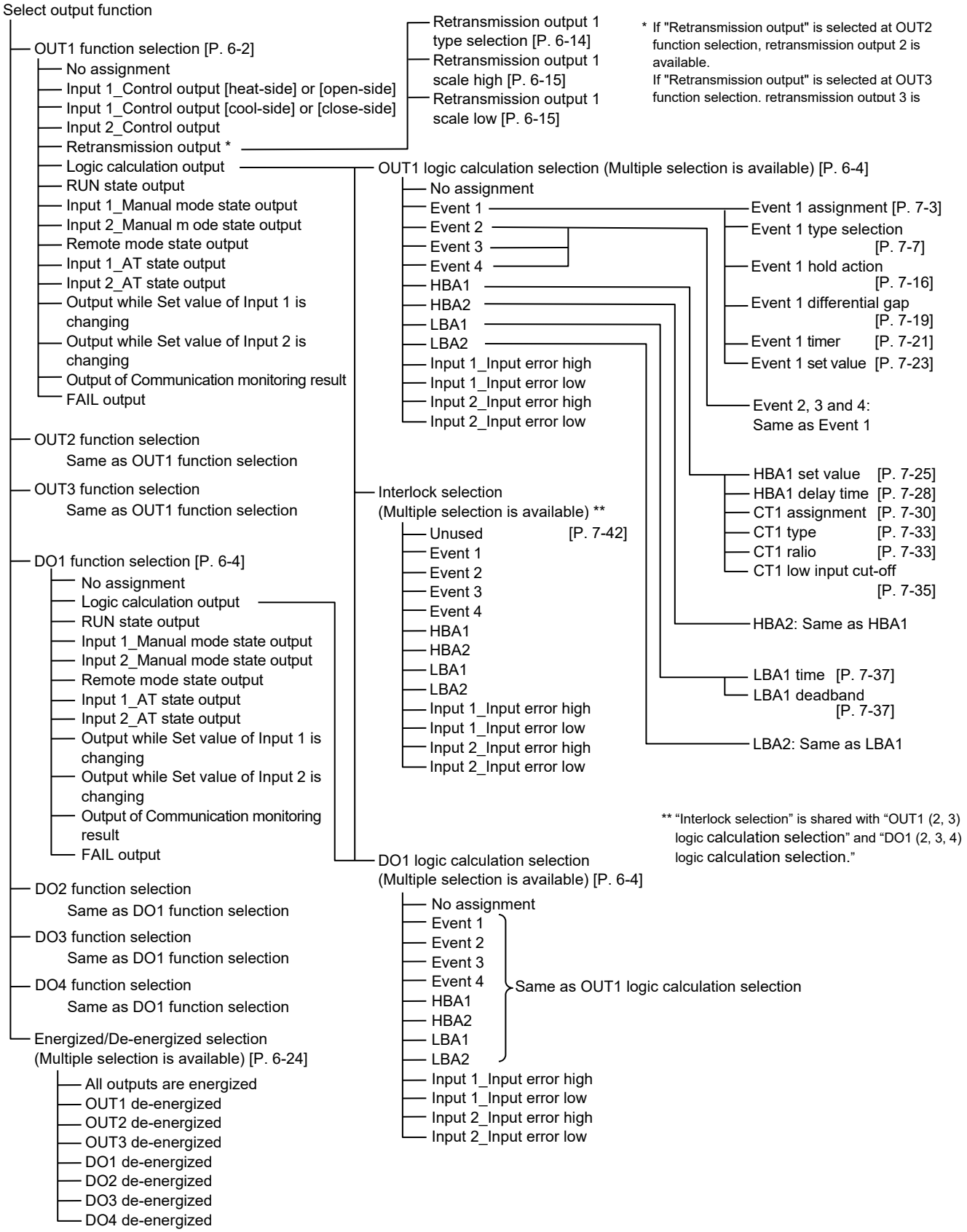
[Setup procedures]

To enter the Engineering mode



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

● Output function map



■ Parameter setting

● OUT1 function selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL1	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, HBA, LBA, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	Based on Model code

📖 To display "OUT1 function selection," you need to specify the output type other than "None" at Output 1 (OUT1) at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the OUT1 function selection is changed.

● OUT2 function selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL2	Same as OUT1 function selection	Based on Model code

📖 To display "OUT2 function selection," you need to specify the output type other than "None" at Output 2 (OUT2) at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the OUT2 function selection is changed.

● OUT3 function selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL3	Same as OUT1 function selection	4

To display "OUT3 function selection," you need to specify the output type OUT3 at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the OUT3 function selection is changed.

● DO1 function selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL1	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output	Based on Model code

To display "DO1 function selection," you have to specify digital output (DO) for FZ110.

● DO2 function selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL2	Same as DO1 function selection	Based on Model code

To display "DO2 function selection," you have to specify 4 digital outputs (DO) on FZ400/900 at the time of order. For FZ110, you have to specify 2 digital outputs (DO) at the time of order.

● DO3 function selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL3	Same as DO1 function selection	Based on Model code

To display "DO3 function selection," you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

● DO4 function selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL4	Same as DO1 function selection	Based on Model code

To display "DO4 function selection," you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

● OUT1 logic calculation selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oLG1	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0

To display "OUT1 logic calculation selection," you need to specify the output type other than "None" at Output 1 (OUT1) at the time of order.

● OUT2 logic calculation selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oLG2	Same as OUT1 logic calculation selection	Based on Model code

To display "OUT2 logic calculation selection," you need to specify the output type other than "None" at Output 2 (OUT2) at the time of order.

● OUT3 logic calculation selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oLG3	Same as OUT1 logic calculation selection	0

To display "OUT3 logic calculation selection," you need to specify the output type OUT3 at the time of order.

● DO1 logic calculation selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doLG1	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code

To display "DO1 logic calculation selection," you have to specify digital output (DO) for FZ110.

● DO2 logic calculation selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doLG2	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code

To display "DO2 logic calculation selection," you have to specify 4 digital outputs (DO) on FZ400/900 at the time of order. For FZ110, you have to specify 2 digital outputs (DO) at the time of order.

● DO3 logic calculation selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doLG3	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code

To display "DO3 logic calculation selection," you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

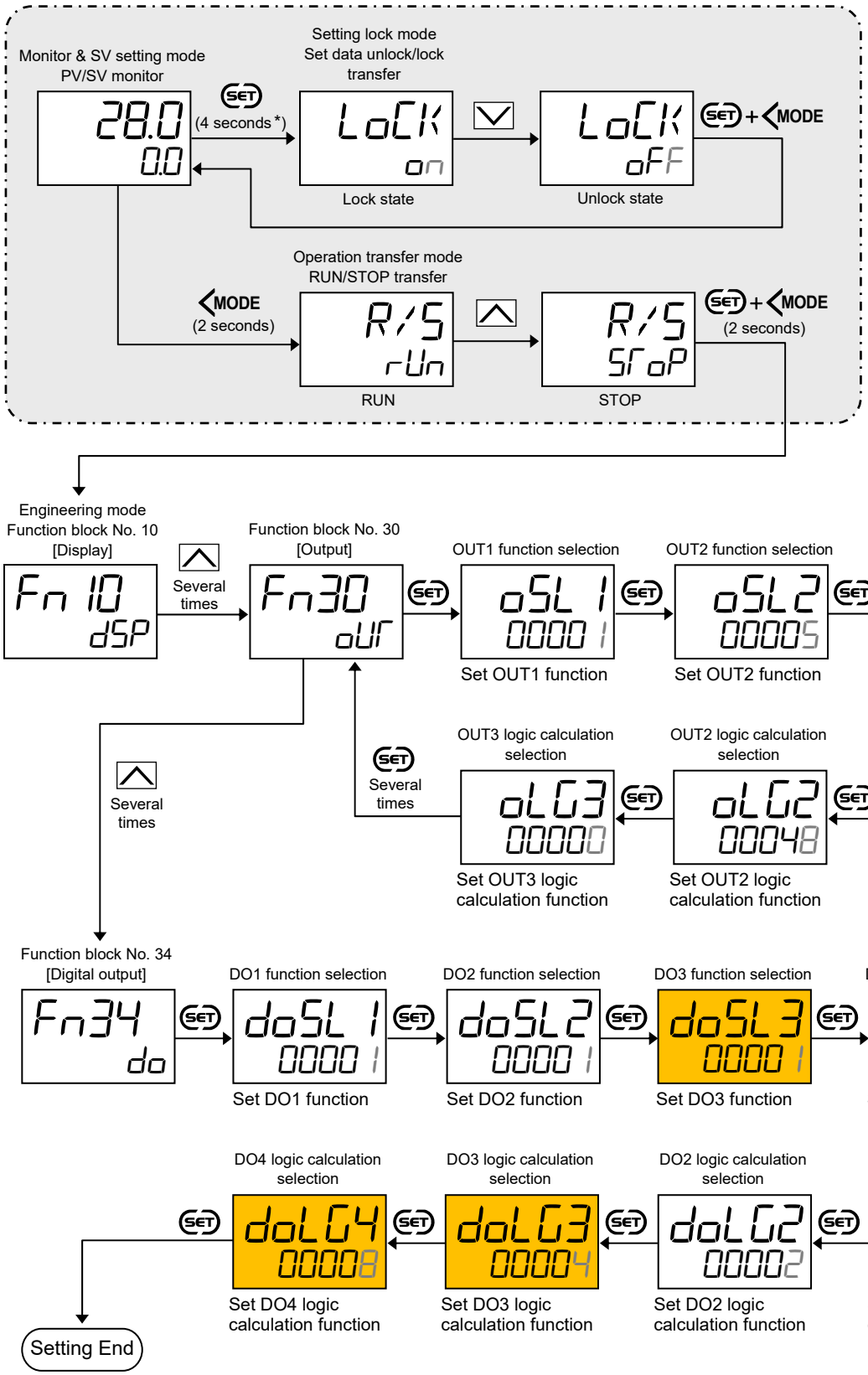
● DO4 logic calculation selection [Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doLG4	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code

To display "DO4 logic calculation selection," you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

■ Setting procedure

To enter the Engineering mode



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

6.2 Changing Output Type of OUT3

OUT3 (optional) is available as a universal output. Output type can be changed even after the purchase.

■ Description of function

Output 3 (optional) may be selected from the following three types. The output can be modified without changing the hardware.

- Voltage pulse output (0/14 V DC)
- Current output (4 to 20 mA DC)
- Current output (0 to 20 mA DC)

■ Parameter setting

● Universal output type selection (OUT3) [Engineering Mode: Function block No. 30 (Fn30)]

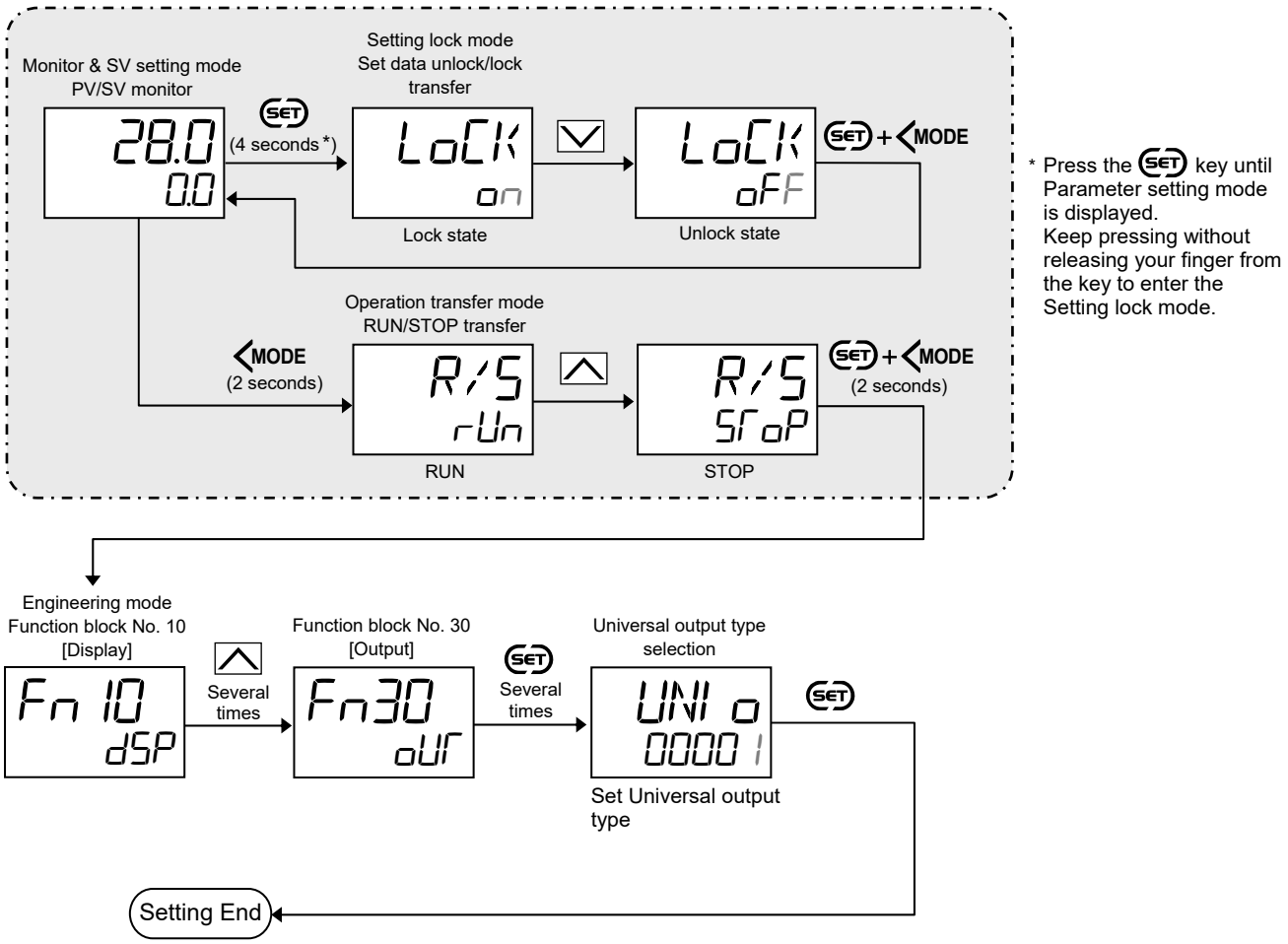
Parameter symbol	Data range	Factory set value
UNI o	0: Voltage pulse output 1: Current output (4 to 20 mA DC) 2: Current output (0 to 20 mA DC)	1

To display "Universal output type selection (OUT3)," you need to specify the output type OUT3 at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Universal output type selection (OUT3) is changed.

■ Setting procedure

To enter the Engineering mode



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

6.3 Using Retransmission Output

Retransmission output can be provided from OUT1 to 3. To use the Retransmission output, the output type must be current or continuous voltage output.

■ Description of function

To use the Retransmission output, select Retransmission output at OUT1 to 3 function selection.
If Retransmission output is selected at the OUT1 function selection, the output is provided as Retransmission output 1.
If Retransmission output is selected at the OUT2 function selection, the output is provided as Retransmission output 2.
If Retransmission output is selected at the OUT3 function selection, the output is provided as Retransmission output 3.

☞ For ditails OUT1 to 3 function selection, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.

● Details of Retransmission output type

Set value	Assigned functions
0	No retransmission output
1	Input 1_Measured value (PV) Input 1_Measured value (PV) is output.
2	Input 1_Local SV Input 1_Set value (SV) is output. The local SV is the SV set. If the set value is changed, irrespective of the Setting change rate limiter whether or not it is set, the new set value will be used as soon as the value is changed.
3	Input 1_SV monitor value Input 1_Set value (SV) is output. The SV monitor value is the monitored value of the set value (SV). If a Setting change rate limiter is set, the set value starts changing according to the setting when the setting is changed.
4	Input 1_Deviation [Input 1_Measured value (PV) – Input 1_Set value (SV)] is output.
5	Input 1_Manipulated output value [heat-side] Input 1_Manipulated output value [heat-side] is output.
6	Input 1_Manipulated output value [cool-side] Input 1_Manipulated output value [cool-side] is output.
7	Input 2_Measured value (PV) [1] Input 2_Measured value (PV) is output.
8	Input 2_Local SV [1] Input 2_Set value (SV) is output. The local SV is the SV set. If the set value is changed, irrespective of the Setting change rate limiter whether or not it is set, the new set value will be used as soon as the value is changed.
9	Input 2_SV monitor value [1] Input 2_Set value (SV) is output. The SV monitor value is the monitored value of the set value (SV). If a Setting change rate limiter is set, the set value starts changing according to the setting when the setting is changed.
10	Input 2_Deviation [1] [Input 2_Measured value (PV) – Input 2_Set value (SV)] is output.
11	Input 2_Manipulated output value [1] Input 2_Manipulated output value [heat-side] is output.
12	Remote setting input value [2] Remote setting input value is output.
13	Current transformer 1 (CT1) input value [3] Current transformer 1 (CT1) input value is output.
14	Current transformer 2 (CT2) input value [4] Current transformer 2 (CT2) input value is output.
15	Measured value (PV) of differential temperature input [1] Measured value (PV) of Differential temperature input [Input 1_Measured value (PV) – Input 2_Measured value (PV)] is output.

[1] Valid if "Measured input 2" is specified at the time of order. (FZ400/900 only)
[2] For FZ400/900: Valid when "Remote setting input" is selected at Select function for input 2.
For FZ110: Valid if Remote setting input is supplied.
[3] Valid if Current transformer (CT) input is supplied.
[4] Valid if two Current transformer (CT) input are supplied. (FZ400/900 only)

The output will be 0 % when the Retransmission output type not provided on the instrument is set.

- Scaling the Retransmission output

Set high and low limits for the Retransmission output. The scale range depends on the type of the selected Retransmission output.

No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value:
Input 1_Input range low to Input 1_Input range high
(When Control with PV select: PV select input range low to PV select input range high)
[Varies with the setting of the Decimal point position.]
Input 1_Deviation:
−(Input 1_Input span) to +(Input 1_Input span)
[Varies with the setting of the Decimal point position.]
Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value:
Input 2_Input range low to Input 2_Input range high
[Varies with the setting of the Decimal point position.]
Input 2_Deviation:
−(Input 2_Input span) to +(Input 2_Input span)
[Varies with the setting of the Decimal point position.]
Manipulated output value:
−5.0 to +105.0 %
Current transformer (CT) input value:
0.0 to 100.0 %
Measured value (PV) of differential temperature input:
−(Input 1_Input span) to +(Input 1_Input span)
[Varies with the setting of the Decimal point position.]

■ Parameter setting

● Retransmission output 1 type [Engineering Mode: Function block No. 31 (Fn31)]

Parameter symbol	Data range	Factory set value
Ao1	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Current transformer 1 (CT1) input value 14: Current transformer 2 (CT2) input value 15: Measured value (PV) of differential temperature input	0

To display "Retransmission output 1 type," Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Retransmission output 1 type is changed.

● Retransmission output 1 scale high [Engineering Mode: Function block No. 31 (Fn31)]

Parameter symbol	Data range	Factory set value
AHS1	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: −(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: −5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: −(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high (Control with PV select: PV select input range high) Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 100.0 Measured value (PV) of differential temperature input: 100

To display "Retransmission output 1 scale high," Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 1 scale low [Engineering Mode: Function block No. 31 (Fn31)]

Parameter symbol	Data range	Factory set value
ALS1	Same as Retransmission output 1 scale high (P. 6-16)	No retransmission output, Input 1_ Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) Input 1_Deviation: −(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: −(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 0.0 Measured value (PV) of differential temperature input: −100

📖 To display "Retransmission output 1 scale low," Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 2 type [Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
Ao2	Same as Retransmission output 1 (P. 6-16)	0

📖 To display "Retransmission output 2 type," Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Retransmission output 2 type is changed.

● Retransmission output 2 scale high [Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
AHS2	Same as Retransmission output 1 scale high (P. 6-16)	Same as Retransmission output 1 scale high

📖 To display "Retransmission output 2 scale high," Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 2 scale low [Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
AL52	Same as Retransmission output 1 scale low (P. 6-17)	Same as Retransmission output 1 scale low

📖 To display "Retransmission output 2 scale low," Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 3 type [Engineering Mode: Function block No. 33 (Fn33)]

Parameter symbol	Data range	Factory set value
Ao3	Same as Retransmission output 1 (P. 6-16)	1

📖 To display "Retransmission output 3 type," OUT3 must be specified at the time of order, and Current output must be set up in "Universal output type selection" in Function block No. 30 in Engineering mode.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Retransmission output 3 type is changed.

● Retransmission output 3 scale high [Engineering Mode: Function block No. 33 (Fn33)]

Parameter symbol	Data range	Factory set value
AH53	Same as Retransmission output 1 scale high (P. 6-16)	Same as Retransmission output 1 scale high

📖 To display "Retransmission output 3 scale high," OUT3 must be specified at the time of order, and Current output must be set up in "Universal output type selection" in Function block No. 30 in Engineering mode.

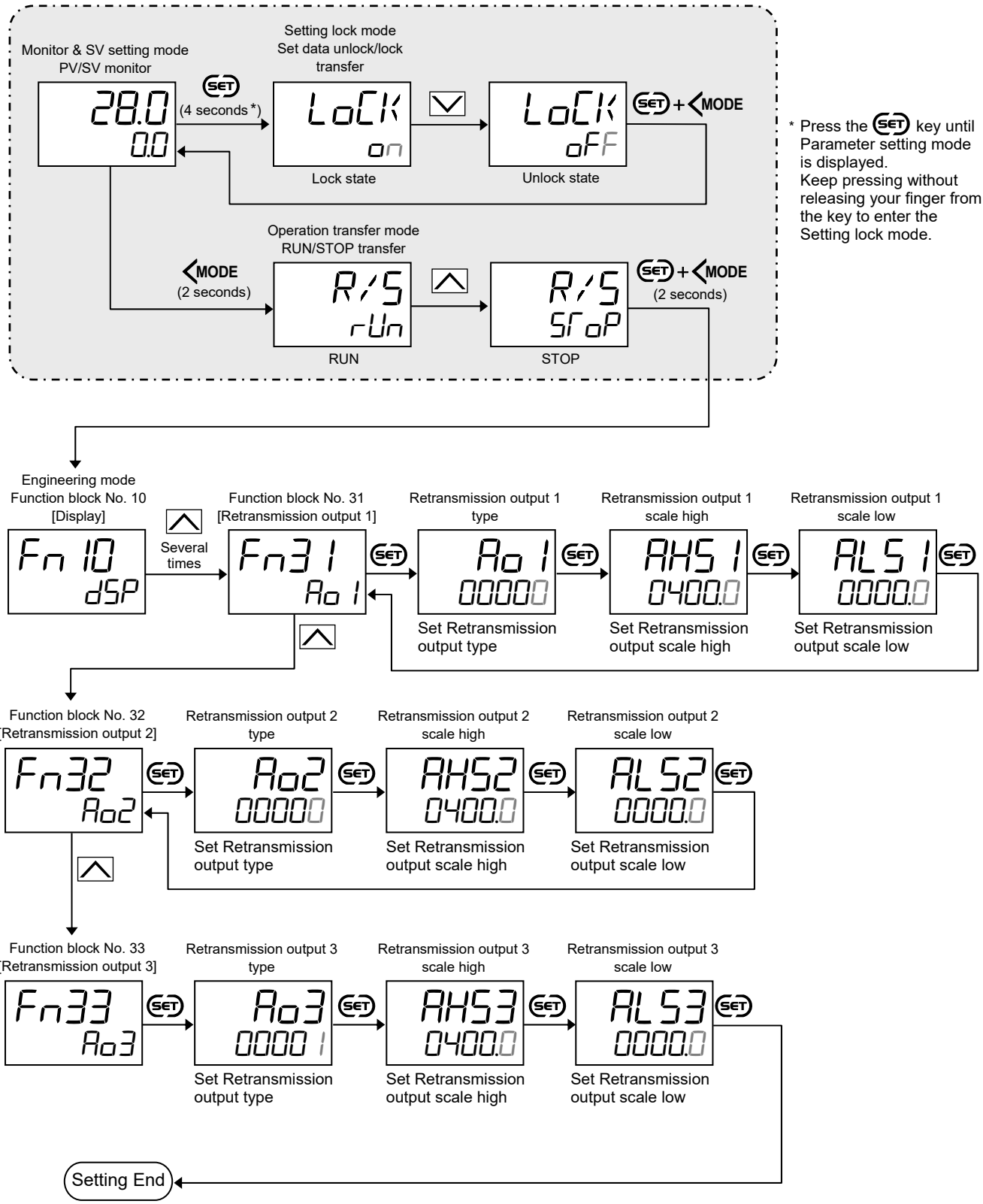
● Retransmission output 3 scale low [Engineering Mode: Function block No. 33 (Fn33)]

Parameter symbol	Data range	Factory set value
AL53	Same as Retransmission output 1 scale low (P. 6-17)	Same as Retransmission output 1 scale low

📖 To display "Retransmission output 3 scale low," OUT3 must be specified at the time of order, and Current output must be set up in "Universal output type selection" in Function block No. 30 in Engineering mode.

■ Setting procedure

To enter the Engineering mode



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

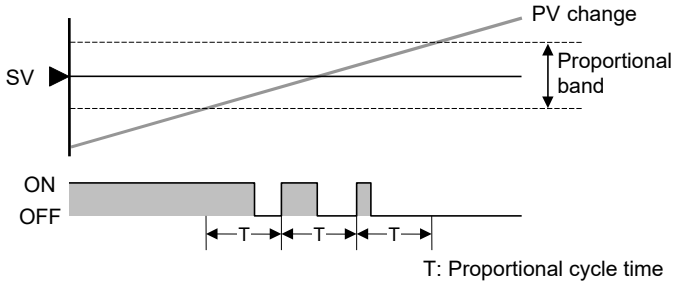
6.4 Changing Proportional Cycle Time

When time proportioning output (relay output, voltage pulse output or transistor output) is specified at the time of ordering, Proportional cycle time and Minimum ON/OFF time of proportional cycle can be changed.

■ Description of function

● Proportional cycle time

Manipulated output value turns ON and OFF in a certain cycle (Proportional cycle time) when the Measured value (PV) reaches within the Proportional band at Time proportioning action. More precise control can be achieved by shortening Proportional cycle time, however, the life of operating unit (Relay etc.) can be shortened based on the feature of the specific controlled object



● Minimum ON/OFF time of proportioning cycle

Minimum ON/OFF time of proportioning cycle can be used to compensate relay life by acquiring the minimum OF/OFF time.

Minimum ON time of proportioning cycle:

Manipulated output does not turn ON when the duration of the computed ON output is shorter than the Minimum ON time of proportioning cycle being set.

Manipulated output remains ON the same amount of time as the computed ON output when the computed ON output is longer than the Minimum ON time of proportioning cycle being set.

(Minimum ON time of proportioning cycle is valid when the computed ON output exceeds 0 %.)

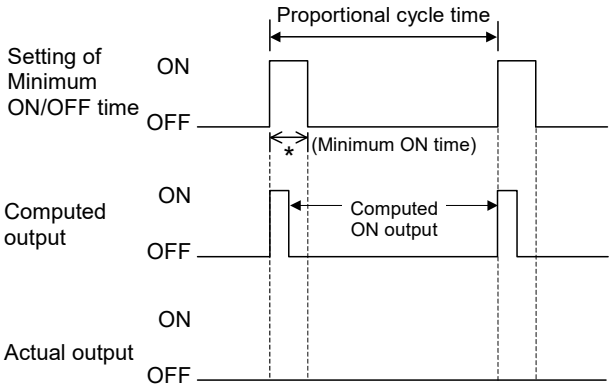
Minimum OFF time of proportioning cycle:

Manipulated output remains OFF the same amount of time as the Minimum OFF time set when the computed OFF output is shorter than the Minimum OFF time being set.

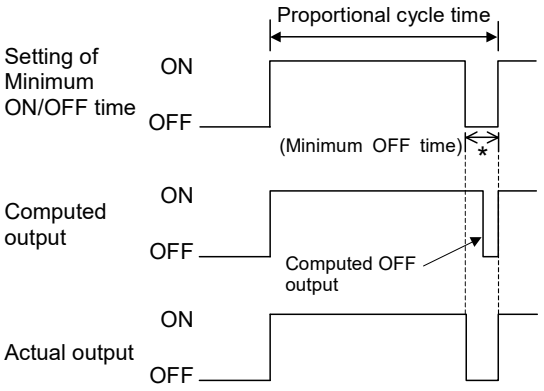
Manipulated output remains OFF the same amount of time as the computed OFF output when the computed OFF output is longer than the Minimum OFF time being set.

(Minimum OFF time of proportioning cycle is valid when the computed OFF output is below 100 %.)

When the computed ON output exceeds 0 %



When the computed OFF output is below 100 %



* When a long minimum ON/OFF time is required for the relay, set a time longer than that time.

Minimum ON/OFF time of proportioning cycle is not operative if the Proportioning cycle is set shorter than the Minimum ON/OFF time of proportioning cycle (Proportioning cycle < Minimum ON/OFF proportioning time).

■ Parameter setting

● OUT1 proportional cycle time [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r1	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note

Note: In case OUT1 function selection is "Input 1_Control output [cool-side]" AND Input 1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

To display "OUT1 proportional cycle time," Output type on OUT1 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT2 proportional cycle time [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r2	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note

Note: In case OUT2 function selection is "Input 1_Control output [cool-side]" AND Input 1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

To display "OUT2 proportional cycle time," Output type on OUT2 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT3 proportional cycle time [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r3	0.1 to 100.0 seconds	Voltage pulse output: Note

Note: In case OUT3 function selection is "Input 1_Control output [cool-side]" AND Input 1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

To display "OUT3 proportional cycle time," OUT3 must be specified at the time of order, and Voltage pulse output must be set up in "Universal output type selection" in Function block No. 30 in Engineering mode.

● OUT1 minimum ON/OFF time of proportional cycle [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
Mr1	0 to 1000 ms	0

To display "OUT1 minimum ON/OFF time of proportional cycle," Output type on OUT1 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT2 minimum ON/OFF time of proportional cycle [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
MT2	0 to 1000 ms	0

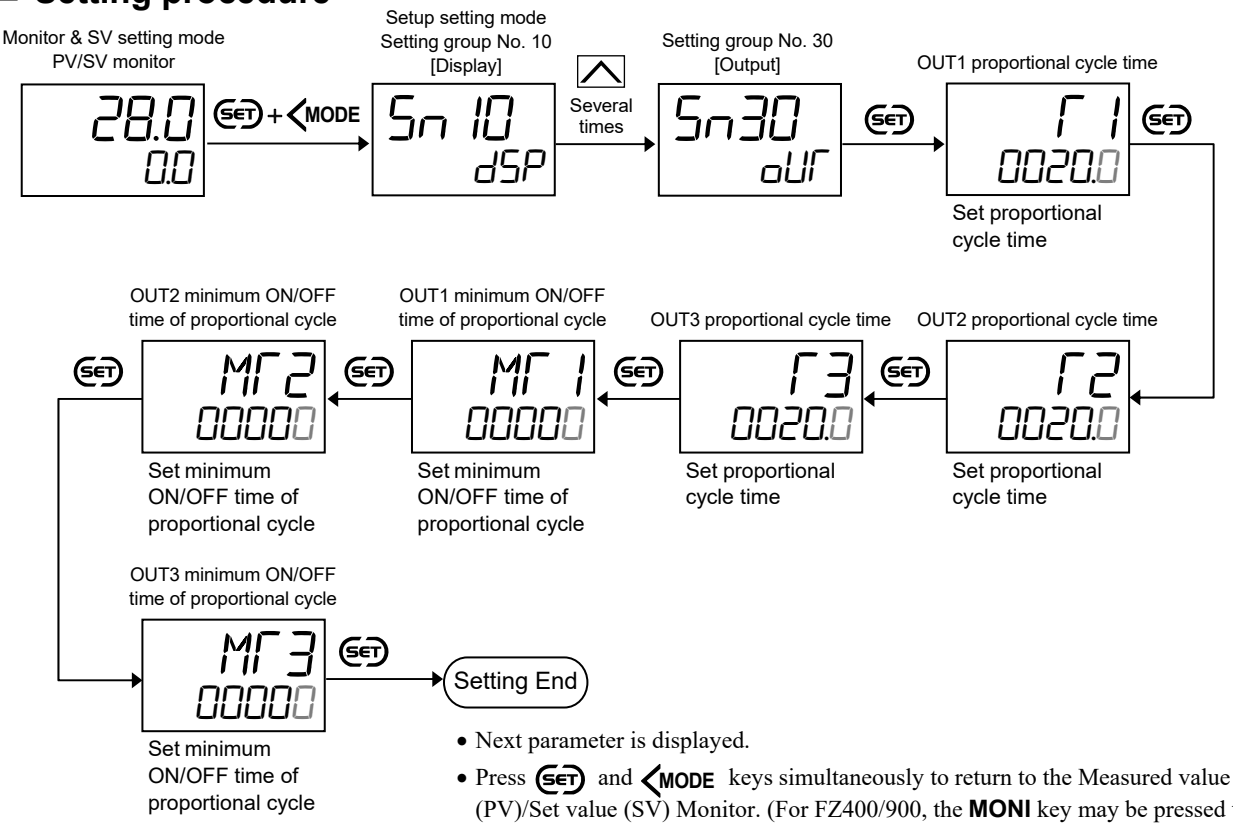
To display "OUT2 minimum ON/OFF time of proportional cycle," Output type on OUT2 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT3 minimum ON/OFF time of proportional cycle [Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
MT3	0 to 1000 ms	0

To display "OUT3 minimum ON/OFF time of proportional cycle," OUT3 must be specified at the time of order, and Voltage pulse output must be set up in "Universal output type selection" in Function block No. 30 in Engineering mode.

■ Setting procedure



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

6.5 Changing Energizing/De-energizing Output

Each output (OUT 1 to 3, DO1 to 4) can be individually set to energize or de-energize.

Setting energize/de-energize at Control output, Retransmission output, or Output terminal to which FAIL is assigned is ignored. (FAIL is fixed as de-energize)

■ Description of function

● Outputs selectable to energize or de-energize

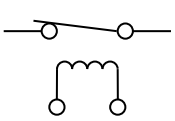
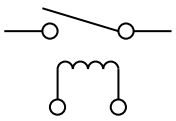
Logic calculation output: Event, Heater break alarm (HBA), Control loop break alarm (LBA), Input error status

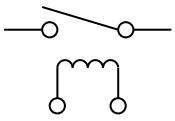
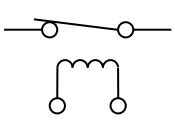
Instrument Status Output: RUN, Manual mode, Remote mode, Autotuning (AT), While Set value (SV) is changing, Communication monitoring result

● Explanation of energizing and de-energizing outputs

Output type		Output state	
		Status when the function assigned to the output is ON	Status when the function assigned to the output is OFF
Relay contact output	Energize	Contact close	Contact open
	De-energize	Contact open	Contact close
Voltage pulse output	Energize	ON	OFF
	De-energize	OFF	ON
Current output	Energize	Outputs the maximum output current (100 %)	Outputs the minimum output current (0 %)
	De-energize	Outputs the minimum output current (0 %)	Outputs the maximum output current (100 %)
Continuous voltage output	Energize	Outputs the maximum output current (100 %)	Outputs the minimum output current (0 %)
	De-energize	Outputs the minimum output current (0 %)	Outputs the maximum output current (100 %)
Transistor output	Energize	ON	OFF
	De-energize	OFF	ON

Example: Relay contact output

	Status when the function assigned to the output is ON	Status when the function assigned to the output is OFF
Energize	Contact close 	Contact open 

	Status when the function assigned to the output is ON	Status when the function assigned to the output is OFF
De-energize	Contact open 	Contact close 

● Output state at STOP

Irrespective of setting Energize/De-energize, the output state at STOP is as follows.
If "Output action at control stop" (Function block No. 30 in Engineering mode) is set to continue the action, setting of Energize/De-energize remains valid.

Output type	Output state
Relay contact output	Contact open
Voltage pulse output	OFF
Current output	Outputs the minimum output current (0 %)
Continuous voltage output	Outputs the minimum output current (0 %)
Transistor output	OFF

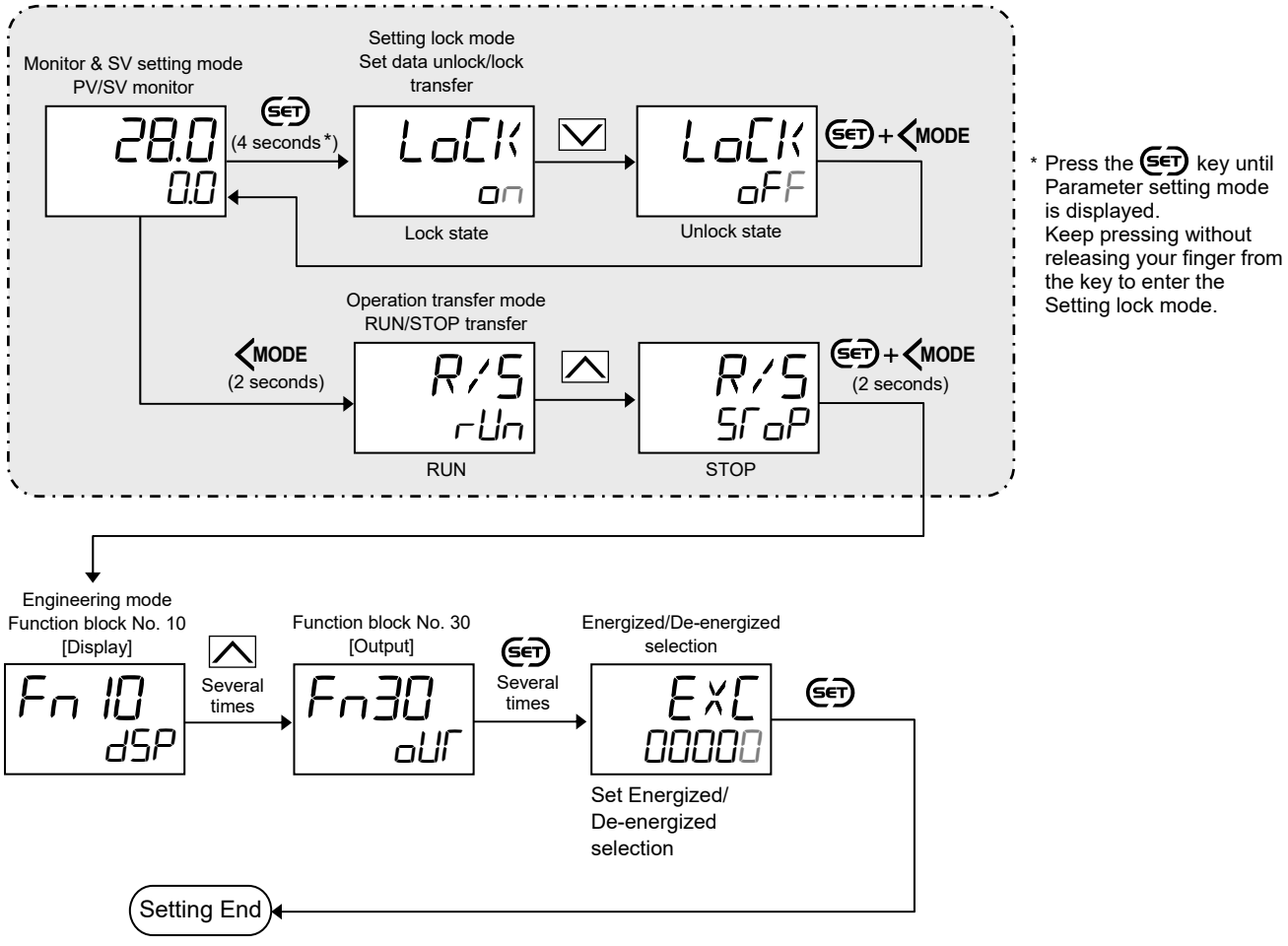
■ Parameter setting

● Energized/De-energized selection [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
EXC	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0

■ Setting procedure

To enter the Engineering mode



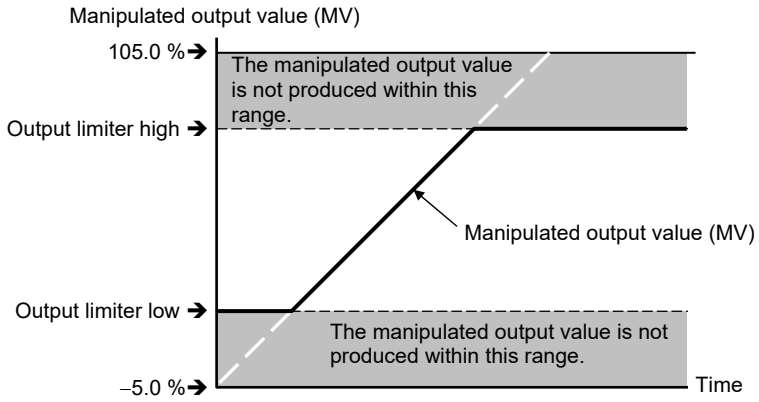
- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

6.6 Limiting Output

Use output limiter to limit the output.

■ Description of function

This is the function which restricts the high and low limits of Manipulated output values (MV).



Output limiter is also effective in ON/OFF control.

■ Parameter setting

● Input 1_Output limiter high [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. oLH	Input 1_Output limiter low [heat-side] to 105.0 %	105.0

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter high [heat-side] is changed.

● Input 1_Output limiter low [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. oLL	–5.0 % to Input 1_Output limiter high [heat-side]	–5.0

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter low [heat-side] is changed.

● Input 2_Output limiter high [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. oLH	Input 2_Output limiter low to 105.0 %	105.0

To display "Input 2_Output limiter high," specify "Measured input 2" at the time of order, AND "Select function for Input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 2_Output limiter high is changed.

● Input 2_Output limiter low [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. oLL	–5.0 % to Input 2_Output limiter high	–5.0

To display "Input 2_Output limiter low," specify "Measured input 2" at the time of order, AND "Select function for Input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 2_Output limiter low is changed.

● Input 1_Output limiter high [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1.oLHc	Input 1_Output limiter low [cool-side] to 105.0 %	105.0

To display "Input 1_Output limiter high [cool-side]," specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at "Input 1_Control action" (Function block No. 51 in Engineering mode).

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter high [cool-side] is changed.

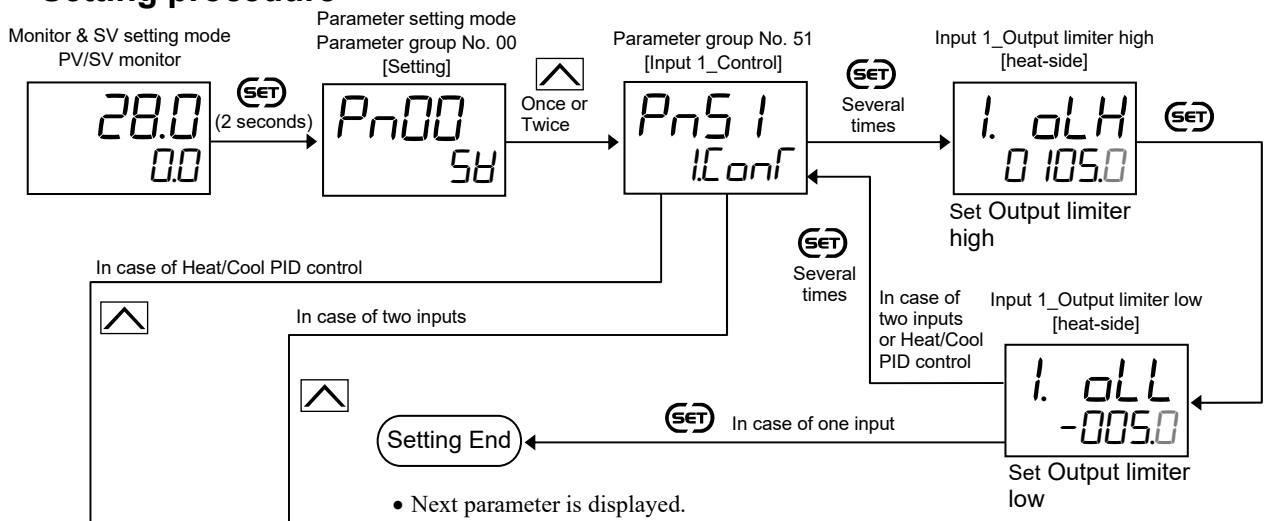
● Input 1_Output limiter low [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1.oLLc	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0

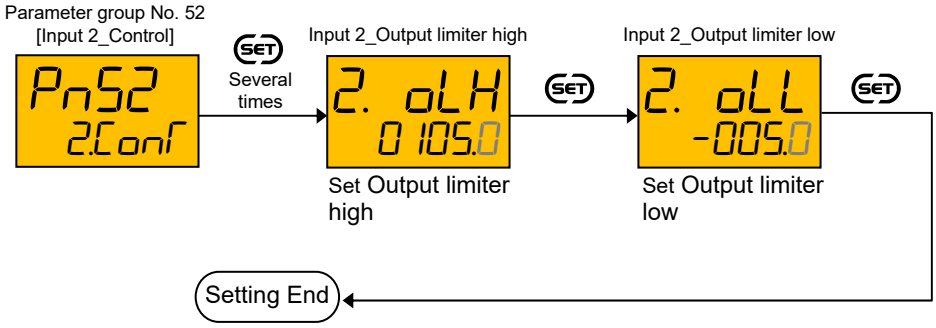
To display "Input 1_Output limiter low [cool-side]," specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at "Input 1_Control action" (Function block No. 51 in Engineering mode).

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter low [cool-side] is changed.

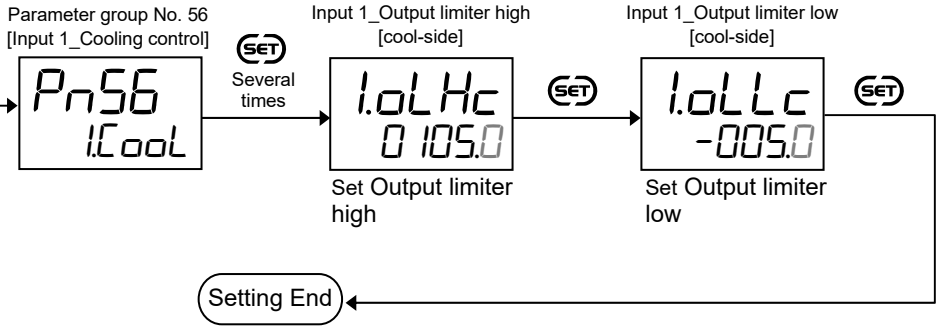
■ Setting procedure



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



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



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

6.7 Suppressing Sudden Change in Output (Output Change Rate Limiter)

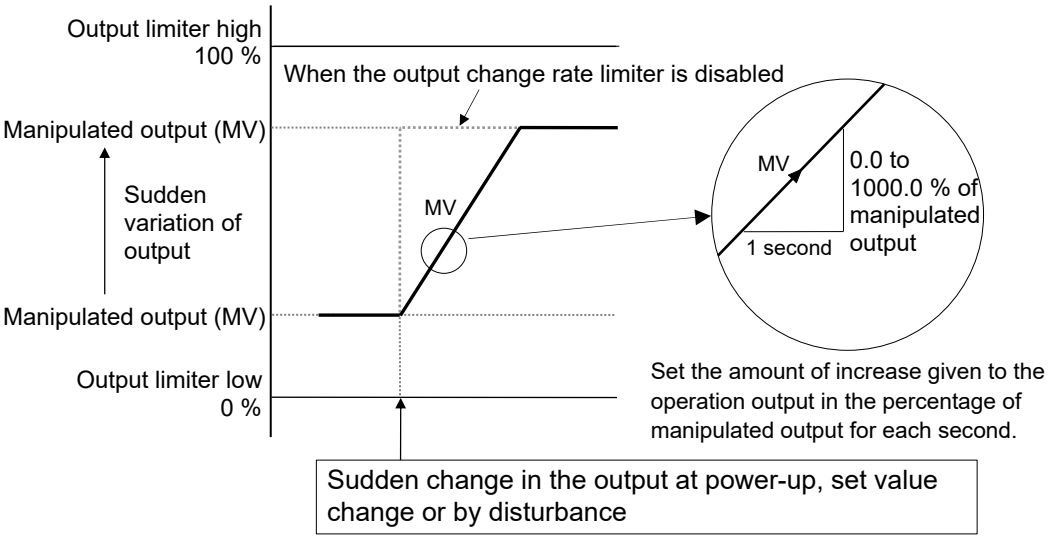
Output change rate limiter may be used to suppress sudden change in output at power on or at the time of set value change.

■ Description of function

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

Example: The Output change rate limiter is effective.

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



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

- If the output change rate is set smaller, it will cause slow control response and affect Derivative action.
- When the Output change rate limiter is used, you may not be able to obtain appropriate PID constants by Autotuning.
- The Output change rate limiter is particularly effective when a sudden MV change may create uncontrollable situation cause a large current flow. Also, it is very effective current output or voltage output is used as control output.
- Output change rate limiter may be also effective in Manual mode (including communication). Output change rate limiter also functions when output changes suddenly due to manipulated manual output at input error.
- When the instrument recovers from power failure in Hot start 1, the Output change rate limiter starts from the value before the power failure.
- The Output change rate limiter is deactivated when control is stopped (at STOP), when control action is an ON/OFF control or Position proportioning PID control.

■ Parameter setting

● Input 1_Output change rate limiter (up) [heat-side] [Engineering Mode: Function block No. 51 (FnS 1)]

Parameter symbol	Data range	Factory set value
1. oRU	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

● Input 1_Output change rate limiter (down) [heat-side] [Engineering Mode: Function block No. 51 (FnS 1)]

Parameter symbol	Data range	Factory set value
1. oRd	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

● Input 2_Output change rate limiter (up) [Engineering Mode: Function block No. 52 (FnS2)]

Parameter symbol	Data range	Factory set value
2. oRU	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

To display "Input 2_Output change rate limiter (up)," specify "Measured input 2" at the time of order, AND "Select function for Input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Output change rate limiter (down) [Engineering Mode: Function block No. 52 (FnS2)]

Parameter symbol	Data range	Factory set value
2. oRd	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

To display "Input 2_Output change rate limiter (down)," specify "Measured input 2" at the time of order, AND "Select function for Input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_Output change rate limiter (up) [cool-side] [Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
1.oRUc	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

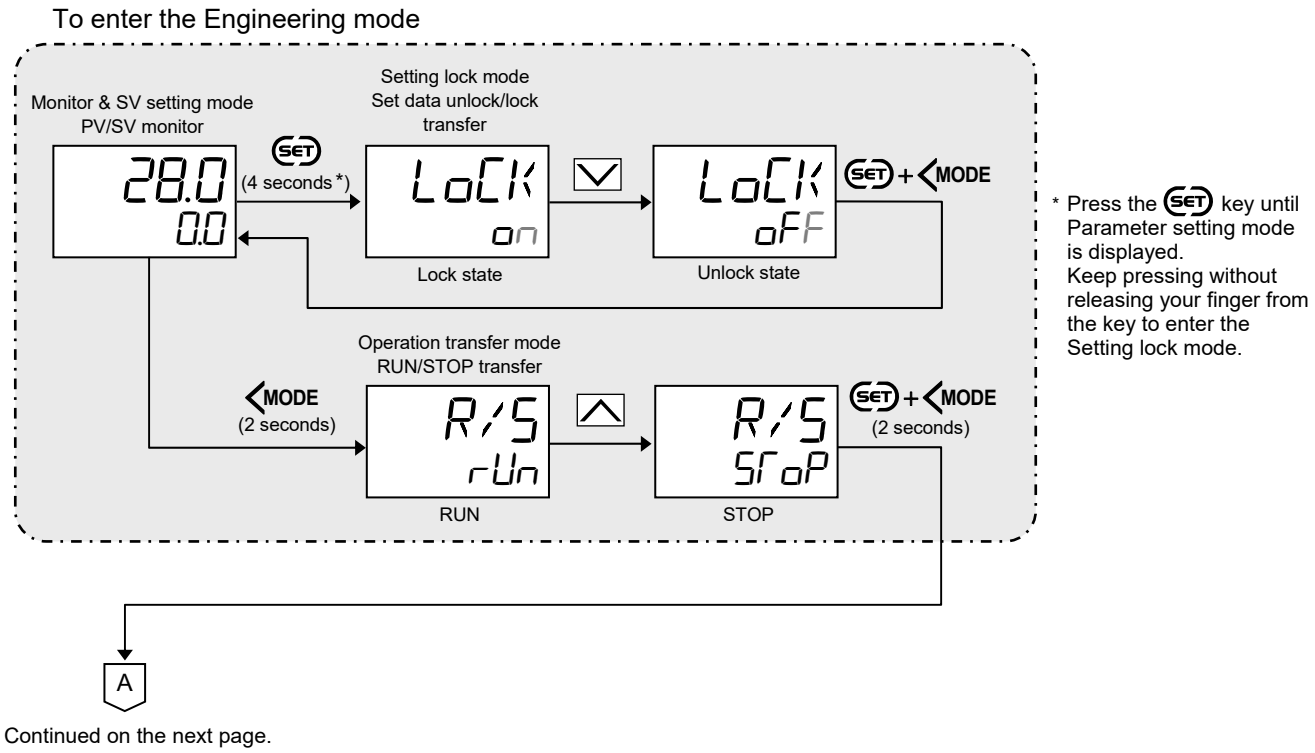
To display "Input 1_Output change rate limiter (up) [cool-side]," specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at "Input 1_Control action" (Function block No. 51 in Engineering mode).

● Input 1_Output change rate limiter (down) [cool-side] [Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
1.oRdc	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0

To display "Input 1_Output change rate limiter (down) [cool-side]," specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at "Input 1_Control action" (Function block No. 51 in Engineering mode).

■ Setting procedure



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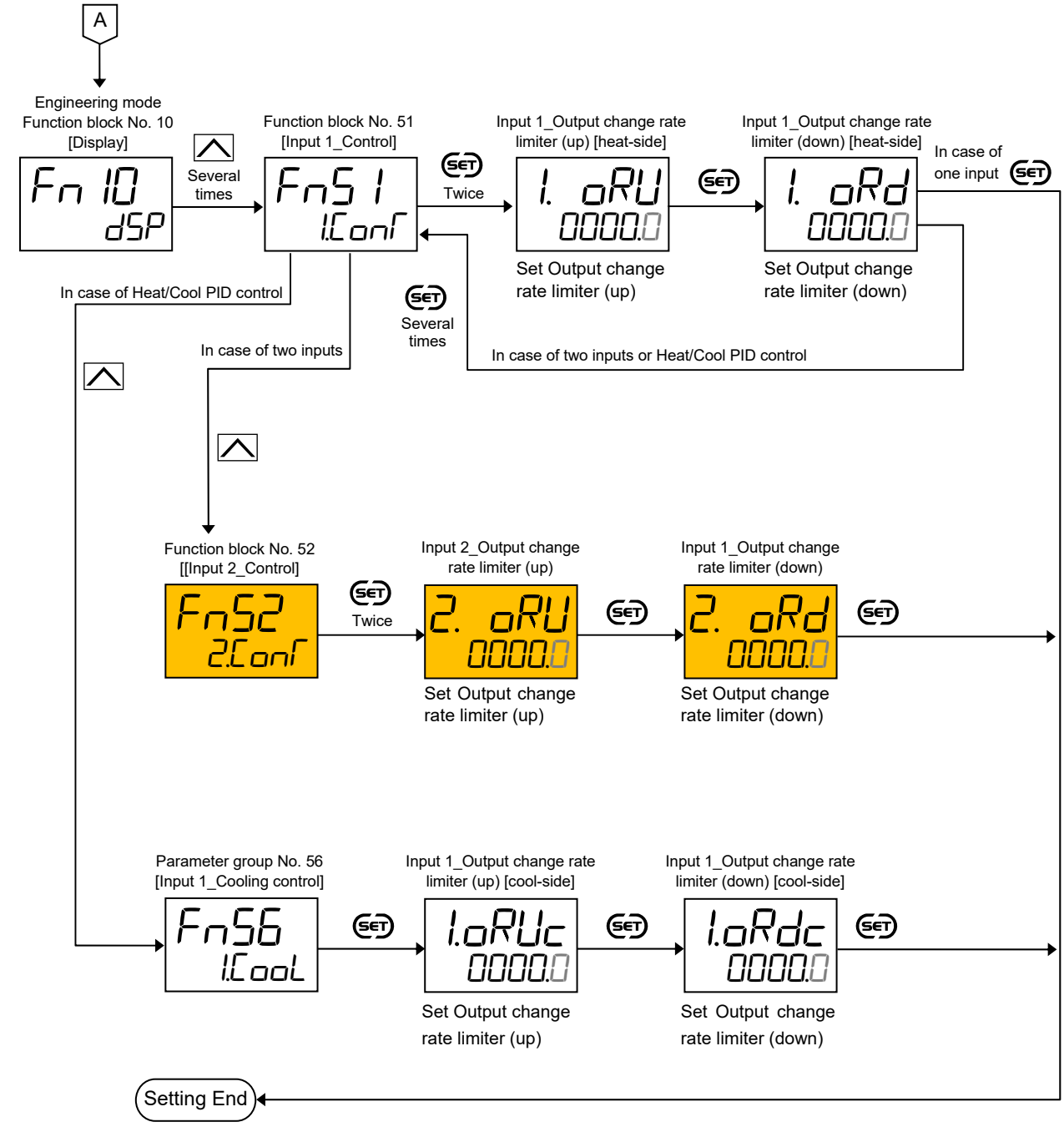


- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

6.8 Suppressing Sudden Change in Output (Balanceless Bumpless)

Balanceless bumpless may be used to suppress sudden output change when the control is transferred from Auto mode to Manual mode (or Manual mode to Auto mode).

■ Description of function

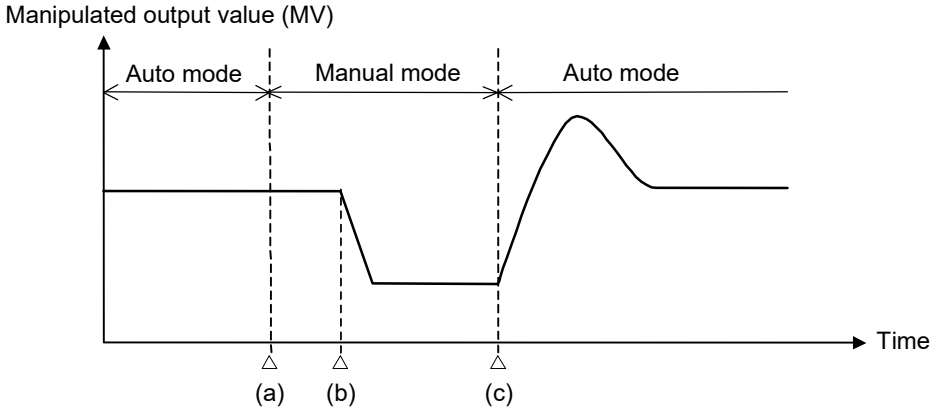
Manipulated output value, when transferred from Auto mode to Manual mode, depends on the setting of "Manual manipulated output value selection." Selection of "Use the most recent manipulated output value" (balanceless bumpless function) or "Use the Manual manipulated output value *" (bump action) can be selected in "Manual manipulated output value selection."

* The Manual manipulated output value is the last manipulated output value in Manual mode before the mode is transferred from Auto mode to Manual mode.
  Note that the Manual manipulated output value can be preset in advance in the Setup setting mode before the mode is transferred to Manual mode.

When the mode is transferred from Manual mode to Auto mode, the balanceless bumpless function is always activated.

● Balanceless bumpless function

This function is used to prevent overload caused by the Manipulated output value (MV) suddenly changing when Auto mode is transferred to Manual mode and vice versa.



(a) Transfer from Auto mode to Manual mode.
  However, when the mode is transferred to Manual mode, the Manipulated output value used in Auto mode will be used as the manual output value in Manual mode.

(b) The manipulated output value is changed (Manual mode function)

(c) Transfer from Manual mode to Auto mode.
  When the mode is transferred to Auto mode, the controller starts PID control based on the MV used in Manual mode.

● Bumpless action associated with Auto/Manual transfer at the time of memory area selection

This instrument allows Auto/Manual transfer at the time of Memory area selection. Selection of balanceless bumpless action and bump action can be made at the time of Auto/Manual transfer.

[Parameters to set up]

- Auto/Manual transfer selection (Area)

  This setting is used to select whether the mode should be transferred to Auto mode or Manual mode at the time of Memory area selection. This setting is also used to select balanceless bumpless action or bump action at the time of Auto/Manual transfer.

- Manipulated output value (Area)

  This setting is used to set a manipulated output value when Bump action is selected at the time of Auto/Manual selection (area). This setting is used in Auto mode and Manual mode in common.

There are several ways to select a memory area.
Concerning the selection by key operation, refer to **10.3 Storing the Control Related Settings (Memory Area Function) (P. 10-10)** or **FZ110/FZ400/FZ900 Quick Operation Manual (IMR03A02-E□)**.
Concerning the selection by Digital input (DI), refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.
Concerning the selection by Memory area soak time, refer to **10.5 Executing Simple Program Operation (P. 10-18)** or **10.6 Executing Simple Sequence Operation (P. 10-26)**.

Bumpless/Bump action by "Auto/Manual transfer selection (Area)" has a priority over the Bumpless/Bump action by "Manual manipulated output value selection."

■ Parameter setting

● Manual manipulated output value selection [Engineering Mode: Function block No. 50 (FnS0)]

Parameter symbol	Data range	Factory set value
MVTS	0: The last manipulated output value (Balanceless bumpless function) 1: Manual manipulated output value	0

● Input 1_Manual manipulated output value [Setup Setting Mode: Setting group No. 51 (Sn51)]

Parameter symbol	Data range	Factory set value
1. M.MV	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control: –(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

* Heat/Cool PID control has exceptional conditions as follows for the data range.

(1) Input 1_Output limiter high [cool-side] is ≤ 0.0 %
- Input 1_Output limiter low [heat-side] is ≤ 0.0 %: 0.0 % to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is > 0.0 %: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is ≤ 0.0 %
- Input 1_Output limiter low [cool-side] is ≤ 0.0 %: –(Input 1_Output limiter high [cool-side]) to 0.0 %
- Input 1_Output limiter low [cool-side] is > 0.0 %: –(Input 1_Output limiter high [cool-side]) to –(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0% in the following cases:
Input 1_Output limiter high [cool-side] ≤ 0.0 %, AND Input 1_Output limiter high [heat-side] ≤ 0.0 %

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

● Input 2_Manual manipulated output value [Setup Setting Mode: Setting group No. 52 (Sn52)]

Parameter symbol	Data range	Factory set value
2. M.MV	Input 2_Output limiter low to Input 2_Output limiter high	–5.0

To display "Input 2_Manual manipulated output value," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_Auto/Manual transfer selection (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

● Input 1_Manipulated output value (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1. MV.A	PID control, Position proportioning PID control: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 %	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control:0.0

● Input 2_Auto/Manual transfer selection (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

To display “Input 2_Auto/Manual transfer selection (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Manipulated output value (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

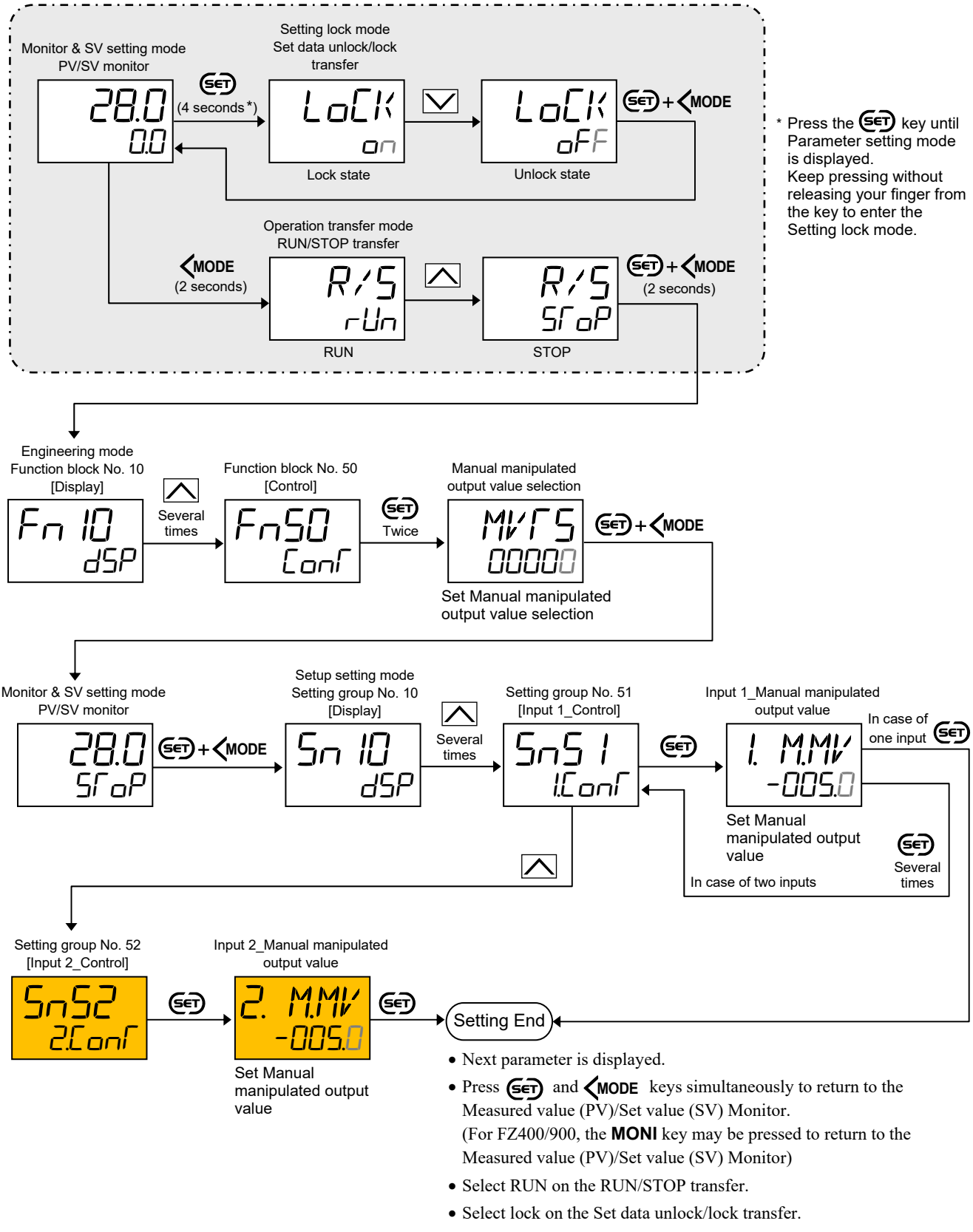
Parameter symbol	Data range	Factory set value
2. MV.A	−5.0 to +105.0 %	−5.0

To display “Input 2_Manipulated output value (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

■ Setting procedure

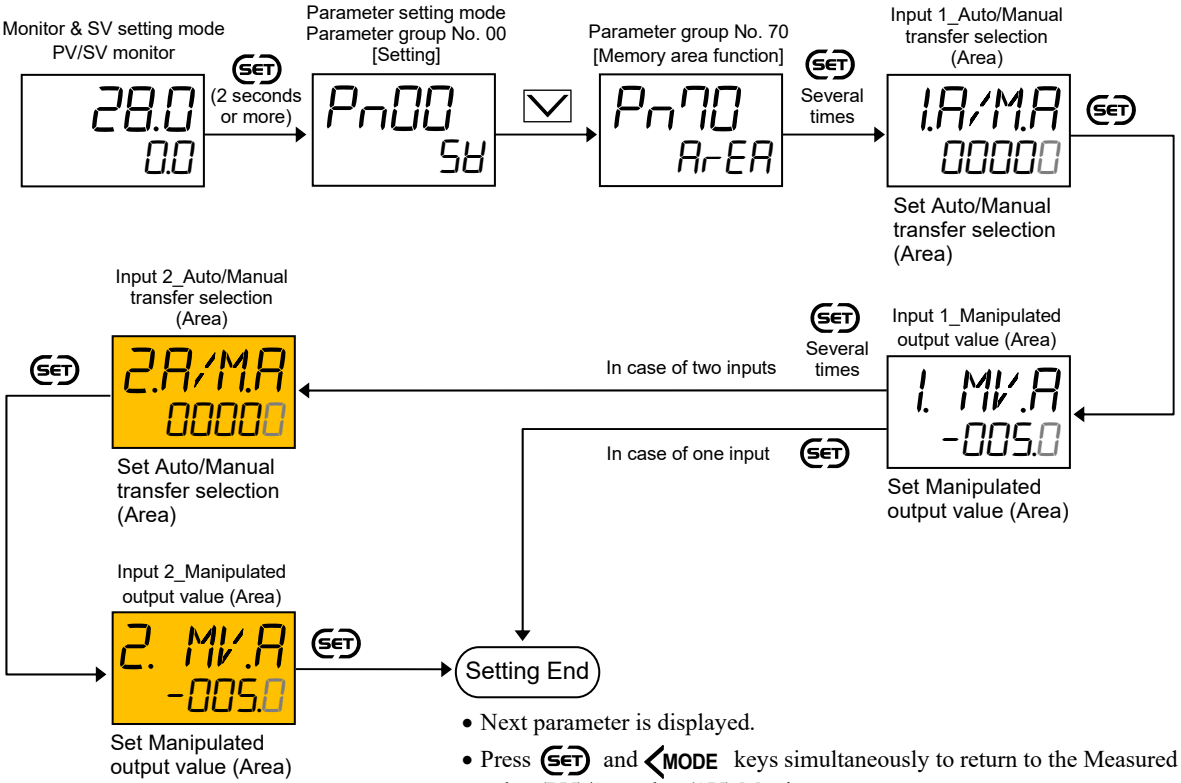
● Setting “Manual manipulated output value selection” and “Manual manipulated output value”

To enter the Engineering mode



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

● Setting “Auto/Manual transfer selection (Area)” and “Manipulated output value (Area)”



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

6.9 Changing the Output Action While in Control Stop Mode

This instrument can continue supplying Retransmission output and Event outputs, or output Manipulated output value, even while Control is stopped.

■ Description of function

The following three types can be continued to output even while in control stop mode. Multi types can be selected.

- Retransmission output
- Logic calculation output [Event, Heater break alarm (HBA), Input error status]
- Instrument Status Output [Manual mode, Remote mode, While Set value (SV) is changing, Communication monitoring result]

Continued output types while in Control stop cannot be selected by the output.
For example, this combination is not available:
Event 1: Continue to output even while in Control stop. Event 2: Output to be stopped.
Selection can be made in the unit of Retransmission output, Logic operation output, and Instrument status output.

Selecting “Logic calculation output: Action continues” as “Output action at control stop” will not include Control loop break alarm (LBA).

● Manipulated output value at STOP

Manipulated output value at STOP is a function to produce the preset manipulated output value at Control STOP. In the case of Heat/Cool PID control, Manipulated output value can be set on both sides of heating and cooling. Likewise, in case of a dual output type, manipulated output value can be set on both sides of Control output 1 and 2.

■ Parameter setting

● Output action at control stop [Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
55	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0

● Input 1_Manipulated output value at STOP [heat-side] [Engineering Mode: Function block No. 51 (Fn5 1)]

Parameter symbol	Data range	Factory set value
1. RMV	−5.0 to +105.0 %	−5.0

● Input 2_Manipulated output value at STOP [Engineering Mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. RMV	–5.0 to +105.0 %	–5.0

To display "Input 2_Manipulated output value at STOP," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

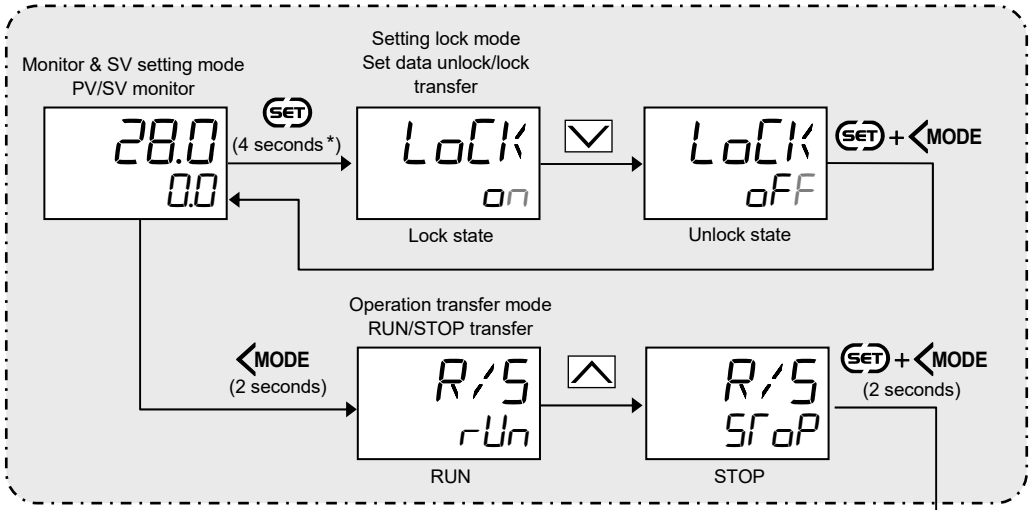
● Input 1_Manipulated output value at STOP [cool-side] [Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
1.RMV c	–5.0 to +105.0 %	–5.0

To display "Input 1_Manipulated output value at STOP [cool-side]," specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at "Input 1_Control action" (Function block No. 51 in Engineering mode).

■ Setting procedure

To enter the Engineering mode



* Press the SET key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

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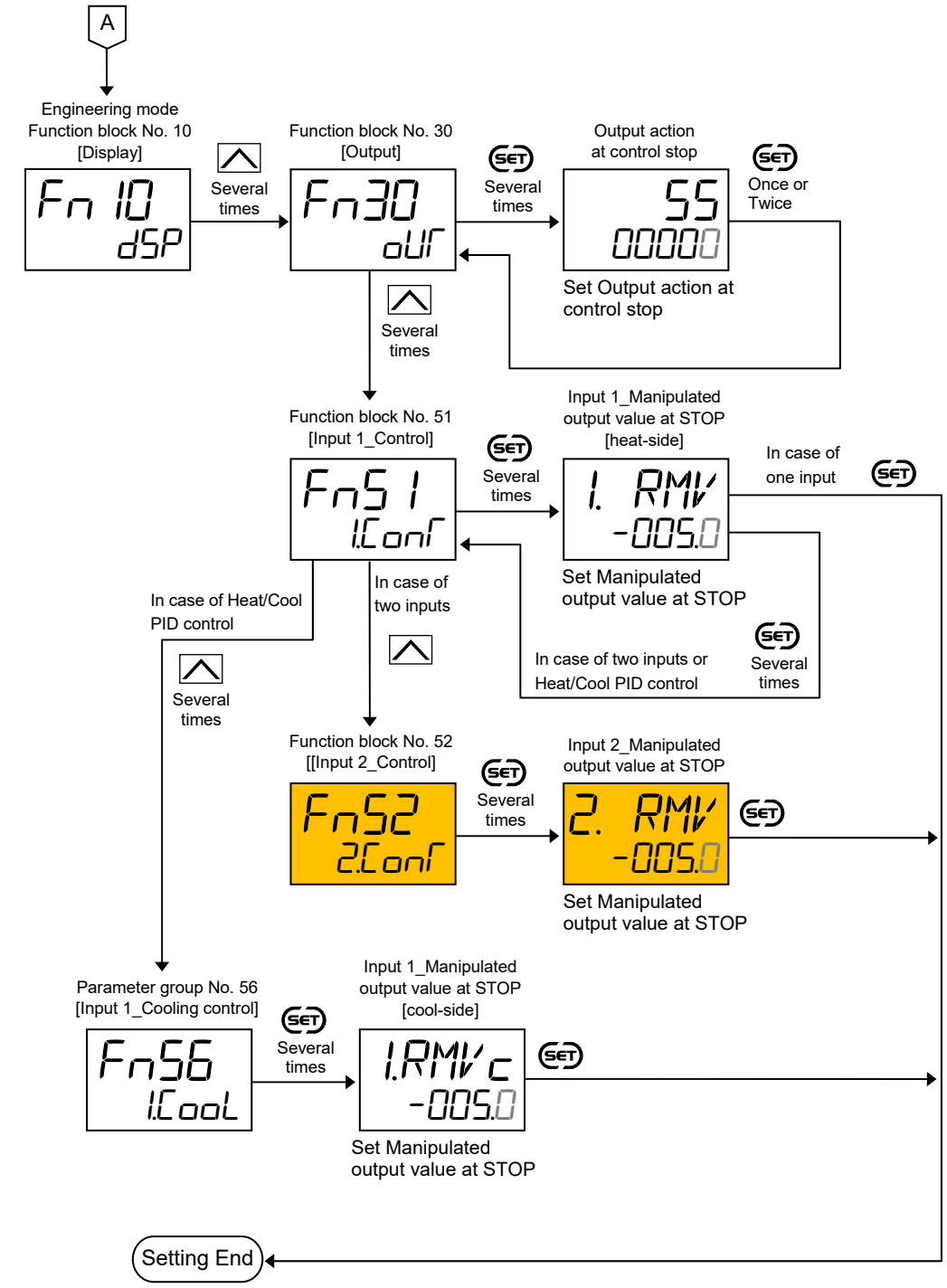


- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

6.10 Monitoring Manipulated Output Value

Manipulated output value can be monitored on this instrument.

■ Display contents

● Input 1_Manipulated output value monitor [heat-side] [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
1. MV	–5.0 to +105.0 %	

Not displayed when the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID control with Feedback resistance (FBR) input.

● Input 1_Manipulated output value monitor [cool-side] [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
1. MVc	–5.0 to +105.0 %	

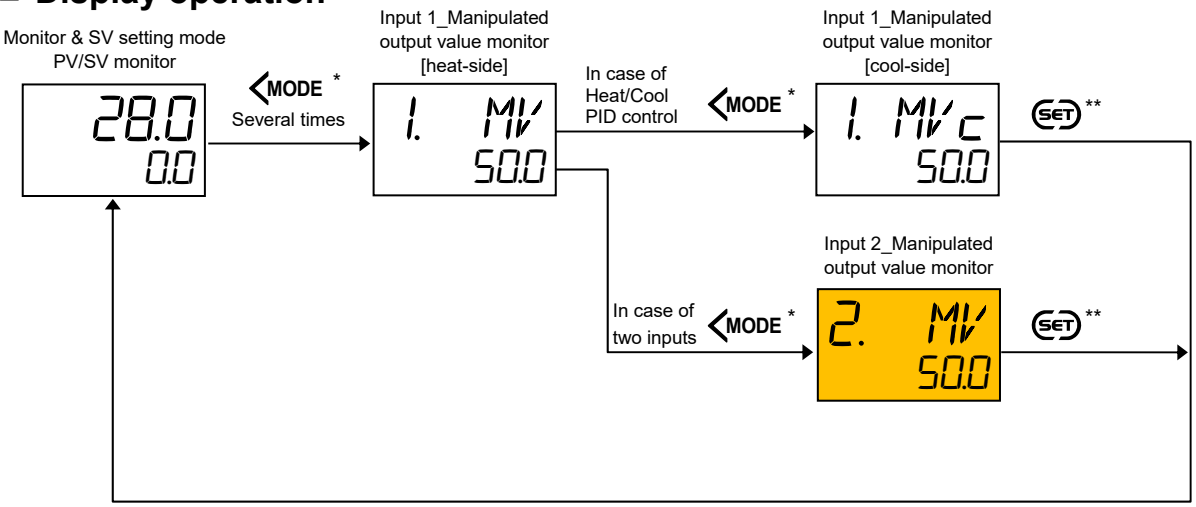
To display “Input 1_Manipulated output value monitor [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).

● Input 2_Manipulated output value monitor [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
2. MV	–5.0 to +105.0 %	

To display “Input 2_Manipulated output value monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

■ Display operation



* In case of a FZ400/900, **MONI** key may be used instead.

** In case of a FZ400/900, **R.SET** key may be used to return.

MEMO

7 EVENT FUNCTION

This chapter describes event related functions, setting contents and setting procedure based on the key words related to events.

7.1 Using Event Function 7-2
7.1.1 Changing input for event 7-3
7.1.2 Changing event type 7-7
7.1.3 Adding hold action to the event action 7-16
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7.1 Using Event Function

■ Setting procedure for event function

Set event as follows:

Set the parameter related to event output

Set the parameter related to Event output.

- OUT1 to 3 function selection
- DO1 to 4 function selection
- OUT1 to 3 logic calculation selection
- DO1 to 4 logic calculation selection
- Energized/De-energized selection
- Interlock selection
- Output action at control stop

☞ For OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection and DO1 to 4 logic calculation selection, refer to **6.1 Changing Output Assignment (P. 6-2)**.

☞ For Energized/De-energized selection, refer to **6.5 Changing Energizing/De-energizing Output (P. 6-24)**.

☞ For Interlock function, refer to **7.5 Keeping the Event State (Interlock Function) (P. 7-42)** and **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

☞ For Output action at control stop, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 6-39)**.

Set the Event parameter

Set the following parameters:

- Event assignment
- Event type
- Event hold action
- Event differential gap
- Event timer

☞ For event assignment, refer to **7.1.1 Changing input for event (P. 7-3)**.

☞ For event type, refer to **7.1.2 Changing event type (P. 7-7)**.

☞ For event hold action, refer to **7.1.3 Adding hold action to the event action (P. 7-16)**.

☞ For event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

☞ For event timer, **7.1.5 Preventing event from turning on due to a transient abnormal input (P. 7-21)**.

Set the Event set value

Set the Event set value.

☞ For event set value, refer to **7.1.7 Changing the event set value (P. 7-23)**.

7.1.1 Changing input for event

On this instrument input signal can be individually set for each event.

– Input 1
– Input 2
– Differential temperature input

■ Description of function

There are four action available for event; Deviation action, Input value action, Set value action, and Manipulated output value action.
Each event uses its own value.

● Deviation action

For Input 1: Deviation = Input 1_Measured value (PV) – Input 1_Set value (SV)
For Input 2: Deviation = Input 2_Measured value (PV) – Input 2_Set value (SV)
For Differential temperature input: Deviation = Measured value (PV) of differential temperature input – Set value (SV) of differential temperature input

● Input value action

For Input 1: Input value = Input 1_Measured value (PV)
For Input 2: Input value = Input 2_Measured value (PV)
For Differential temperature input: Input value = Measured value (PV) of differential temperature input

● Set value action

For Input 1: Set value = Input 1_Set value (SV)
For Input 2: Set value = Input 2_Set value (SV)
For Differential temperature input: Set value = Set value (SV) of differential temperature input

● Manipulated output value action

For Input 1: Manipulated output value = Input 1_ Manipulated output value (MV)
For Input 2: Manipulated output value = Input 2_ Manipulated output value (MV)
For Differential temperature input: Manipulated output value = Input 1_ Manipulated output value (MV)

■ Parameter setting

● Event 1 assignment
[Engineering Mode: Function block No. 41 (FnH1)]

Parameter symbol	Data range	Factory set value
EVA1	1: Input 1 2: Input 2 3: Differential temperature input	1

To display "Event 1 assignment," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 1 assignment is changed.

● Event 2 assignment
[Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EvA2	1: Input 1 2: Input 2 3: Differential temperature input	1

To display "Event 2 assignment," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 2 assignment is changed.

● Event 3 assignment
[Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EvA3	1: Input 1 2: Input 2 3: Differential temperature input	1

To display "Event 3 assignment," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 3 assignment is changed.

● Event 4 assignment
[Engineering Mode: Function block No. 44 (Fn44)]

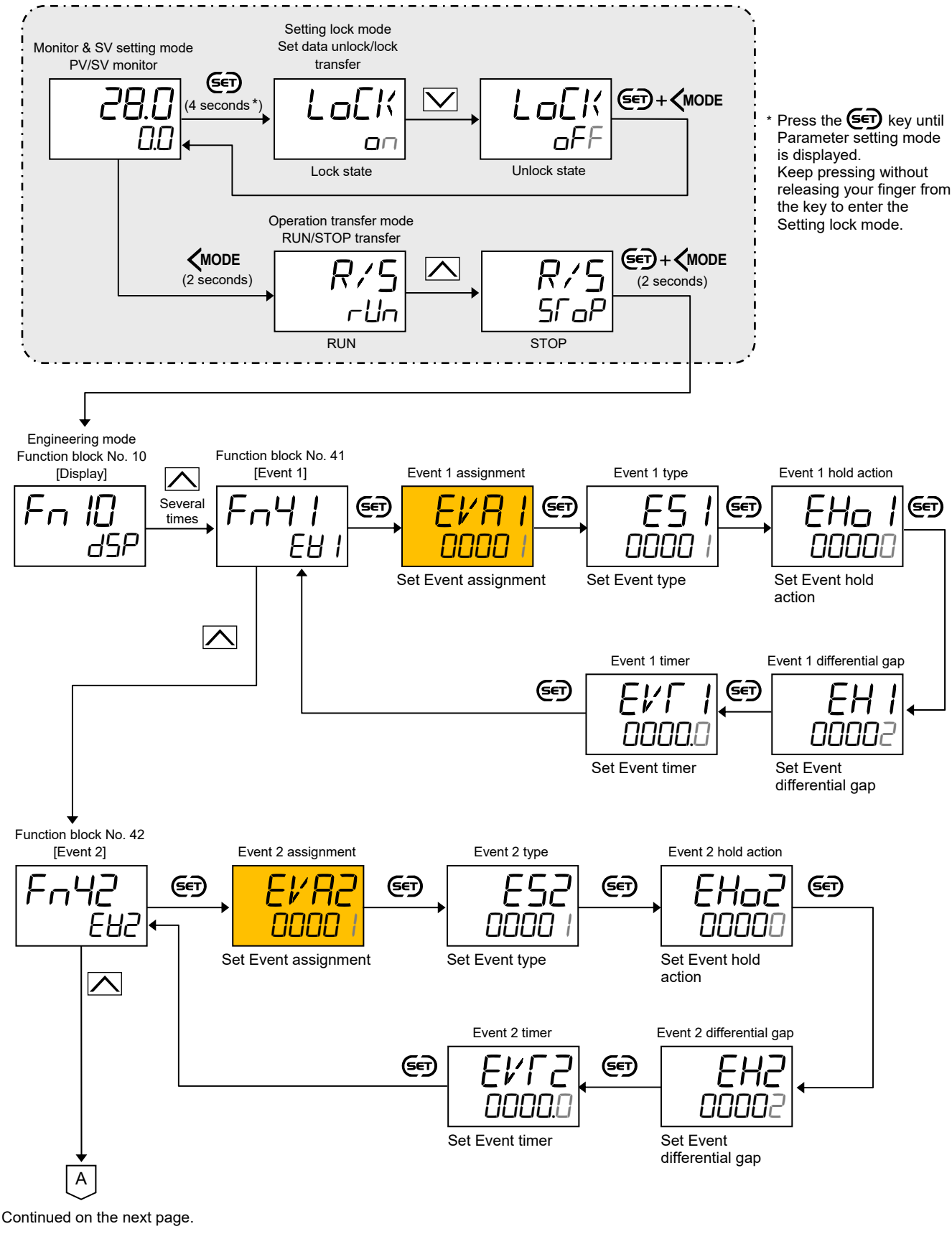
Parameter symbol	Data range	Factory set value
EvA4	1: Input 1 2: Input 2 3: Differential temperature input	1

To display "Event 4 assignment," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 4 assignment is changed.

■ Setting procedure

To enter the Engineering mode



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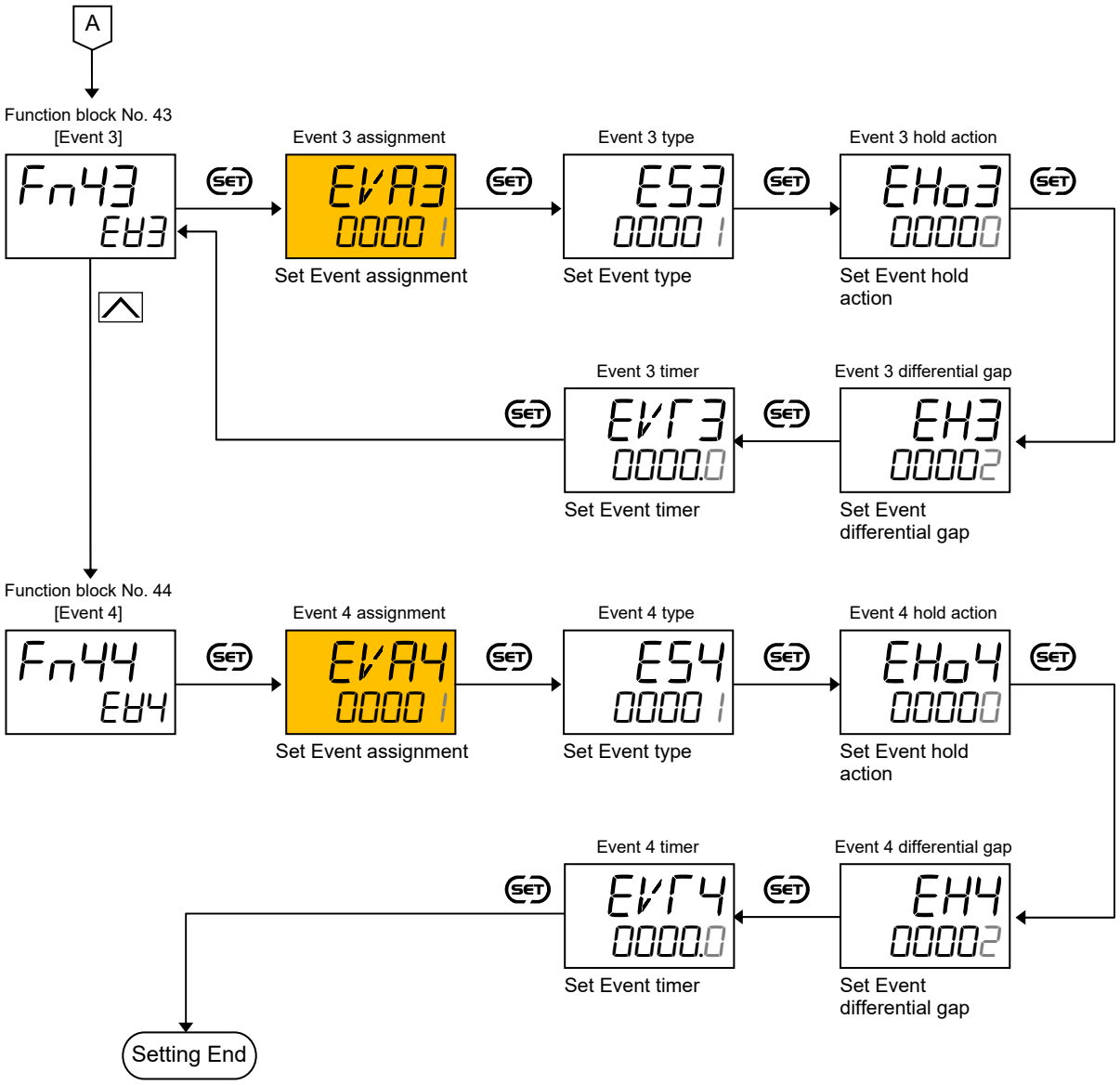


- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

7.1.2 Changing event type

There are 24 types of event in total.

- Event type

Set value	Event type	Initial setting code
0	None	N
1	Deviation high (using SV monitor value) [1]	A, E (with hold action), Q (with re-hold action)
2	Deviation low (using SV monitor value) [1]	B, F (with hold action), R (with re-hold action)
3	Deviation high/low (using SV monitor value) [1]	C, G (with hold action), T (with re-hold action)
4	Band (using SV monitor value) [1]	D
5	Deviation high/low (using SV monitor value) [High/Low individual setting] [1]	X, Y (with hold action), Z (with re-hold action)
6	Band (using SV monitor value) [High/Low individual setting] [1]	U
7	SV high (using SV monitor value)	V
8	SV low (using SV monitor value)	W
9	Process high [2]	H, K (with hold action)
10	Process low [2]	J, L (with hold action)
11	Deviation high (using local SV) [1]	—
12	Deviation low (using local SV) [1]	—
13	Deviation high/low (using local SV) [1]	—
14	Band (using local SV) [1]	—
15	Deviation high/low (using local SV) [High/Low individual setting] [1]	—
16	Band (using local SV) [High/Low individual setting] [1]	—
17	SV high (using local SV)	—
18	SV low (using local SV)	—
19	MV high [heat-side] [2, 3]	1
20	MV low [heat-side] [2, 3]	2
21	MV high [cool-side] [2]	3
22	MV low [cool-side] [2]	4
23	Process high/low [High/Low individual setting] [2]	—
24	Process band [High/Low individual setting] [2]	—

[1] Event hold and re-hold action is available.

[2] Event hold action is available.

[3] The Manipulated output value (MV) corresponds to the Feedback resistance (FBR) input value when the Control action is a Position proportioning PID control with Feedback resistance (FBR) input.

■ Description of function

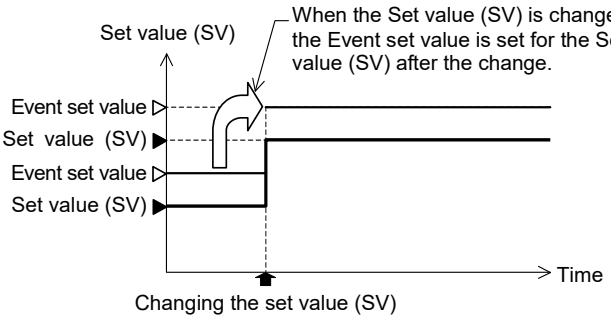
● Deviation action

When the deviation (PV – SV) reaches the Event set value, event ON occurs.
SV monitor value type and local SV value type are available for Deviation action.

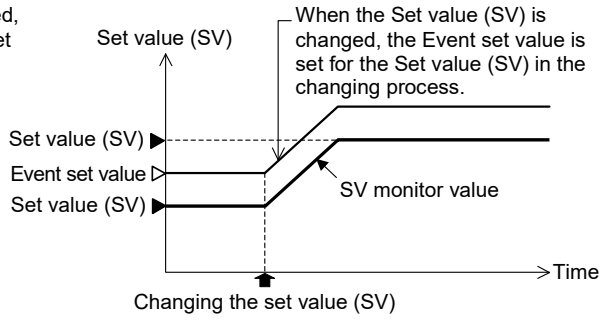
SV monitor value type	The Event set value is set for the SV monitor value. Setting change rate limiter adjusts the Event set value to follow the same change rate of SV monitor value. SV monitor value: SV monitor value is displayed in the Measured value (PV)/Set value (SV) monitor screen (Monitor & SV setting mode). When Setting change rate limiter is set, the Set value (SV) in the changing process is displayed.
Local SV type	The Event set value is set for the Set value (SV) [Local SV]. Local SV: Local SV is displayed in the Measured value (PV)/Set value (SV) screen (Monitor & SV setting mode).

SV monitor value type

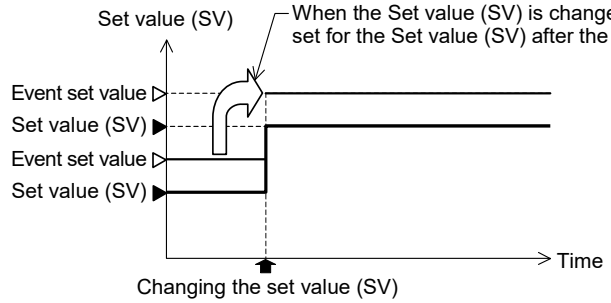
[When setting change rate limiter is not set.]



[When setting change rate limiter is set.]



Local SV type



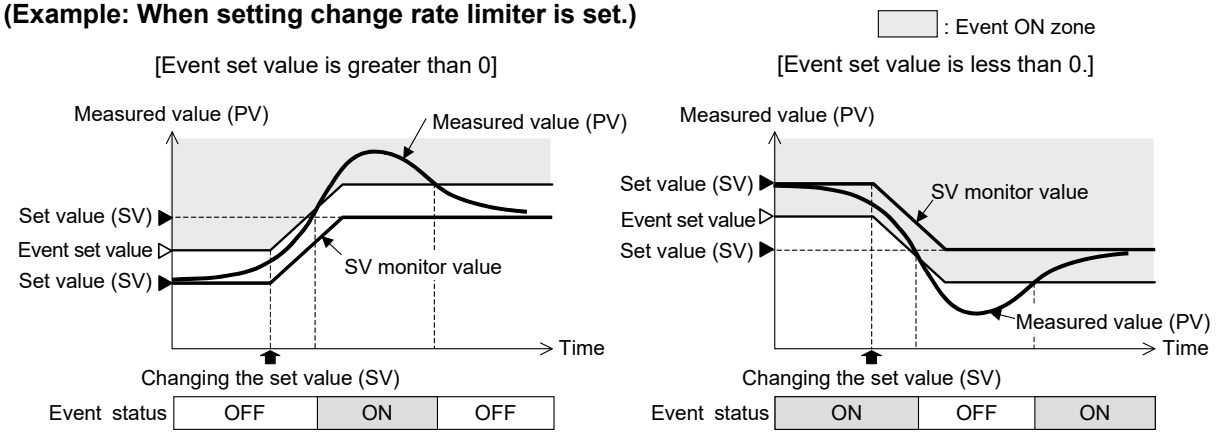
Local SV type has only one type of action on change with or without the Setting change rate limiter.

☞ For the Setting change rate limiter, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

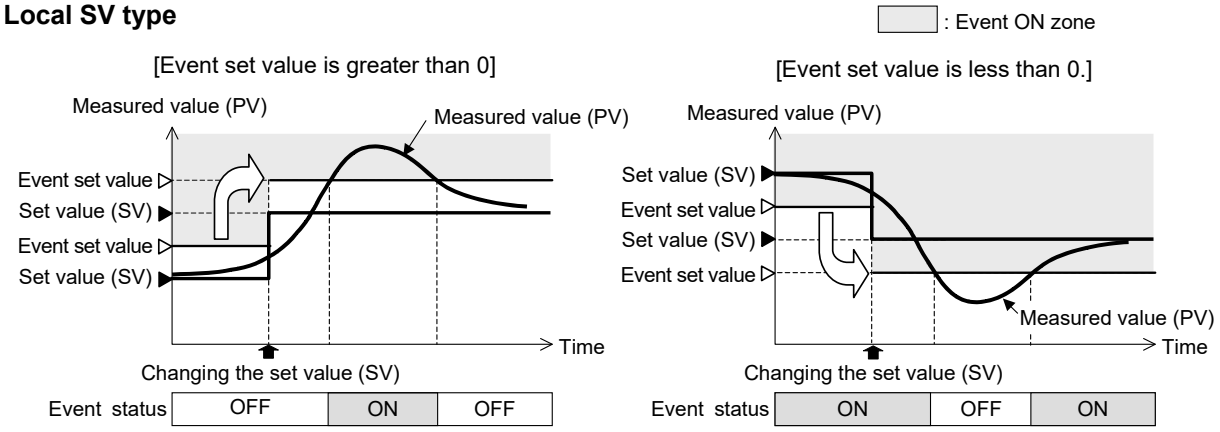
Some examples of Deviation high are described in the following:

Deviation high: When the deviation (PV – SV) is more than the Event set value, the event ON occurs.

SV monitor value type
(Example: When setting change rate limiter is set.)



Local SV type



☞ Event turns ON or OFF in accordance with the differential gap setting. For Event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

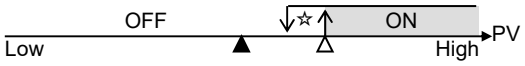
Diagrams of the Deviation action type are shown in the following:

ON: Event action turned on
OFF: Event action turned off (▲: Set value (SV) △: Event set value ☆: Event differential gap)

Deviation high

When the deviation (PV – SV) is more than the Event set value, the event ON occurs.

(Event set value is greater than 0.)



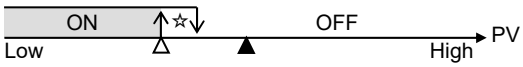
(Event set value is less than 0.)

Deviation low

When the deviation (PV – SV) is less than the Event set value, the event ON occurs.

(Event set value is greater than 0.)

(Event set value is less than 0.)



Deviation high/low

Two types of Deviation high/low action are available.

Without high/low individual setting:

When the absolute deviation | PV – SV | is more/less than the Event set value, the event ON occurs.

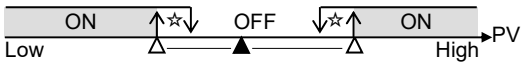
With high/low individual setting:

High action: When the deviation (PV – SV) is more than the Event set value [high], the event ON occurs.

Low action: When the deviation (PV – SV) is less than the Event set value [low], the event ON occurs.

(Without High/Low individual setting)

(With High/Low individual setting)



Band

Two types of Band action are available.

Without high/low individual setting:

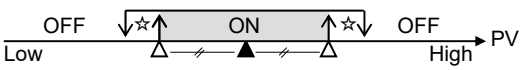
When the absolute deviation | PV – SV | is within the Event set value, the event ON occurs.

With high/low individual setting:

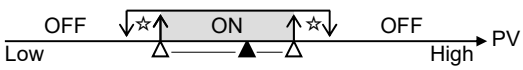
High action: When the deviation (PV – SV) is less than the Event set value [high], the event ON occurs.

Low action: When the deviation (PV – SV) is more than the Event set value [low], the event ON occurs.

(Without High/Low individual setting)



(With High/Low individual setting)



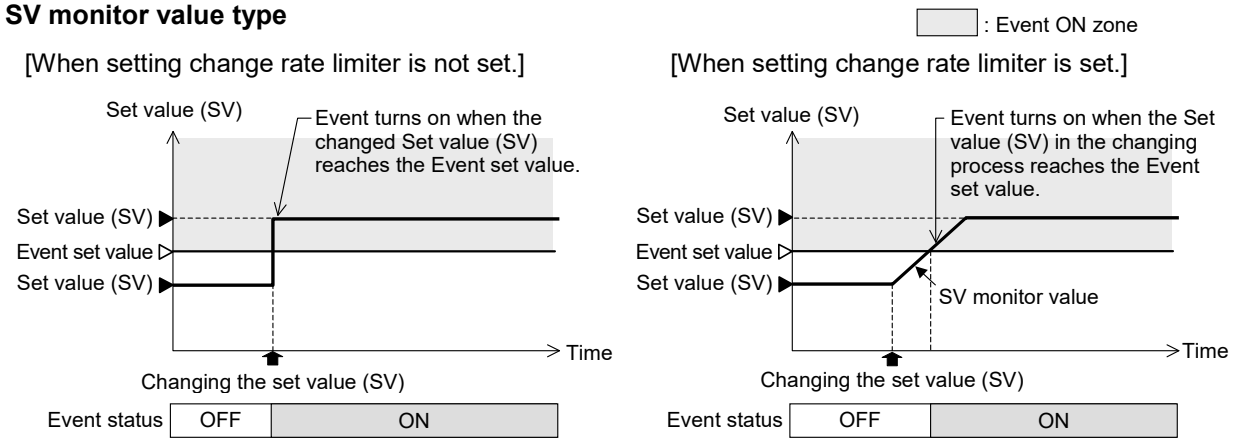
● Set value action

When the Set value (SV) reaches the Event set value, event ON occurs.
SV monitor value type and local SV value type are available for Set value action.

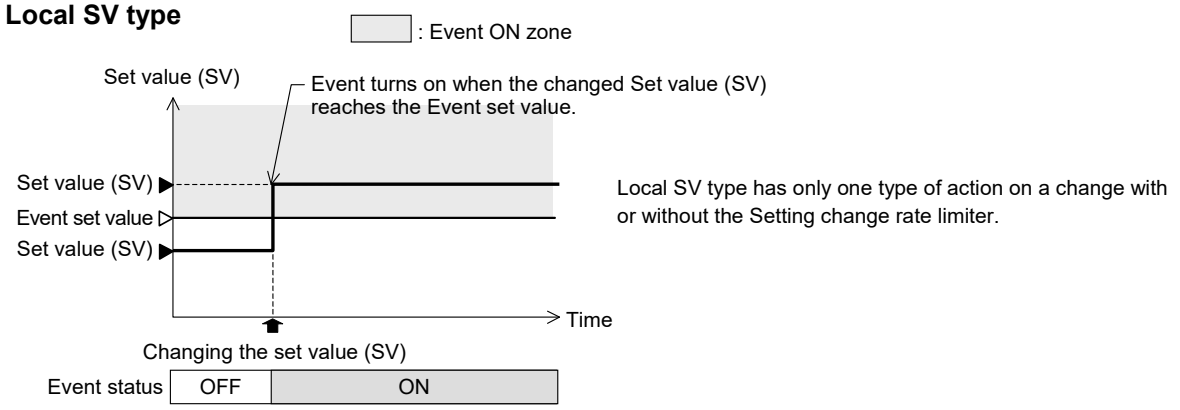
SV monitor value type	Event turns on when SV monitor value reaches Event set value. Setting change rate limiter turns on the event when the Set value (SV) in the changing process reaches Event set value. SV monitor value: SV monitor value is displayed in the Measured value (PV)/Set value (SV) monitor screen (Monitor display mode). When Setting change rate limiter is set, the Set value (SV) in the changing process is displayed.
Local SV type	Event turns on when Set value (SV) [Local SV] reaches Event set value. Local SV: Local SV is displayed in the Measured value (PV)/Set value (SV) screen (SV setting mode).

Some examples of SV high are described in the following:
SV high: When the Set value (SV) is more than the Event set value, the event ON occurs.

SV monitor value type



Local SV type



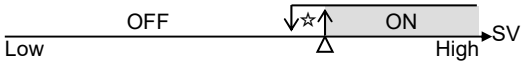
☞ Event turns ON or OFF in accordance with the differential gap setting. For Event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

Diagrams of the Set value action type are shown in the following:

ON: Event action turned on
OFF: Event action turned off (△: Event set value ☆: Event differential gap)

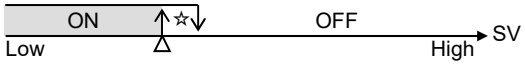
SV high

When the Set value (SV) is more than the Event set value, the event ON occurs.



SV low

When the Set value (SV) is less than the Event set value, the event ON occurs.



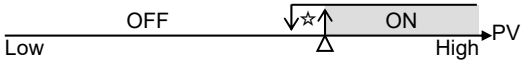
● Input value action

When the Measured value (PV) reaches the Event set value, event ON occurs.

ON: Event action turned on
OFF: Event action turned off (△: Event set value ☆: Event differential gap)

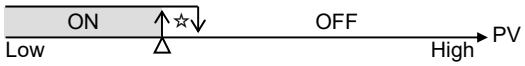
Process high

When the Measured value (PV) is more than the Event set value, the event ON occurs.



Process low

When the Measured value (PV) is less than the Event set value, the event ON occurs.



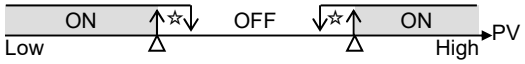
Process high/low

Process high/low action can be modified to high and low individual setting.

High action: When the Measured value (PV) is more than the Event set value [high], the event ON occurs.

Low action: When the Measured value (PV) is less than the Event set value [low], the event ON occurs.

(With High/Low individual setting)



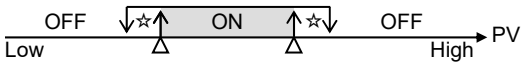
Process band

Process band action can be modified to high and low individual setting.

High action: When the Measured value (PV) is less than the Event set value [high], the event ON occurs.

Low action: When the Measured value (PV) is more than the Event set value [low], the event ON occurs.

(With High/Low individual setting)



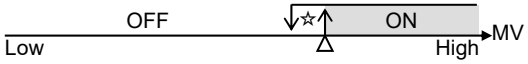
● Manipulated output value action

When a Manipulated output value (MV) reaches the Event set value, the event ON occurs.

ON: Event action turned on
OFF: Event action turned off (△: Event set value ☆: Event differential gap)

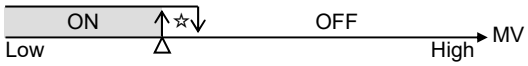
MV high

When the Manipulated output value (MV) is more than the Event set value, the event ON occurs.



MV high

When the Manipulated output value (MV) is less than the Event set value, the event ON occurs.



■ Parameter setting

● Event 1 type
[Engineering Mode: Function block No. 41 (Fn4 1)]

Parameter symbol	Data range	Factory set value
ES1	0: None 1: Deviation high (Using SV monitor value) [a] 2: Deviation low (Using SV monitor value)[a] 3: Deviation high/low (Using SV monitor value) [a] 4: Band (Using SV monitor value) [a] 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] [a] 6: Band (Using SV monitor value) [High/Low individual setting] [a] 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high [b] 10: Process low [b] 11: Deviation high (Using local SV) [a] 12: Deviation low (Using local SV) [a] 13: Deviation high/low (Using local SV) [a] 14: Band (Using local SV) [a] 15: Deviation high/low (Using local SV) [High/Low individual setting] [a] 16: Band (Using local SV) [High/Low individual setting] [a] 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] [b, c] 20: MV low [heat-side] [b, c] 21: MV high [cool-side] [b] 22: MV low [cool-side] [b] 23: Process high/low [High/Low individual setting] [b] 24: Process band [High/Low individual setting] [b] [a] Event hold and re-hold action is available. [b] Event hold action is available. [c] When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 1 type is changed.

- **Event 2 type**
  [Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
E52	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 2 type is changed.

- **Event 3 type**
  [Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
E53	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 3 type is changed.

- **Event 4 type**
  [Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
E54	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Event 4 type is changed.

■ Setting procedure

Refer to the operation on P. 7-5.

7.1.3 Adding hold action to the event action

On this instrument hold action or re-hold action can be added to the Event action.

Some event actions may not be available with hold and re-hold actions. Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.

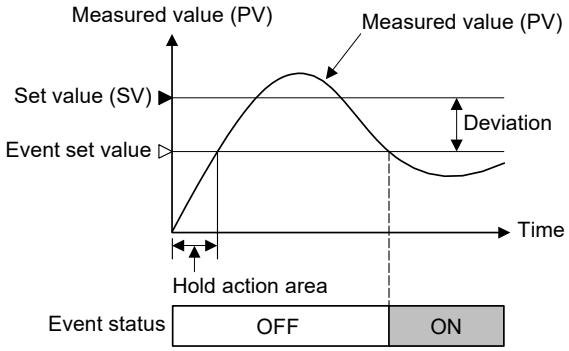
Refer to Setting of Event types (P.7-14) for those events that are available with hold or re-hold action.

■ Description of function

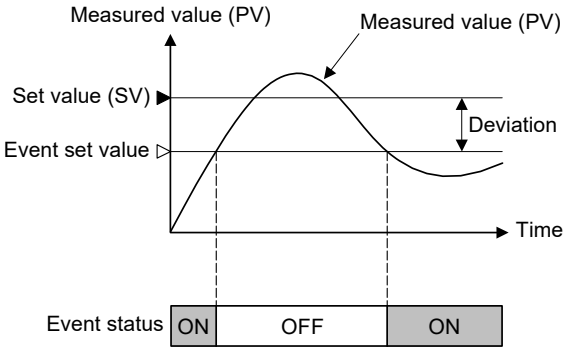
● Hold action

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

[With hold action]



[Without hold action]



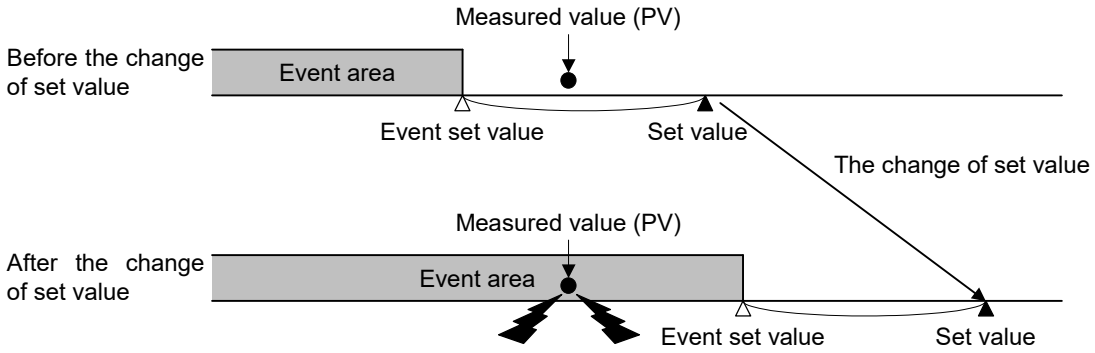
● Re-hold action

When Re-hold action is ON, the event action is also suppressed at the Set value (SV) change until the Measured value (PV) has entered the non-event range.

Action condition	Hold action	Re-hold action
When the power is turned on	Works	Works
When transferred from STOP (control STOP) to RUN (control RUN)	Works	Works
When the Set value (SV) is changed	Does not work	Works

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

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



NOTE

When high alarm with hold action/re-hold action is used for Event function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

The re-hold action is invalid for any of the following.

- Setting of Setting change rate limiter is other than "0 (no function)"
- Remote mode
- Cascade control
- Differential temperature control

■ Parameter setting

● Event 1 hold action [Engineering Mode: Function block No. 41 (FnH1)]

Parameter symbol	Data range	Factory set value
EHo1	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

● Event 2 hold action [Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EHo2	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

● Event 3 hold action [Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EHo3	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

● Event 4 hold action [Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
EHo4	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

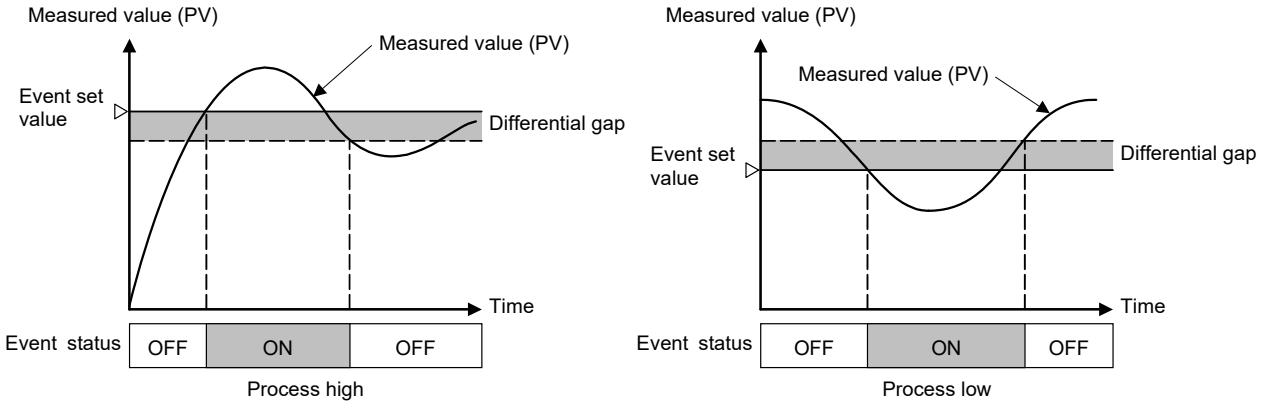
■ Setting procedure

Refer to the operation on P. 7-5.

7.1.4 Setting a differential gap in event action

■ Description of function

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



■ Parameter setting

● Event 1 differential gap [Engineering Mode: Function block No. 41 (Fn41)]

Parameter symbol	Data range	Factory set value
EH1	Deviation, Process and SV: • If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) • If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2

● Event 2 differential gap [Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EH2	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2

● Event 3 differential gap [Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EH3	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2

● Event 4 differential gap [Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
EH4	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of input span MV: 0.2

■ Setting procedure

Refer to the operation on P. 7-5.

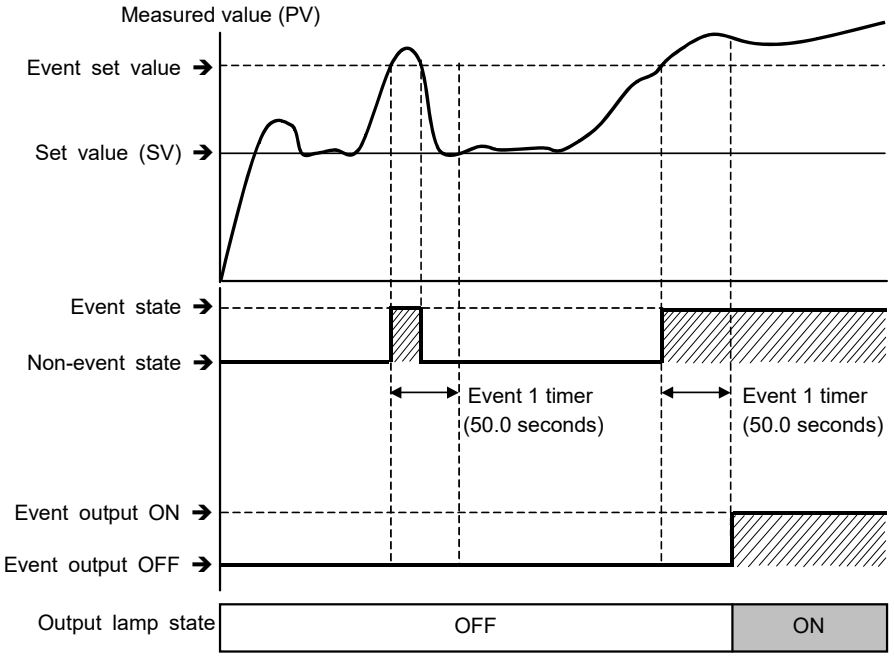
7.1.5 Preventing event from turning on due to a transient abnormal input

Event timer can be used to prevent event from turning on for the event state shorter than the set time.

■ Description of function

When an event condition becomes ON, the output is suppressed until the Event timer set time elapses. If the event output is still ON after time is up, the output will resume.

Example: When the setting of Event 1 timer is 50.0 seconds



- The Event timer is also activated for the following reasons:
  - When set to the event state simultaneously with power turned on
  - When set to the event state simultaneously with control changed to RUN (control start) from STOP (control stop).
- In the event wait state, no event output is turned on even after the Event timer preset time has elapsed.
- The Event timer is reset for the following reasons:
  - When power failure occurs while the Event timer is being activated
  - When control is changed to STOP (control stop) from RUN (control start) while the Event timer is being activated *
  - Cancellation of Event state

* Event timer will not be reset by switching to the STOP (control stop) when logical operation output (OUT1 to OUT3 logic calculation selection) is selected for an Event and "logic calculation output: Action continues" is set for the Output action in Reset mode.

■ Parameter setting

● Event 1 timer
[Engineering Mode: Function block No. 41 (Fn41)]

Parameter symbol	Data range	Factory set value
EVT 1	0.0 to 600.0 seconds	0.0

● Event 2 timer
[Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EVT2	0.0 to 600.0 seconds	0.0

● Event 3 timer
[Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EVT3	0.0 to 600.0 seconds	0.0

● Event 4 timer
[Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
EVT4	0.0 to 600.0 seconds	0.0

■ Setting procedure

Refer to the operation on P. 7-5.

7.1.6 Changing event output assignment

Event output assignment can be changed through OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection, and DO1 to 4 logic calculation selection.
Depending on the ordered specifications, there may be some restrictions in the event output assignment.

☞ For Event output assignment, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.

7.1.7 Changing the event set value

The Event set value can be set in Parameter group No. 40 in the Parameter setting mode.
Since the Set value for Event 1 to 4 are included in the Memory area, up to 16 data can be stored per parameter.

☞ For detailed operation on how to set Event set values, refer to **FZ110/FZ400/FZ900 Quick operation manual (IMR03A02-E□)** or **FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware] (IMR03A04-E□)**.
Details of Memory area transfer can be found in **10.3 Storing the control related set values (Memory Area function) (P. 10-10)**.

7.2 Using Heater Break Alarm (HBA)

■ Setting procedure for Heater break alarm (HBA)

Set Heater break alarm (HBA) as follows:

Set the parameter related to HBA output

Set the parameter related to Heater break alarm (HBA) output.

- OUT1 to 3 function selection
- DO1 to 4 function selection
- OUT1 to 3 logic calculation selection
- DO1 to 4 logic calculation selection
- Energized/De-energized selection
- Interlock selection
- Output action at control stop

☞ For OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection and DO1 to 4 logic calculation selection, refer to **6.1 Changing Output Assignment (P. 6-2)**.

☞ For Energized/De-energized selection, refer to **6.5 Changing Energizing/De-energizing Output (P. 6-24)**.

☞ For Interlock function, refer to **7.5 Keeping the Event State (Interlock Function) (P. 7-42)** and **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

☞ For Output action at control stop, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 6-39)**.

Set the Current transformer (CT) parameter

Set the following parameters:

- CT assignment
- CT type
- CT ratio
- CT low input cut-off

☞ For CT assignment, refer to **7.2.3 Changing the output monitored by the Heater Break Alarm (HBA) (P. 7-30)**.

☞ For CT type and CT ratio, refer to **7.2.4 Changing the current transformer (CT) type (P. 7-33)**.

☞ For CT low input cut-off, refer to **7.2.5 Forcing the CT input value to 0.0A when the heater is OFF (P. 7-35)**.

Set the HBA parameter

Set the following parameters:

- Heater break alarm (HBA) set value
- Number of heater break alarm 1 (HBA1) delay times

☞ For Heater break alarm (HBA) set value, refer to **7.2.1 Setting the heater break alarm (HBA) set value (P. 7-25)**.

☞ For Number of heater break alarm 1 (HBA1) delay times, refer to **7.2.2 Preventing Heater break alarm (HBA) from turning on due to a transient abnormal input (P. 7-28)**.

7.2.1 Setting the Heater break alarm (HBA) set value

■ Description of function

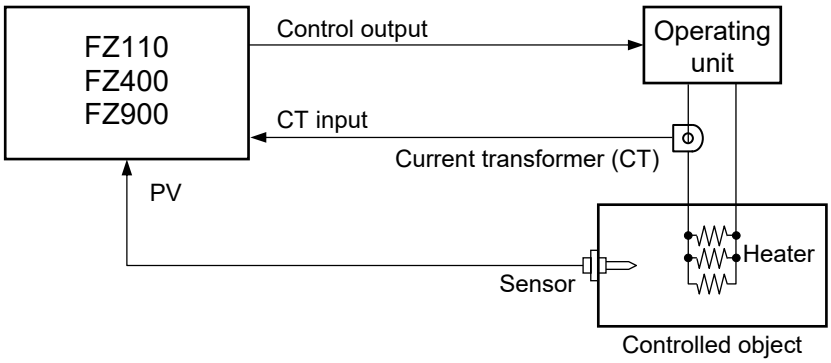
● Heater break alarm (HBA)

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

The Heater break alarm (HBA) function is activated for the following cases:

① Low or No current flow (Heater break, malfunction of the control device, etc.):
When the control output is ON and the CT input value is equal to or less than the heater break determination point for the preset number of consecutive sampling cycles, an alarm is activated.

② Over current or short-circuit:
When the control output is OFF and the CT input value is equal to or greater than the heater break determination point for the preset number of consecutive sampling cycles, an alarm is activated.

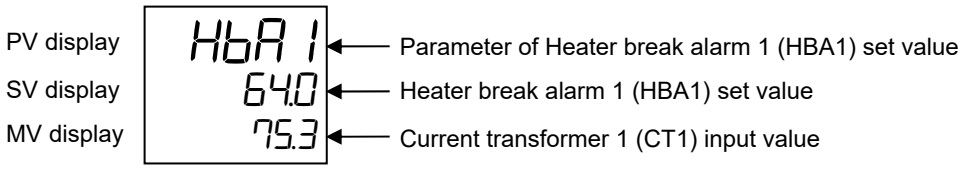


[Setting Heater Break Alarm]

Set the HBA set value to approximately 85 % of the maximum reading of the CT input.
Set the HBA set value to a slightly smaller value to prevent a false alarm if the power supply becomes unstable. When more than one heater is connected in parallel, the HBA set value may need to be increased to detect a single heater failure.

When a set value of Heater Break Alarm (HBA) is set on FZ400/900, the CT input value is displayed on the MV display and it may be helpful to set an alarm value.

[Display example]



When Heater break alarm 1 (HBA1) is set, the display shows the input value of the Current transformer 1 (CT1). When Heater break alarm 2 (HBA2) is set, the display shows the input value of the Current transformer 2 (CT2).

The data to be displayed on the MV display can be selected at “Show/Hide MV” in Function block 10 in Engineering mode. When the Heater break alarm (HBA) is displayed, the MV display shows the Current transformer (CT) input value.

■ Parameter setting

● Heater break alarm 1 (HBA1) set value [Setup Setting Mode: Setting group No. 45 (Sn45)]

Parameter symbol	Data range	Factory set value
HbA1	0.0 to 100.0 A 0.0: HBA function OFF	0.0

To display "Heater break alarm 1 (HBA1) set value," "CT input" must be specified at the time of order.

This parameter is not displayed if "no assignment" is set at "CT1 assignment" in Function block 45 in Engineering mode. If the output type assigned at "CT1 assignment" is Current output or Continuous voltage output, this parameter will not be displayed.

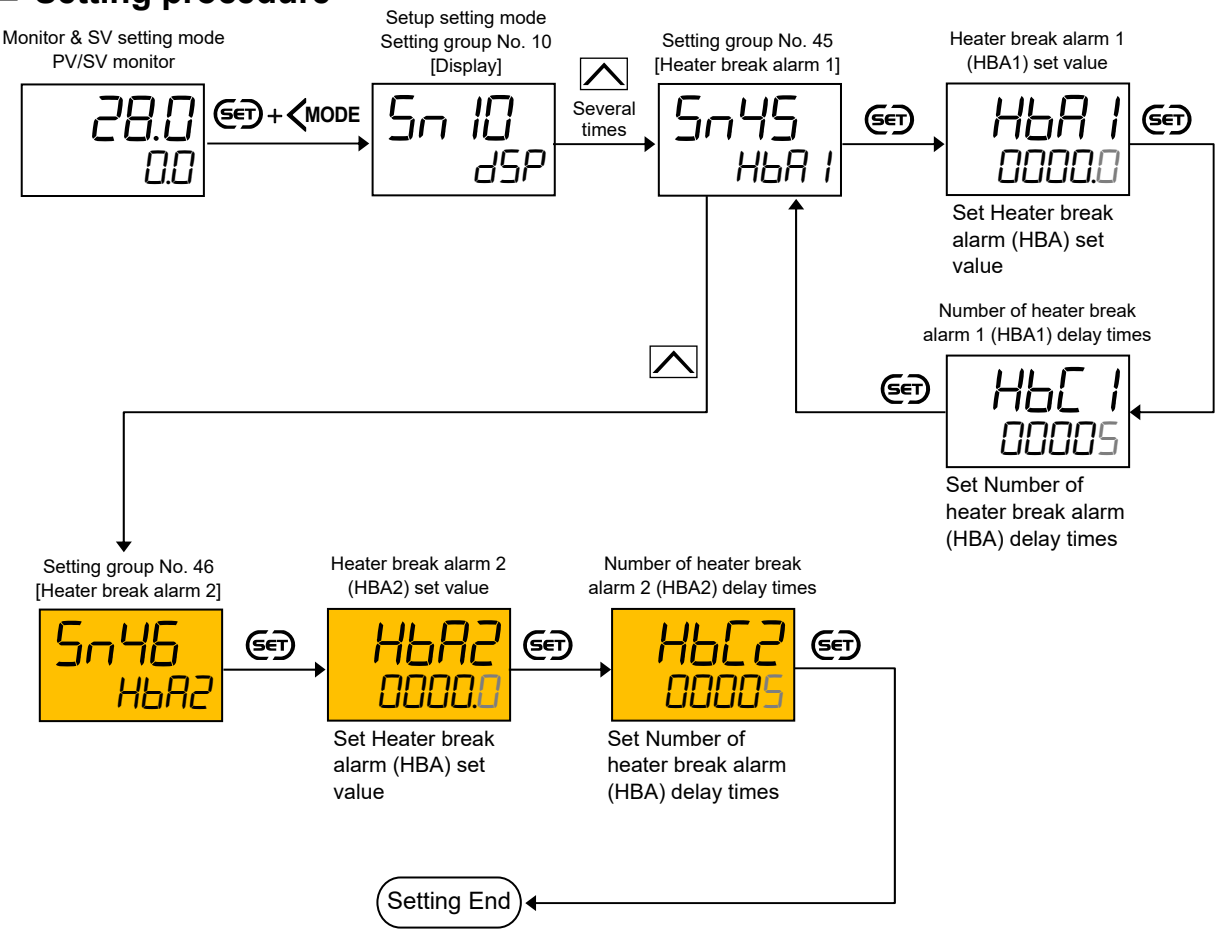
● Heater break alarm 2 (HBA2) set value [Setup Setting Mode: Setting group No. 46 (Sn46)]

Parameter symbol	Data range	Factory set value
HbA2	0.0 to 100.0 A 0.0: HBA function OFF	0.0

To display "Heater break alarm 2 (HBA2) set value," "CT input" must be specified at the time of order. (When CT input is specified on FZ400/900, two CT inputs are supplied.)

This parameter is not displayed if "no assignment" is set at "CT2 assignment" in Function block 46 in Engineering mode. If the output type assigned at "CT2 assignment" is Current output or Continuous voltage output, this parameter will not be displayed.

■ Setting procedure



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

7.2.2 Preventing Heater break alarm (HBA) from turning on due to a transient abnormal input

There is a function called HBA delay time which suppresses the alarm when the Heater break alarm (HBA) state is less than the setting (the number of sampling).

■ Description of function

● Number of HBA delay times

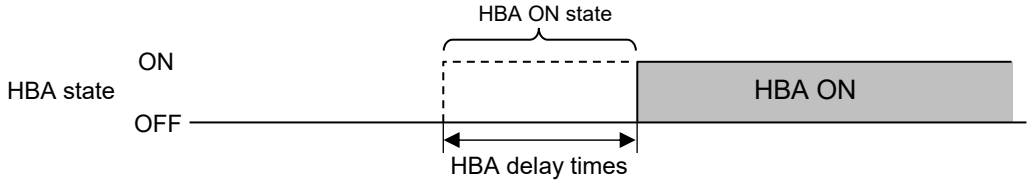
This is a function to allow the Heater break alarm (HBA) to turn on if the Heater break alarm (HBA) ON condition continues beyond the setting (the number of sampling).

Heater break alarm (HBA) delay times = Number of HBA delay times × Sampling time *

*The sampling cycle time is the shortest. It varies with the load factor (Output ON or OFF time).

Example:
Sampling cycle: 0.5 seconds
Number of HBA delay times: 5 times (Factory set value)

HBA delay times = 5 times × 0.5 seconds = 2.5 seconds



■ Parameter setting

● Number of heater break alarm 1 (HBA1) delay times [Setup Setting Mode: Setting group No. 45 (5n45)]

Parameter symbol	Data range	Factory set value
HbC 1	0 to 255 times	5

To display “Number of heater break alarm 1 (HBA1) delay times,” “CT input” must be specified at the time of order.

This parameter is not displayed if “no assignment” is set at “CT1 assignment” in Function block 45 in Engineering mode. If the output type assigned at “CT1 assignment” is Current output or Continuous voltage output, this parameter will not be displayed.

● Number of heater break alarm 2 (HBA2) delay times [Setup Setting Mode: Setting group No. 46 (5n46)]

Parameter symbol	Data range	Factory set value
HbC2	0 to 255 times	5

To display "Number of heater break alarm 2 (HBA2) delay times," "CT input" must be specified at the time of order. (When CT input is specified on FZ400/900, two CT inputs are supplied.)

This parameter is not displayed if "no assignment" is set at "CT2 assignment" in Function block 46 in Engineering mode. If the output type assigned at "CT2 assignment" is Current output or Continuous voltage output, this parameter will not be displayed.

■ Setting procedure

Refer to the operation on P. 7-27.

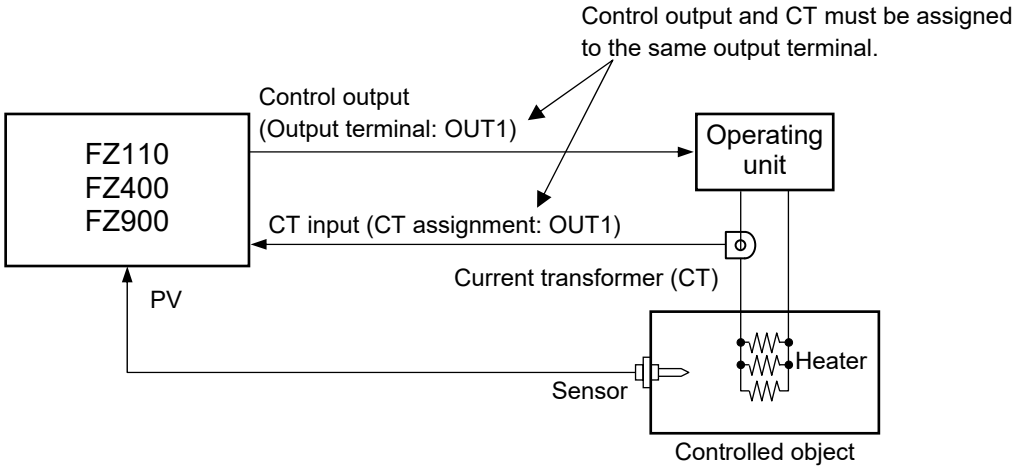
7.2.3 Changing the output monitored by the Heater break alarm (HBA)

Assignment of control output monitored by Current transformer (CT) used with Heater break alarm (HBA) can be changed.

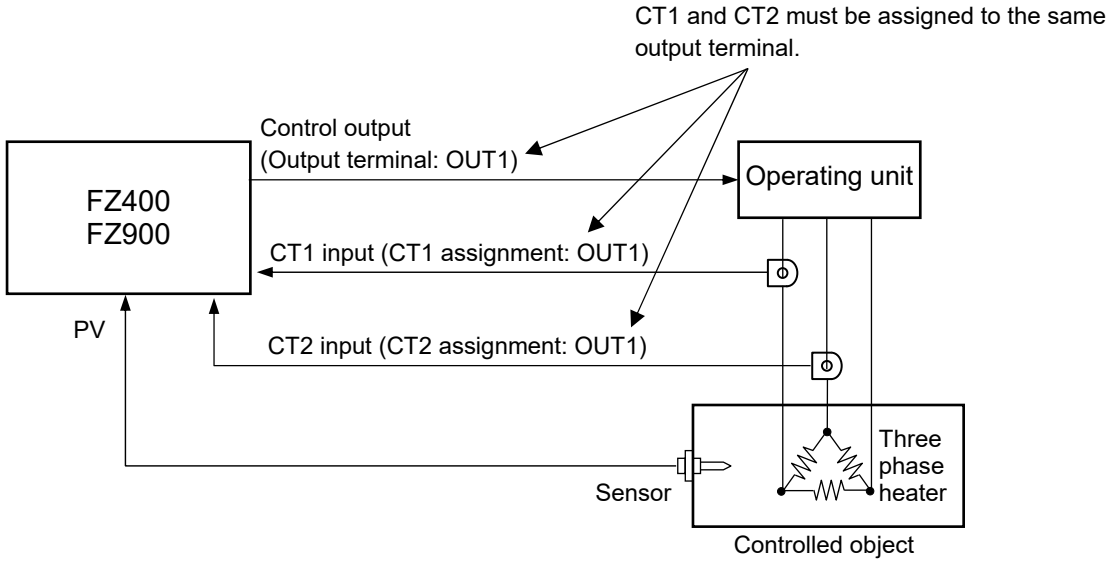
■ Description of function

● CT assignment

The Current transformer (CT) input used by the Heater break alarm (HBA) monitors the output from the output device controlled by the control output from the controller. If the output terminal of the control output from the instrument is changed, assignment of the CT needs to be changed accordingly.



When there are two CT inputs (only on FZ400/900), to detect a break in three phase heater, CT1 and CT2 must be assigned to the same terminal.



■ Parameter setting

● CT1 assignment
[Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CTA1	0: None 1: OUT1 2: OUT2 3: OUT3	1

To display "CT1 assignment," "CT input" must be specified at the time of order.

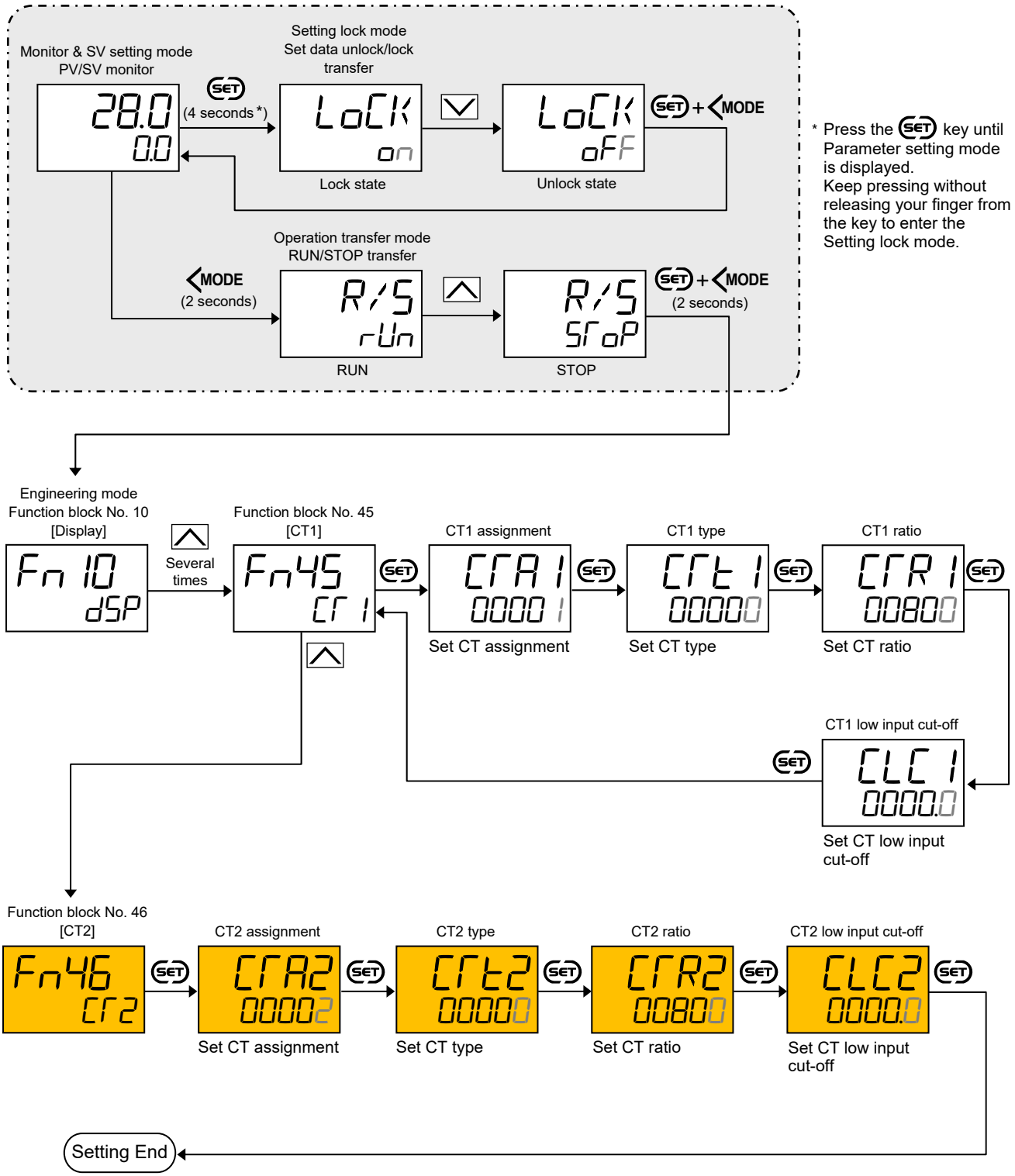
● CT2 assignment
[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CTA2	0: None 1: OUT1 2: OUT2 3: OUT3	Based on Model code

To display "CT2 assignment," "CT input" must be specified at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

■ Setting procedure

To enter the Engineering mode



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

7.2.4 Changing the Current transformer (CT) type

When a Current transformer (CT) type is changed, change the CT type on the instrument.

Input range of Current transformer (CT)

- CTL-6-P-N: 0 to 30 A
- CTL-12-S56-10L-N: 0 to 100A
- CTL-6-P-Z: 0 to 10 A

■ Parameter setting

● CT1 type [Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CT1	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code

📖 To display "CT1 type," "CT input" must be specified at the time of order.

📖 After "CT1 type" is changed, the value of "CT1 ratio" is initialized and set to an appropriate CT type.
CT ratio value
- CTL-6-P-N: 800
- CTL-12-S56-10L-N: 1000
- CTL-6-P-Z: 800

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the CT1 type is changed.

● CT1 ratio [Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CTR1	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000

📖 To display "CT1 ratio," "CT input" must be specified at the time of order.

● CT2 type
[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CT2	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code

To display "CT2 type," "CT input" must be specified at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

After "CT2 type" is changed, the value of "CT2 ratio" is initialized and set to an appropriate CT type.
CT ratio value
- CTL-6-P-N: 800
- CTL-12-S56-10L-N: 1000
- CTL-6-P-Z: 800

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the CT2 type is changed.

● CT2 ratio
[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CT2	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000

To display "CT2 ratio," "CT input" must be specified at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

■ Setting procedure

Refer to the operation on P. 7-32.

7.2.5 Forcing the CT input value to 0.0 A when the heater is OFF

If the Current transformer (CT) input value exceeds 0.0 A while the heater is off, the input value of the Current transformer (CT) can be forced to 0.0 A.

■ Description of function

● CT low input cut-off

The CT input value may exceed 0.0 A while the heater is OFF (control output is OFF). In such a case CT low input cut-off may be used. This is a function to force the CT input which is below the set value to 0.0 A.

Note that Heater break alarm (HBA) may nor work properly if setting such as follows is made when the CT low input cut-off function is used.

CT low input cut-off set value > Heater break alarm (HBA) set value

[Example] CT low input cut-off set value: 1.0 A and Heater break alarm (HBA) set value: 0.5 A

- If the CT input value is 0.8 A when the control output is ON, the CT input value becomes 0.0 A, causing the Heater break alarm (HBA) to turn on.
  → Actually the CT input value is larger than the HBA set value and the HBA is OFF.
- If the CT input value is 0.8 A when the control output is OFF, the CT input value becomes 0.0 A, causing the Heater break alarm (HBA) to turn off.
  → Actually the CT input value is larger than the HBA set value and the HBA is ON.

If current larger than the CT low input cut-off set value is given, HBA functions properly.

■ Parameter setting

● CT1 low input cut-off [Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CLC1	0.0 to 1.0 A	0.0

To display “CT1 low input cut-off,” “CT input” must be specified at the time of order.

● CT2 low input cut-off [Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CLC2	0.0 to 1.0 A	0.0

To display “CT2 low input cut-off,” “CT input” must be specified at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

■ Setting procedure

Refer to the operation on P. 7-32.

7.3 Using Control Loop Break Alarm (LBA)

■ Setting procedure for Control loop break alarm (LBA)

Set Control loop break alarm (LBA) as follows:

Set the parameter related to LBA output

Set the parameter related to LBA output.

- OUT1 to 3 function selection
- DO1 to 4 function selection
- OUT1 to 3 logic calculation selection
- DO1 to 4 logic calculation selection
- Energized/De-energized selection
- Interlock selection
- Output action at control stop

☞ For OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection and DO1 to 4 logic calculation selection, refer to **6.1 Changing Output Assignment (P. 6-2)**.

☞ For Energized/De-energized selection, refer to **6.5 Changing Energizing/De-energizing Output (P. 6-24)**.

☞ For Interlock function, refer to **7.5 Keeping the Event State (Interlock Function) (P. 7-42)** and **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

☞ For Output action at control stop, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 6-39)**.

Set LBA time and LBD

Set the following parameters:

- Control loop break alarm (LBA) time
- LBA deadband (LBD)

☞ For the parameter description, refer to ■ **Description of function (P. 7-37)**.

☞ For the data range of parameter, refer to ■ **Parameter setting (P. 7-38)**.

■ Description of function

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

[Alarm action]

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

● **Heating control**

		When the output reaches 0 % (low limit with output limit function)	When the output exceeds 100 % (high limit with output limit function)
LBA occurring condition	For reverse action	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.
	For direct action	When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.

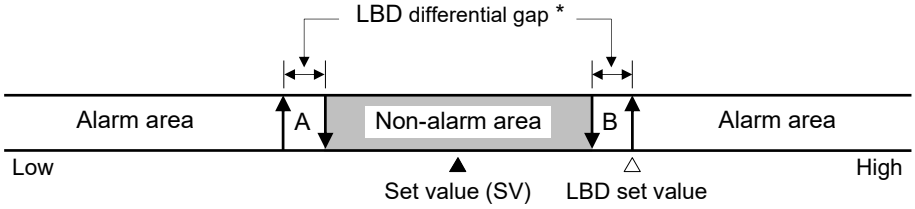
● **Heat/Cool control**

	When the heat-side output exceeds 100 % (high limit with heat-side output limit function) and the cool-side output reaches 0 % (A) *	When the heat-side output reaches 0 % and the cool-side output exceeds 100 % (high limit with cool-side output limit function) (B) *
LBA occurring condition	When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.

* If conditions of (A) and (B) are both met, priority is given to (A).

● LBA deadband (LBD)

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



* TC/RTD input: 0.8 °C [°F] (fixed)
Voltage/Current input: 0.8 % of input span (fixed)

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

LBA function is not available:
- when displaying Input type and Input range after turning ON the power.
- during Autotuning (AT).
- in the STOP mode.
- when Control loop break alarm (LBA) time is "0."
- when Feedback resistance (FBR) is not supplied on the Position proportioning PID control.

If the Control loop break alarm (LBA) setting time does not match the controlled object requirements, the Control loop break alarm (LBA) setting time should be lengthened. If setting time is not correct, the Control loop break alarm (LBA) will malfunction by turning on or off at inappropriate times or not turning on at all.

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

If the Autotuning (AT) is used, the Control loop break alarm (LBA) time is automatically set twice as large as the integral time. The Control loop break alarm (LBA) time will not change even if the integral time is changed. If the Control loop break alarm (LBA) time is "0" and Autotuning (AT) is executed, the Control loop break alarm (LBA) time will not be set.

If the Control loop break alarm (LBA) function detects an error occurring in the control loop, but cannot specify the location, the control loop should be checked. The Control loop break alarm (LBA) function does not detect the location which causes alarm status. If Control loop break alarm (LBA) is ON, check each device or wiring in the control loop.

■ Parameter setting

● Input 1_Control loop break alarm (LBA) time [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. LbA	0 to 7200 seconds 0: No function	Output assignment is entered in the initial setting code: • The assigned output has LBA output: 480 • The assigned output has no LBA output: 0 Output assignment is not entered in the initial setting code: 0

● Input 2_Control loop break alarm (LBA) time [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. LbA	0 to 7200 seconds 0: No function	Output assignment is entered in the initial setting code: • The assigned output has LBA output: 480 • The assigned output has no LBA output: 0 Output assignment is not entered in the initial setting code: 0

To display "Input 2_Control loop break alarm (LBA) time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_LBA deadband (LBD) [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

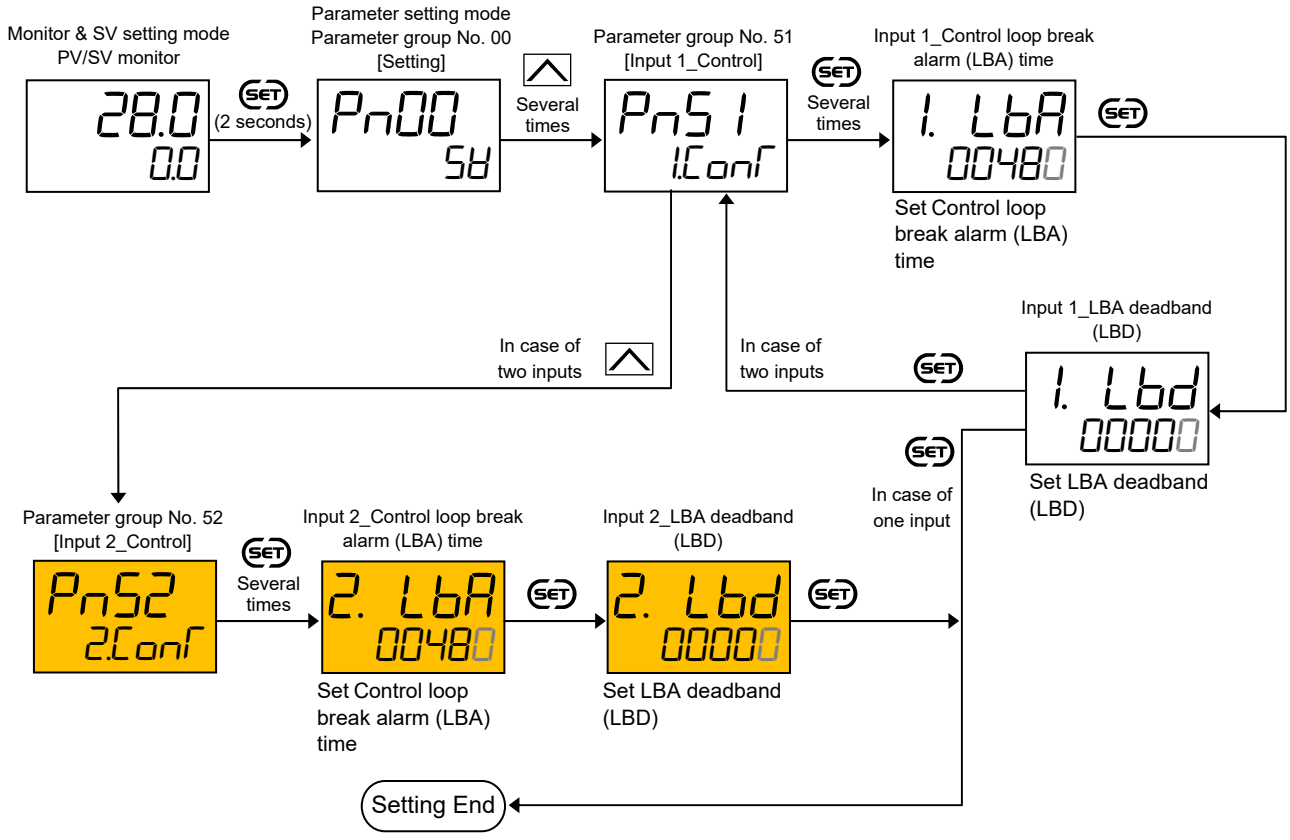
Parameter symbol	Data range	Factory set value
1. Lbd	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0

● Input 2_LBA deadband (LBD) [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. Lbd	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	0

To display "Input 2_LBA deadband (LBD)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

■ Setting procedure



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

7.4 Checking Event ON State

The event ON state can be checked with the ALM lamp or on the Comprehensive event state screen in the Monitor & SV setting mode.

■ Display contents

● ALM lamp

When the event is in the ON state, the ALM lamp turns on. However, the instrument has only one ALM lamp which is turned on using the *OR* relation of the related functions. Combination of the states can be freely available.
The setting can be done at ALM lamp lighting condition (Function block 10 in Engineering mode)

[Events that illuminate the lamp]

- Event 1
- Event 2
- Event 3
- Event 4
- Heater break alarm 1 (HBA1)
- Heater break alarm 2 (HBA2)
- Control loop break alarm 1 (LBA1)
- Control loop break alarm 2 (LBA2)
- Input 1_Input error high
- Input 1_Input error low
- Input 2_Input error high
- Input 2_Input error low

Display example

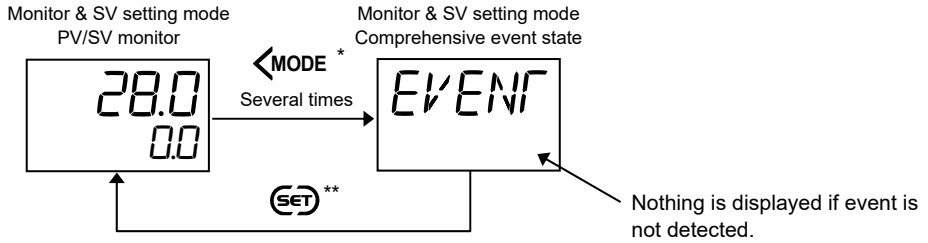
● ALM lamp lighting condition [Engineering Mode: Function block No. 10 (*Fn 10*)]

Parameter symbol	Data range	Factory set value
ALC	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255

● Comprehensive event state [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
EVENT	When an event occurs, the character of the occurring event is displayed on the Set value (SV) display unit. If two or more events occur at the same time, the relevant characters are displayed alternately every 0.5 seconds. EVT 1: Event 1 EVT2: Event 2 EVT3: Event 3 EVT4: Event 4 HbA 1: Heater break alarm 1 (HBA1) HbA2: Heater break alarm 2 (HBA2) LbA 1: Control loop break alarm 1 (LBA1) LbA2: Control loop break alarm 2 (LBA2) In 1.UP: Input 1_Input error high In 1.dn: Input 1_Input error low In2.UP: Input 2_Input error high In2.dn: Input 2_Input error low	—

■ Display operation



* In case of a FZ400/900, **MONI** key may be used instead.

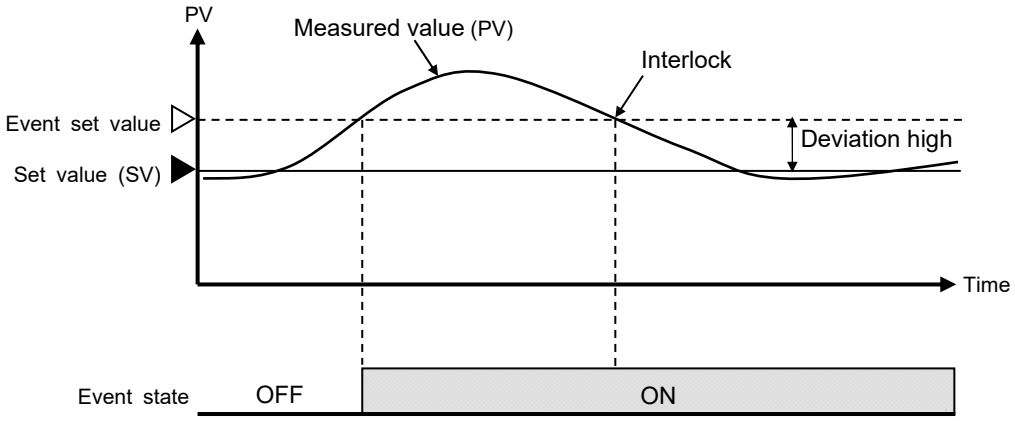
** In case of a FZ400/900, **R.SET** key may be used to return.

7.5 Keeping the Event State (Interlock Function)

■ Description of function

The Event interlock function holds the event state (including the HBA, the LBA and the input error) even if the Measured value (PV) is out of the event zone after it enters the event zone once.
Interlock can be set for the Event, Heater break alarm (HBA), Control loop break alarm (LBA) and Input error.

Example: When the Event interlock function is used for Deviation high



[Without Event hold action]

☞ For the interlock release, refer to **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

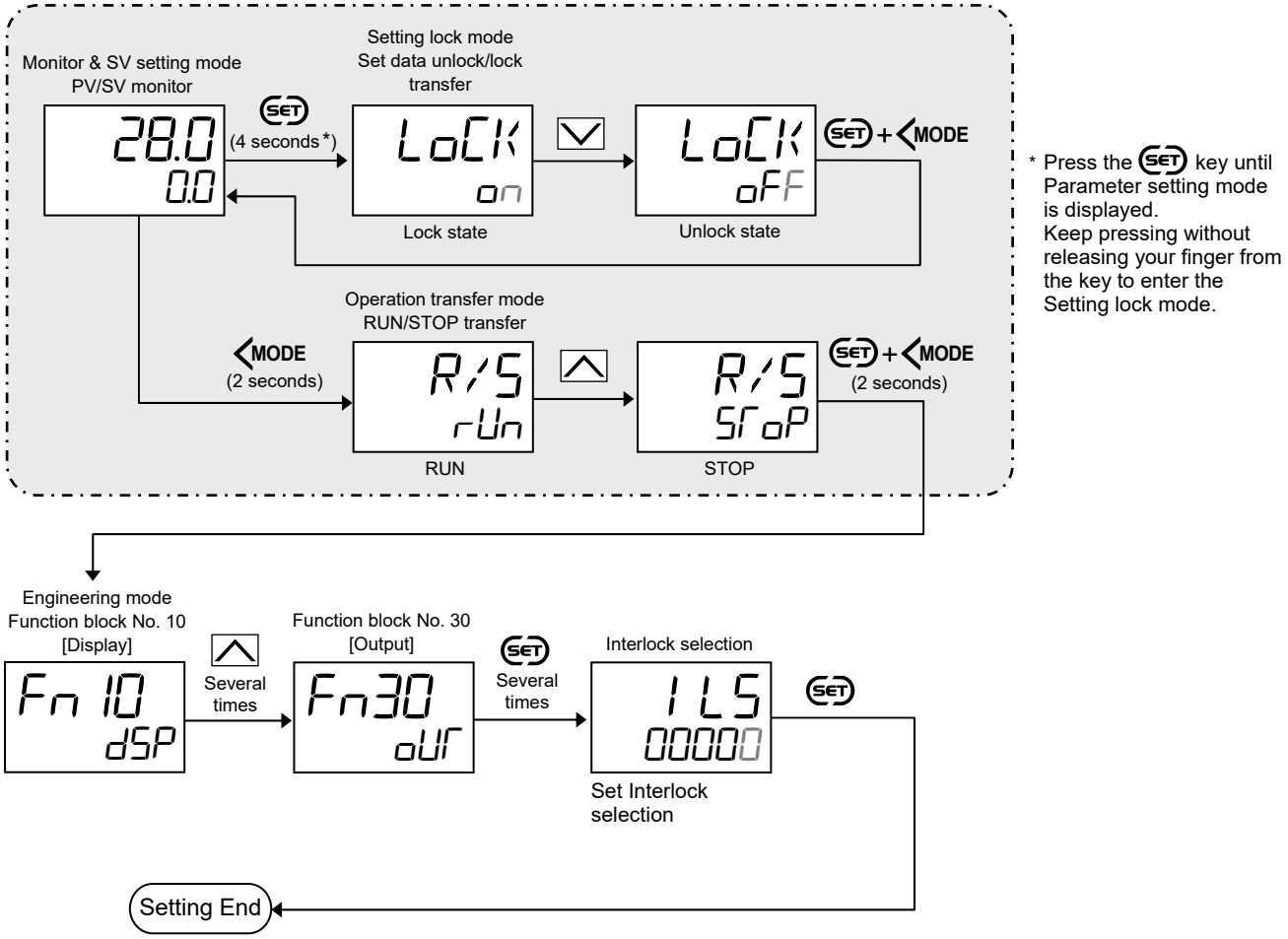
■ Parameter setting

● Interlock selection
[Engineering Mode: Function block No. 30 (*Fn30*)]

Parameter symbol	Data range	Factory set value
ILS	0 to 4095 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0

■ Setting procedure

To enter the Engineering mode



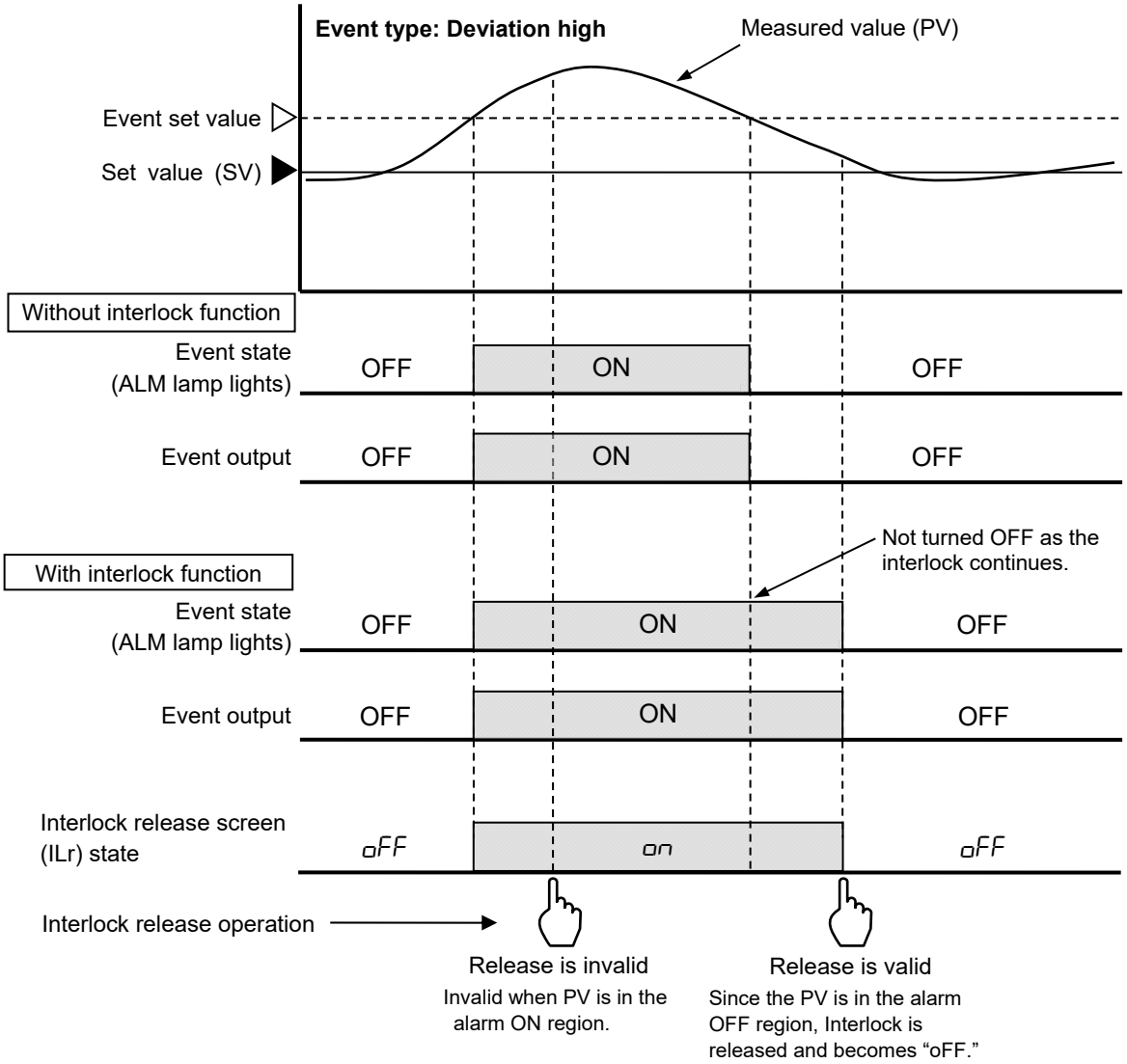
- Next parameter is displayed.
- Press and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set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

7.6 Releasing the Event State (Interlock Release)

■ Description of function

The Event interlock function holds the event state (including the HBA, the LBA and the input error) even if the Measured value (PV) is out of the event zone after it enters the event zone once.
The Interlock may be released by Digital input (DI) and Communication (optional) as well as key operation.

The following picture shows how to release the interlock.



📖 The Interlock release has an influence to all events, Heater break alarm (HBA), Control loop break alarm (LBA) and input error that are in the interlock state and releases such events at one time whose interlock release conditions are met.

☞ For Interlock release through Digital input (DI), refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

☞ For Interlock release through Communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host Communication] (IMR03A07-E□)**.

■ Parameter setting

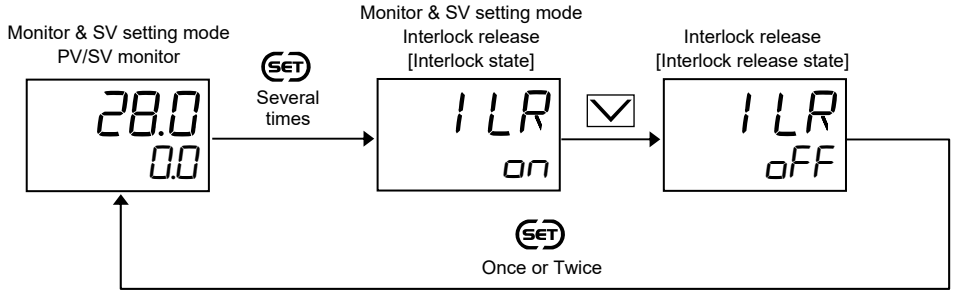
● Interlock release [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
ILR	oFF: Interlock release on: Interlock state	oFF

To display "Interlock release," the Interlock selection must be set (Function block No. 30 in Engineering mode) other than "Unused."

■ Setting procedure

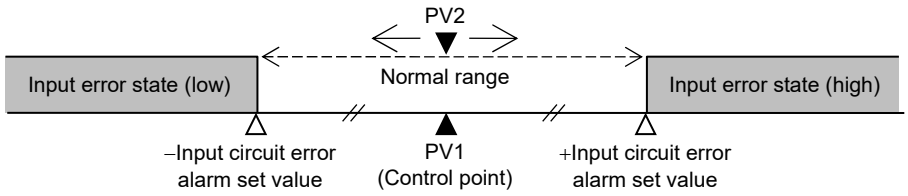
After the Interlock is set, the Interlock release screen shows "on" automatically.



7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900]

■ Description of function

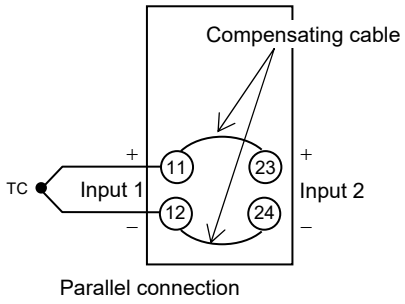
Input circuit error alarm uses two inputs (dual input function) and detects errors in the input circuit from the difference between two inputs. (FZ400/900 only)
When the difference between Input 1_Measured input (PV1) and Input 2_Measured input (PV2 – PV1) exceeds Input circuit error alarm set value, it is considered to be an input error and "Input error state" starts.



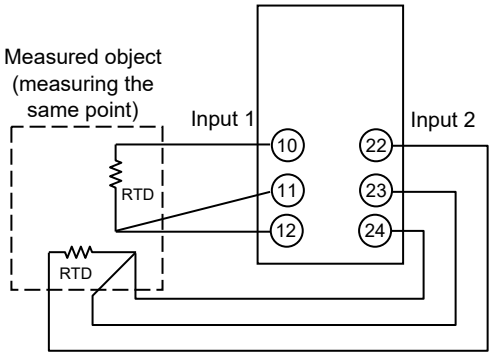
Determination of input errors
- (PV1+ Input circuit error alarm set value) < PV2 ⋯ Input error of Input 1 (high)
- (PV1– Input circuit error alarm set value) > PV2 ⋯ Input error of Input 1 (low)

[Wiring example]

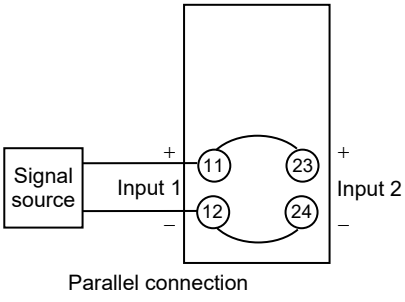
- TC input



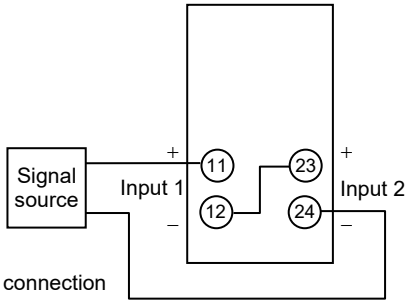
- RTD input



- Voltage input



- Current input



Different input type can be specified for Input 1 and Input 2. Note that action may be different on each input.

To output "Input 1_Input error high/low," output assignment must be set in advance. For details of output assignment, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.

Irrespective of Input circuit error alarm setting, "Input 1_Input error high/low" conducts normal Input error alarm action. For detailed operation at Input error action, refer to **5.7 Changing Error Handling at Input Error (P. 5-39)**.

Before using the Input circuit error alarm, check for errors in measured values between Input 1 and Input 2 which should be removed in advance using PV bias.

The Input circuit error alarm function uses two inputs, but control using Input 2 is not available. However, lighting the ALM lamp and providing state output from Digital output (DO) are possible.

■ Parameter setting

● Select function for input 2 [Engineering Mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To select "Input circuit error alarm" in "Select function for input 2," "Measured input 2" must be ordered.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Select function for input 2 is changed.

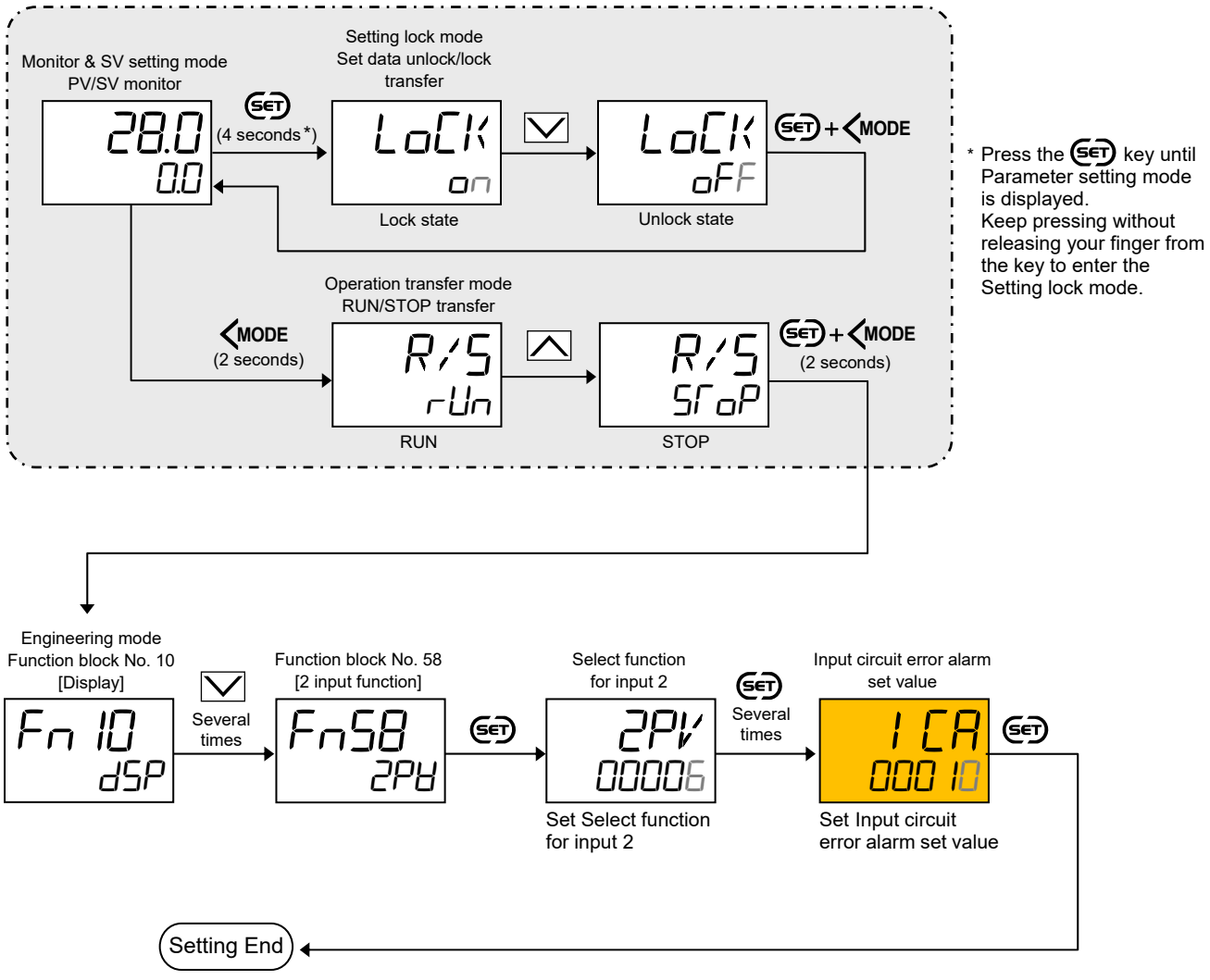
● Input circuit error alarm set value [Engineering Mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
1CA	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span

To display "Input circuit error alarm set value," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Input circuit error alarm.

■ Setting procedure

To enter the Engineering mode



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

8 CONTROL FUNCTION

This chapter describes control related functions, setting contents and setting procedure based on the key words related to controls.

8.1 Running/Stopping Control (RUN/STOP Transfer) 8-2
8.2 Changing Control Action 8-5
8.3 Setting PID Values Automatically (Autotuning) 8-11
8.4 Setting PID Values Automatically (Startup tuning) 8-18
8.5 Setting PID Values Manually 8-24
8.6 Controlling with ON/OFF Action 8-31
8.7 Controlling with Heat/Cool Control 8-36
8.8 Controlling with Position Proportioning Control 8-44
8.9 Controlling with Manual Control 8-56
8.10 Using Remote Setting Input 8-61
8.11 Executing 2-Loop Control [FZ400/900] 8-67
8.12 Executing Differential Temperature Control [FZ400/900] 8-70
8.13 Executing Control with PV Select [FZ400/900] 8-75
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8.15 Controlling with Level PID 8-98
8.16 Eliminating Offset Inherent to Proportioning Control (Manual Reset) 8-108
8.17 Continuing Stable Control after the Operation Transfer (SV Tracking) 8-110
8.18 Suppressing Overshoot 8-116
8.19 Changing the Action at Power ON (Hot/Cold Start) 8-124

8.1 Running/Stopping Control (RUN/STOP Transfer)

The RUN/STOP transfer can be made by Digital input (DI) or Communication (optional) other than the key operation.
The factory set value is RUN. As soon as the controller is powered on, control is started.

- **State of this instrument when set to STOP mode**

STOP display		Displays the STOP symbol "STOP" on the SV, PV or MV * displays. (Factory set value: SV displays) * FZ400/900 only
Control output	PID control	"Input 1_Manipulated output value at STOP [heat-side]" is output. (Factory set value: −5.0 %) "Input 2_Manipulated output value at STOP" * is output. (Factory set value: −5.0 %) * In the case of 2-loop control/Differential temperature control
	Heat/Cool PID control	Heat-side: "Input 1_Manipulated output value at STOP [heat-side]" is output. (Factory set value: −5.0 %) Cool-side: "Input 1_Manipulated output value at STOP [cool-side]" is output. (Factory set value: −5.0 %)
	Position proportioning PID control	Conform to the set value of the Valve action at STOP. When there is Feedback resistance (FBR) input: "Input 1_Manipulated output value at STOP [heat-side]" is output.
Logic calculation output		According to the setting contents of Output action at STOP (Factory set value: OFF)
Retransmission output		
Instrument status output		
Autotuning or Startup tuning		AT canceled (PID constants are not updated.)

☞ For STOP display selection, refer to **9.4 Changing the Display Position of STOP during the Control Stop (P. 9-20)**.

☞ For Action selection at STOP mode, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 10-46)**.

- **State of this instrument when set to RUN mode**

Operation when transferred to RUN from STOP is in accordance with the Hot/Cold start selection setting.

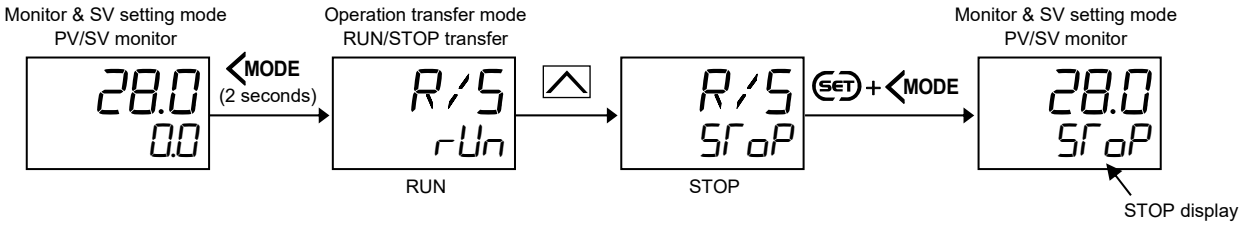
☞ For the Hot/Cold start, refer to **8.19 Changing the Action at Power ON (Hot/Cold Start) (P. 8-124)**.

☞ For the details of the RUN/STOP switching by communication (optional), refer to the **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)**.

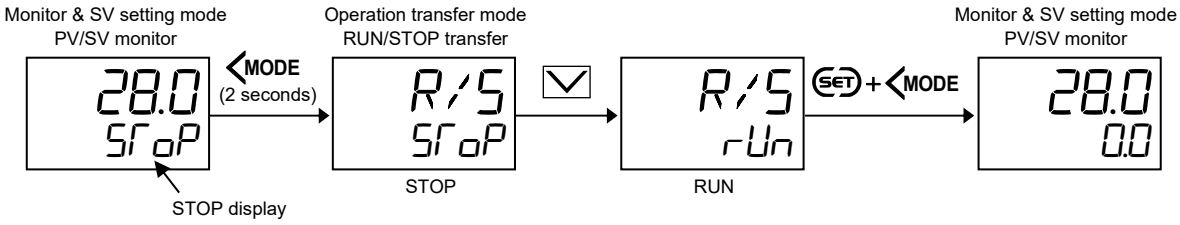
■ Setting procedure

● Selection by front key operation

Changing the mode from RUN to STOP



Changing the mode from STOP to RUN

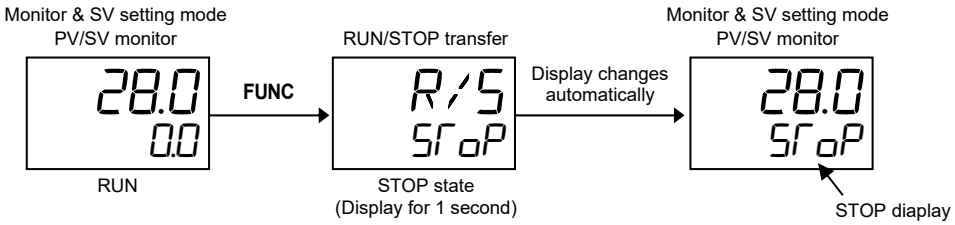


● Changing the mode with the direct key (FZ400/900 only)

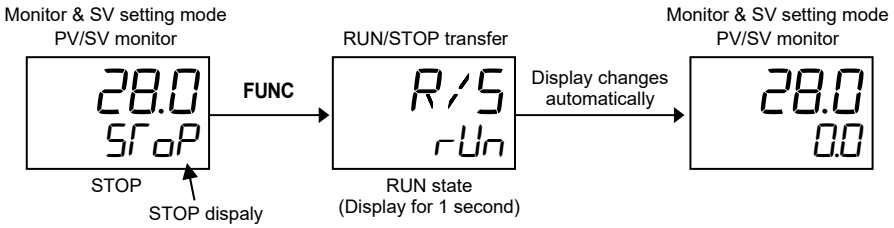
Assigning the "RUN/STOP transfer" function to the FUNC key facilitates the RUN/STOP switching. RUN/STOP transfer function is assigned to the FUNC key at the time of shipment for immediate use. Each time FUNC key is pressed, RUN and STOP are toggled.

☞ For the "FUNC key assignment," refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

Changing the mode from RUN to STOP



Changing the mode from STOP to RUN



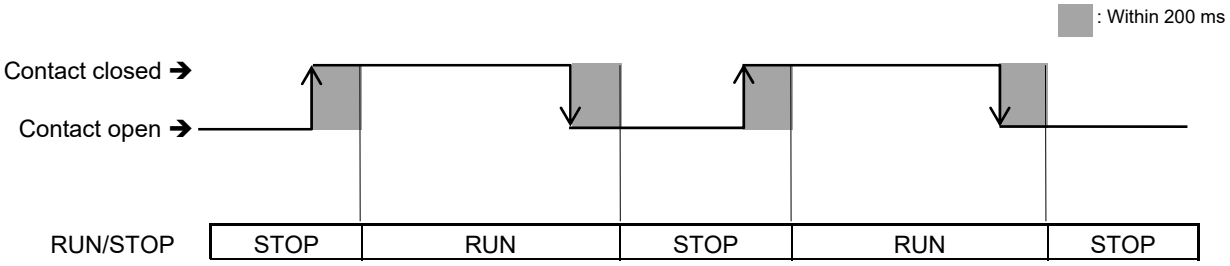
Selection of key action is possible from "Press once" and "Press and hold" to enable the switching. For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the RUN/STOP using the Digital Input (DI), use "DI function selection" (Function block No. 23 in the Engineering mode).

☞ For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of RUN/STOP



NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at "DI logic invert." For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● RUN/STOP transfer state

The table below shows the actual RUN/STOP modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	STOP display	
RUN	RUN	RUN	—	
	STOP	STOP	dSTP	
STOP	RUN		EXTP	Priority to STOP
	STOP		STOP *	

* The instrument without RUN/STOP switching by DI will have the same display.

STOP character display

Monitor & SV setting mode
PV/SV monitor

STOP with the key
(No RUN/STOP transfer by DI)

Monitor & SV setting mode
PV/SV monitor

STOP with the key
RUN/STOP transfer by DI: RUN

Monitor & SV setting mode
PV/SV monitor

STOP with the DI
RUN/STOP transfer by key: RUN

The display position of STOP can be changed. For details, refer to **9.4 Changing the Display Position of STOP during the Control Stop (P. 9-20)**.

8.2 Changing Control Action

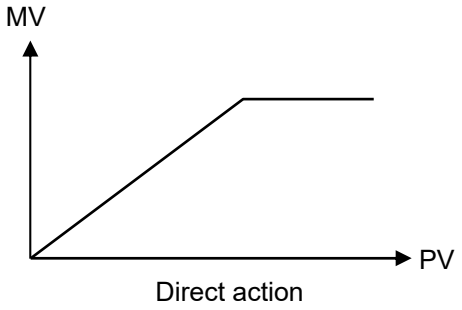
Refer to the following 8 types of control action:

- PID control (direct action)
- PID control (reverse action)
- ON/OFF action
- Heat/Cool PID control (water cooling)
- Heat/Cool PID control (air cooling)
- Heat/Cool PID control (Cooling linear type)
- Position proportioning PID control (direct action)
- Position proportioning PID control (reverse action)

When the control mode is set to Cascade control which uses two measured inputs, the selectable control action is limited to "PID control (direct action)," "PID control (reverse action)," or "ON/OFF action."

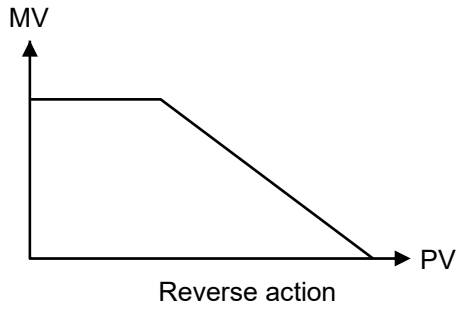
■ PID control (direct action)

The Manipulated output value (MV) increases as the Measured value (PV) increases.
This action is used generally for cooling control.



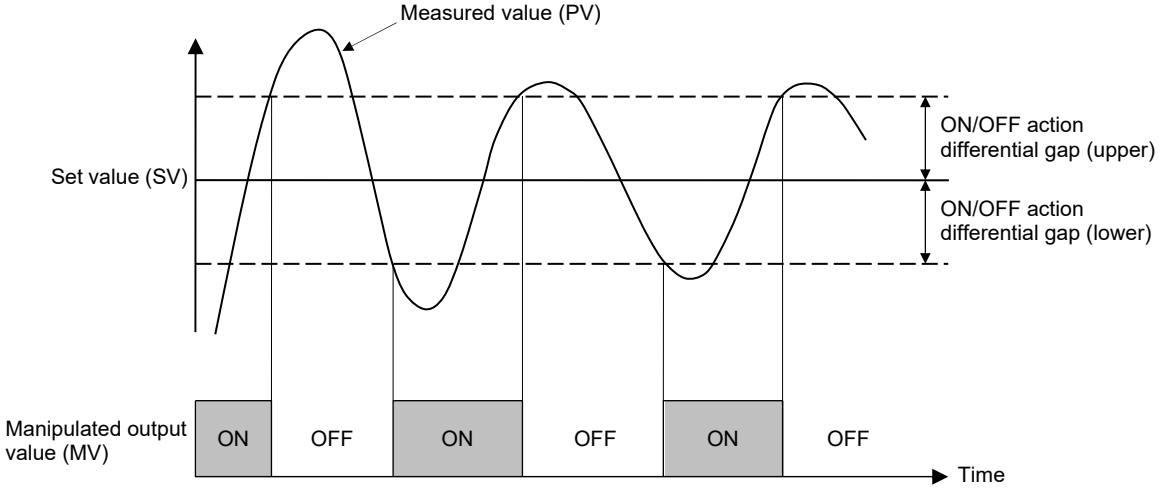
■ PID control (reverse action)

The Manipulated output value (MV) decreases as the Measured value (PV) increases.
This action is used generally for heating control.



■ ON/OFF action

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



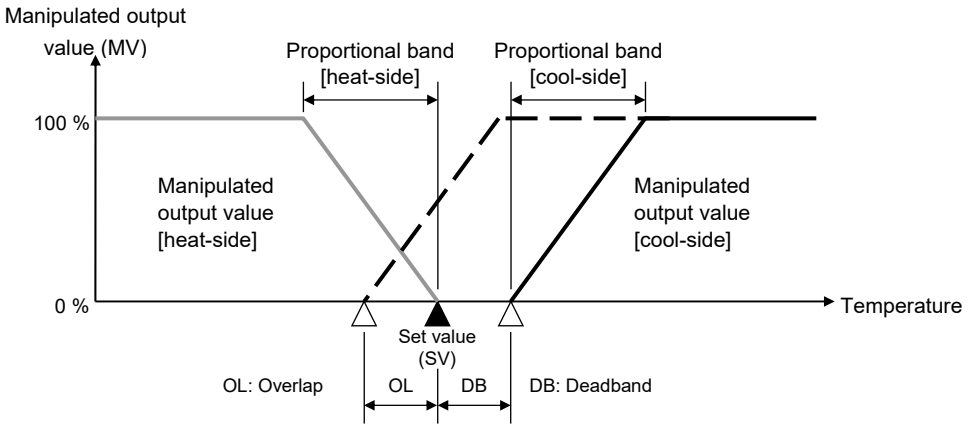
For ON/OFF action, refer to **8.6 Controlling with ON/OFF Action (P. 8-31)**.

■ Heat/Cool PID control

In Heat/Cool control, heating and cooling control can be achieved with a single controller.

Water cooling/Air cooling: The algorithm intended for Heat/Cool control on the plastic extruders is employed. Even in equipment provided with a cooling mechanism having nonlinear characteristics, it responds quickly to attain the characteristic responding to the set value with small overshooting.

Cooling linear type: The algorithm intended for applications without nonlinear cooling capability is employed.

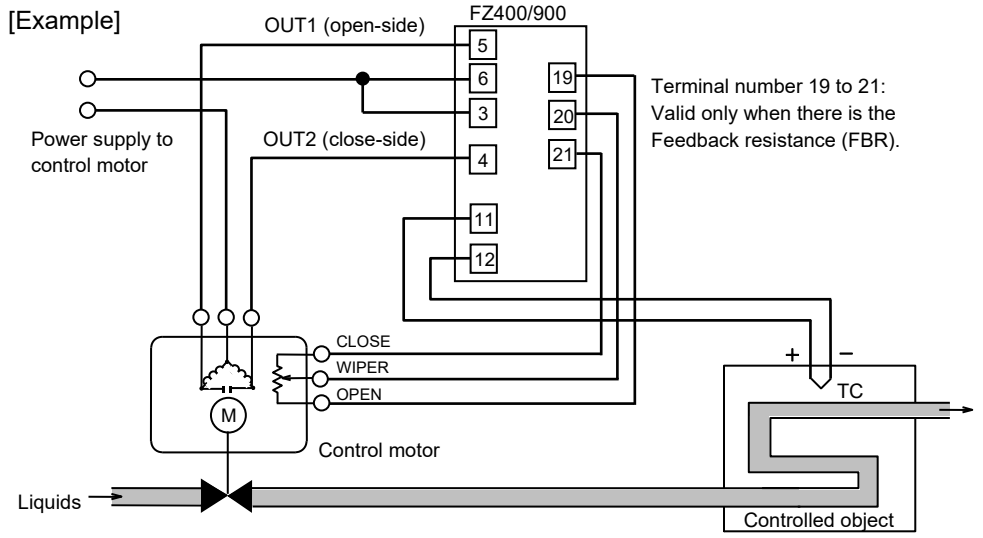


☞ For Heat/Cool PID control, refer to **8.7 Controlling with Heat/Cool Control (P. 8-36)**.

■ Position proportioning PID control

Position proportioning PID control converts the control output value of the controller into the corresponding signal to control a motor driven valve (control motor) and then performs temperature control of a controlled object by regulating fluid flow.

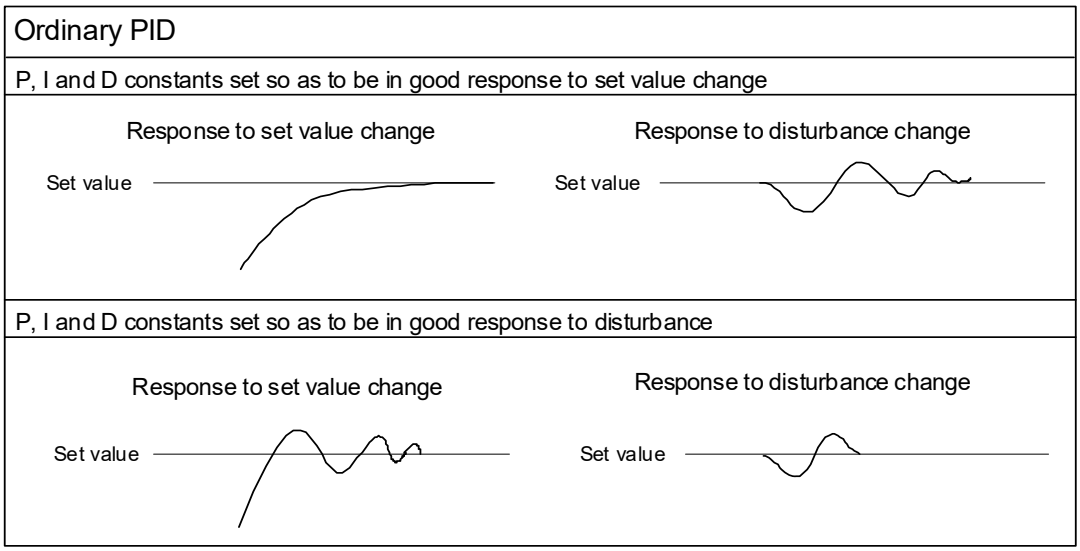
In Position proportioning PID control of this controller, it is possible to select the presence or absence of Feedback resistance (FBR) input which monitors the degree of valve position (Specify when ordering). In addition, the direct action or reverse action can be selected.

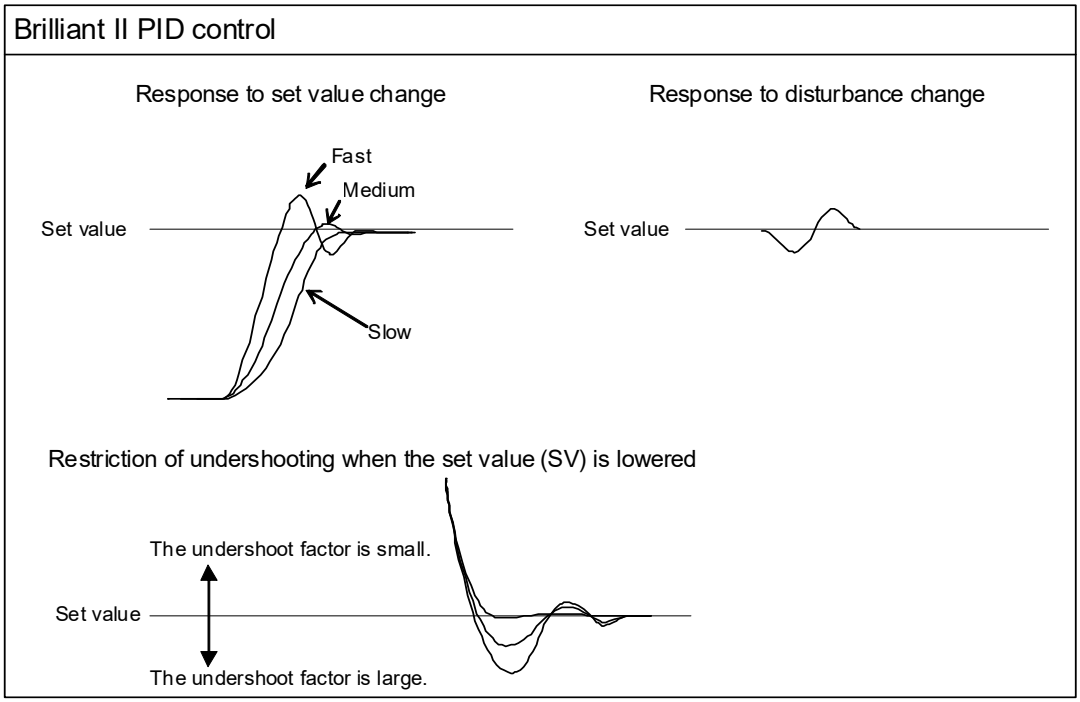


☞ For Position proportioning PID control, refer to **8.8 Controlling with Position Proportioning Control (P. 8-44)**.

■ Brilliant II PID control

PID control is a control method of achieving stabilized control result by setting P (Proportional band), I (Integral time) and D (Derivative time) constants, and is widely used. However, with this PID control, if P, I and D values are set to focus on "better response to control set value change," "response to external disturbance" deteriorates. In contrast, if PID values are set to focus on "better response to external disturbance," "response to control set value change" deteriorates. In brilliant II PID control a form of "Response to setting" can be selected from among **Fast**, **Medium** and **Slow** with PID constants remaining unchanged so as to be in good "Response to disturbances." In addition, the controller is provided with the function which restricts the amount of undershooting caused by the cooling nonlinear characteristic possessed by plastic molding machines when the Set value (SV) is lowered in Heat/Cool PID control.





■ Parameter setting

● Input 1_Control action [Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. oS	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Input 1_Control action is changed.

● Input 2_Control action [Engineering Mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. oS	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action)	Same as Input 1_Control action

📖 To display "Input 2_Control action," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Input 2_Control action is changed.

● Input 1_Control response parameter [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. RPr	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

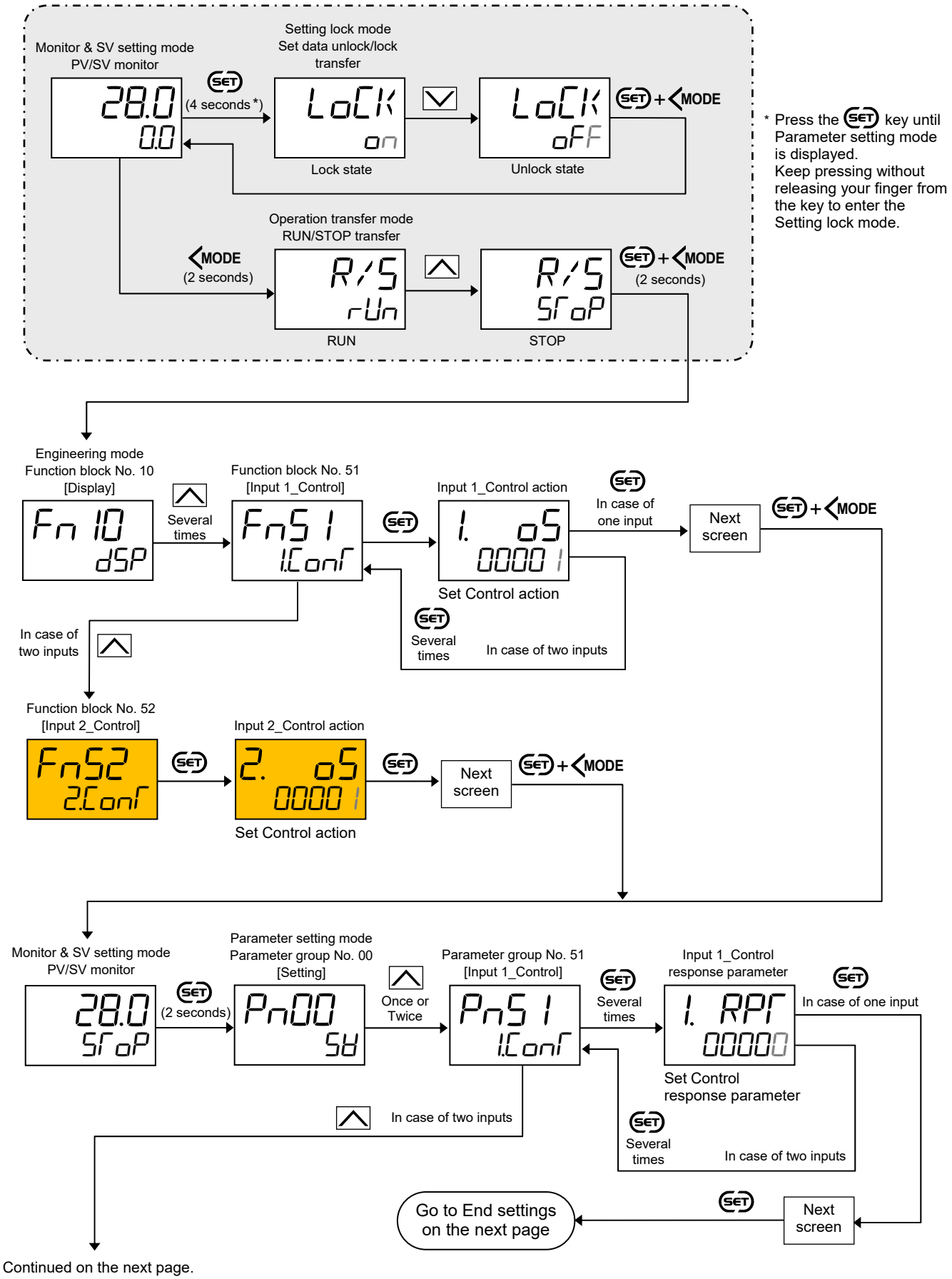
● Input 2_Control response parameter [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. RPr	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0

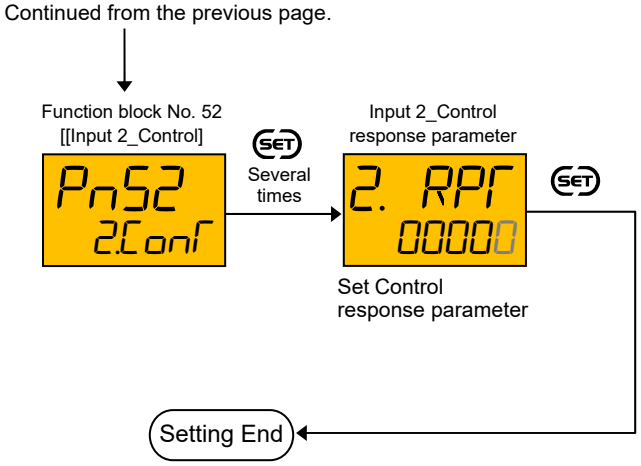
📖 To display "Input 2_Control response parameter," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

■ Setting procedure

To enter the Engineering mode



Continued from the previous page.



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

8.3 Setting PID Values Automatically (Autotuning)

The Autotuning (AT) automatically measures, computes and sets the optimum PID values. The Autotuning (AT) can be used for PID control (Direct action/Reverse action) and Heat/Cool PID control.

☞ For the details of Autotuning (AT) during the Cascade control, refer to **8.14 Executing Cascade Control [FZ400/900] (P. 8-84)**.

■ Description of function

● Parameters computed by Input 1_Autotuning (AT)

- Input 1_Proportional band [heat-side]
- Input 1_Integral time [heat-side]
- Input 1_Derivative time [heat-side]
- Input 1_Proportional band [cool-side] (Only for Heat/Cool PID control)
- Input 1_Integral time [cool-side] (Only for Heat/Cool PID control)
- Input 1_Derivative time [cool-side] (Only for Heat/Cool PID control)
- Input 1_Control loop break alarm (LBA) time * (The LBA time is automatically set to twice the value of the Integral time)

* When the Control break alarm (LBA) time is set to 0, the time will not be automatically obtained through the AT.

● Parameters computed by Input 2_Autotuning (AT)

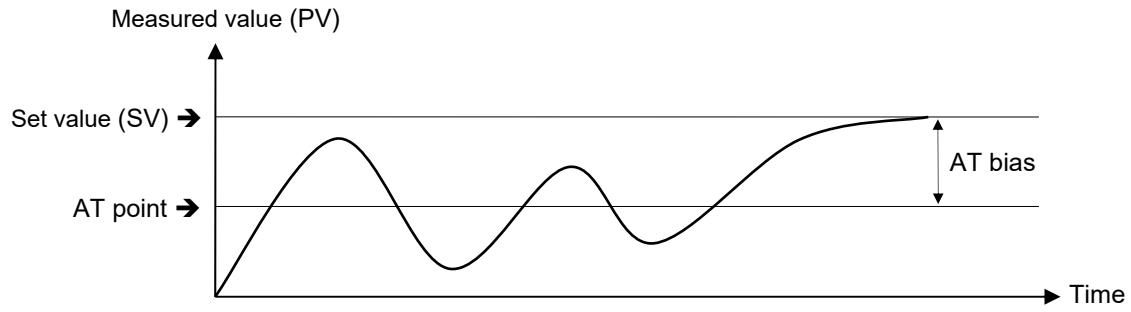
- Input 2_Proportional band
- Input 2_Integral time
- Input 2_Derivative time
- Input 2_Control loop break alarm (LBA) time * (The LBA time is automatically set to twice the value of the Integral time)

* When the Control break alarm (LBA) time is set to 0, the time will not be automatically obtained through the AT.

● AT bias

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

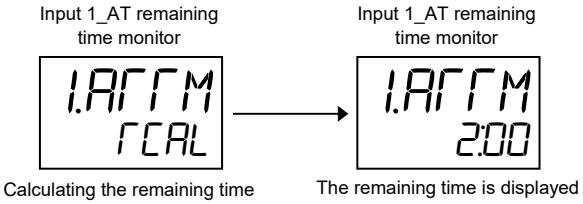
[Example] When AT bias is set to the minus (–) side.



● AT remaining time monitor

Displays the remaining time until the Autotuning (AT) is completed.
(Display range: 0 hours 00 minutes to 48 hours 00 minutes)
The SV display shows "rCAL" from the start of Autotuning (AT) till the display of the remaining time. Once the remaining time is displayed, the time is reduced every minute.

[Example]



The "AT remaining time monitor" is a predictive value and may not be accurate.

● AT/ST status monitor

Displays the execution status of the Autotuning (AT).
- Displays "1" during the Autotuning (AT).
- Displays "0" when the Autotuning (AT) is completed.
- When the Autotuning (AT) is aborted, the display shows −1 up to −4 depending on the reason of the abort.

−1: Aborted. Setting changed.
- When the set value (SV) is changed.
- When the AT bias is changed.
- When the PV bias, PV ratio, or PV digital filter is changed.
- When the Output limiter high or low is changed.
- When the Autotuning (AT) is changed to PID control.
- When the instrument is switched to STOP by RUN/STOP transfer.
- When the instrument is switched to Manual mode using Auto/Manual transfer.
- When the instrument is switched to Remote mode using Remote/Local transfer.
- When the instrument is switched to Cascade/Single.
- When the memory area is changed.

−2: Aborted. Abnormal input.
- When the Measured value (PV) has entered the Input error range.
  [Input error range: Input error determination point high ≥ Measured value (PV),
  Input error determination point low ≤ Measured value (PV)]
- When the Feedback resistance (FBR) input is breaked

−3: Aborted. Timeout.
Output state has not been changed (ON to OFF, OFF to ON) for more than two hours.

−4: Aborted. Abnormal calculated values.
Error in the calculation of the values in Cascade control and Control with PV select.

● Caution for using the Autotuning (AT)

- When a temperature change (UP and/or Down) is 1 °C or less per minute during the Autotuning (AT), the Autotuning (AT) may not be finished normally. In that case, adjust the PID values manually. Manual setting of PID values may also be necessary if the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.
- When the Output change rate limiter is used, you may not be able to obtain appropriate PID constants by Autotuning (AT).

For the manual setting of PID values, refer to **8.5 Setting PID Values Manually (P. 8-24)**.

● Requirements for Autotuning (AT) start

Start the Autotuning (AT) when all following conditions are satisfied:
To start Autotuning (AT), go to Operation transfer mode.

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

● Requirements for Autotuning (AT) cancellation

The Autotuning (AT) is immediately aborted and PID control starts when an error is detected in “AT/ST status monitor.” The PID values will be the same as before the Autotuning (AT) was activated.

☞ For details, refer to “AT/ST status monitor” on the previous page.

The Autotuning (AT) may be aborted in the following cases except for the conditions in “AT/ST status monitor.”

- When the instrument is in FAIL state.
- When the power supply is disconnected.

■ Parameter setting

● Input 1_Autotunning (AT) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. AT U	oFF: PID control on: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "oFF."	oFF

● Input 2_Autotunning (AT) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. AT U	oFF: PID control on: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "oFF."	oFF

To display "Input 2_Autotunning (AT)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT bias [Setup Setting Mode: Setting group No. 53 (Sn53)]

Parameter symbol	Data range	Factory set value
1. AT b	−(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: −(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0

● Input 1_AT bias [Setup Setting Mode: Setting group No. 54 (Sn54)]

Parameter symbol	Data range	Factory set value
2. AT b	−(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0

To display "Input 2_AT bias," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT remaining time monitor [Setup Setting Mode: Setting group No. 53 (Sn53)]

Parameter symbol	Data range	Factory set value
1.ATTM	0 hours 00 minutes to 48 hours 00 minutes	—

● Input 2_AT remaining time monitor [Setup Setting Mode: Setting group No. 54 (5n54)]

Parameter symbol	Data range	Factory set value
2.ATTM	0 hours 00 minutes to 48 hours 00 minutes	—

To display "Input 2_AT remaining time monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT/ST status monitor [Setup Setting Mode: Setting group No. 53 (5n53)]

Parameter symbol	Data range	Factory set value
1.TUNE	0: AT/ST complete 1: AT running now 2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—

● Input 2_AT/ST status monitor [Setup Setting Mode: Setting group No. 54 (5n54)]

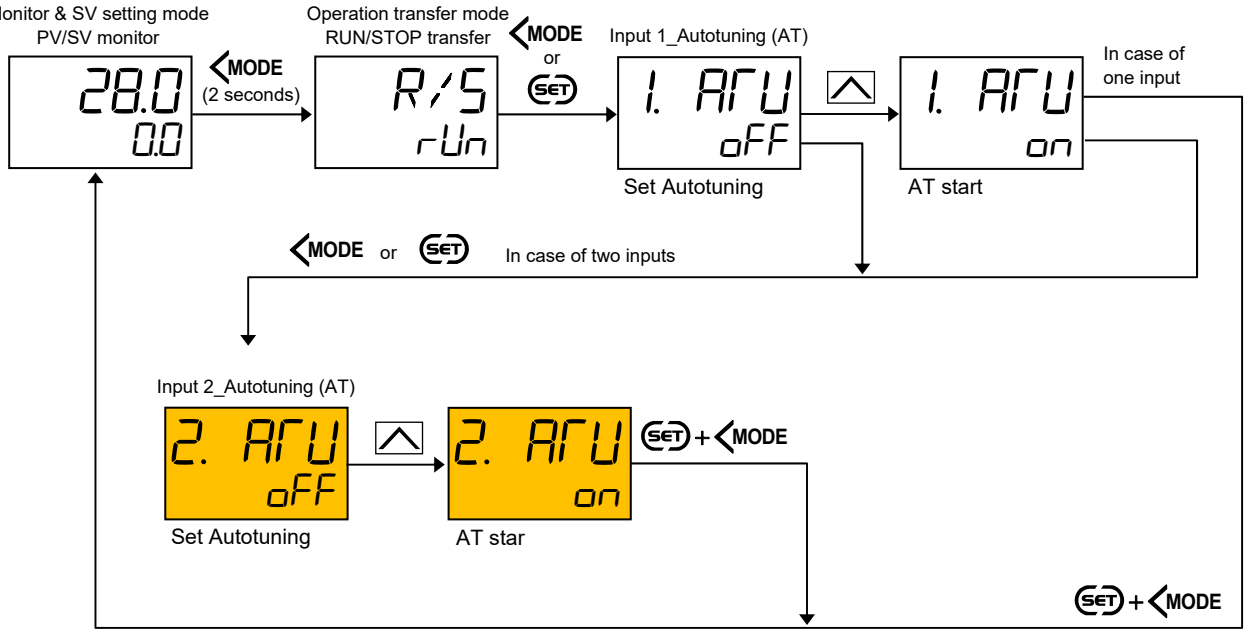
Parameter symbol	Data range	Factory set value
2.TUNE	0: AT/ST complete 1: AT running now 2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—

To display "Input 2_AT/ST status monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

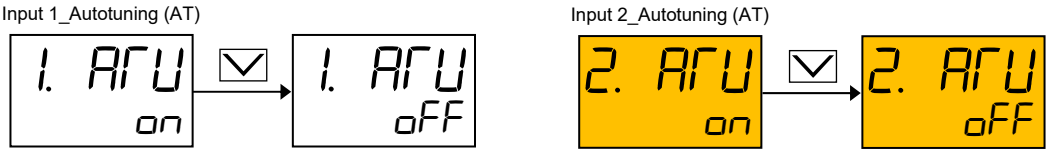
■ Setting procedure

● Start the Autotuning (AT)

Before starting the AT, refer to ●**Requirements for Autotuning (AT) start (P. 8-13)**. Make sure that all required conditions to start the AT are satisfied.



Aborting the Autotuning (AT)



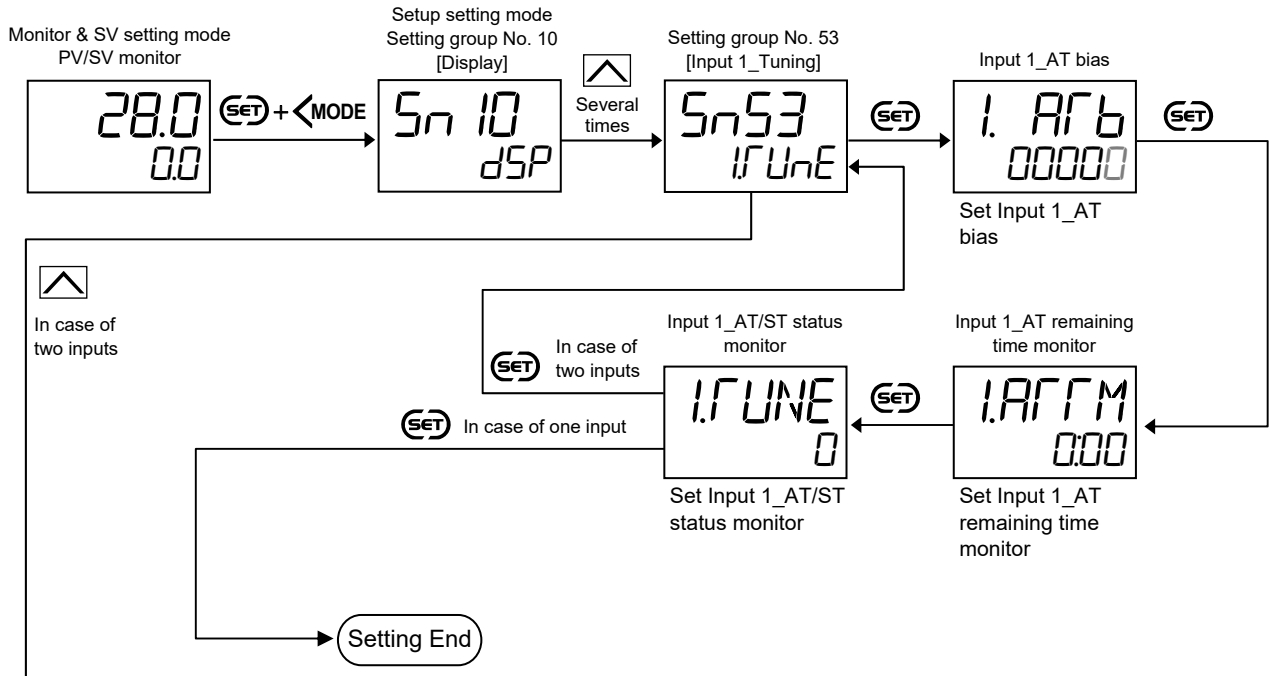
During the Autotuning (AT), the AT lamp blinks.

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

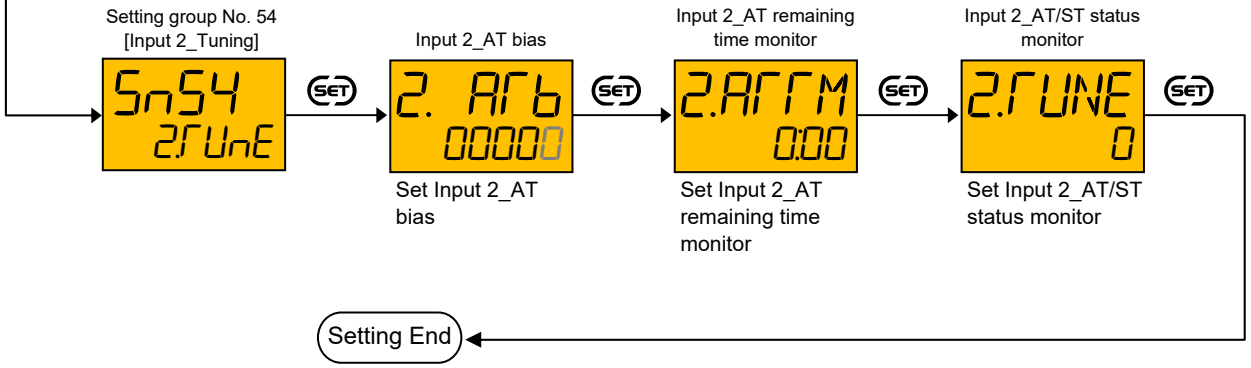
The Autotuning (AT) can be started by Digital input (DI). Refer to "**5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**" for more information on assigning Digital input (DI).

The Autotuning (AT) can be started on FZ400/900 by a key operation of the direct key (FUNC key). For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

● Setting AT bias. Check the AT remaining time and AT/ST status.



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



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

8.4 Setting PID Values Automatically (Startup tuning)

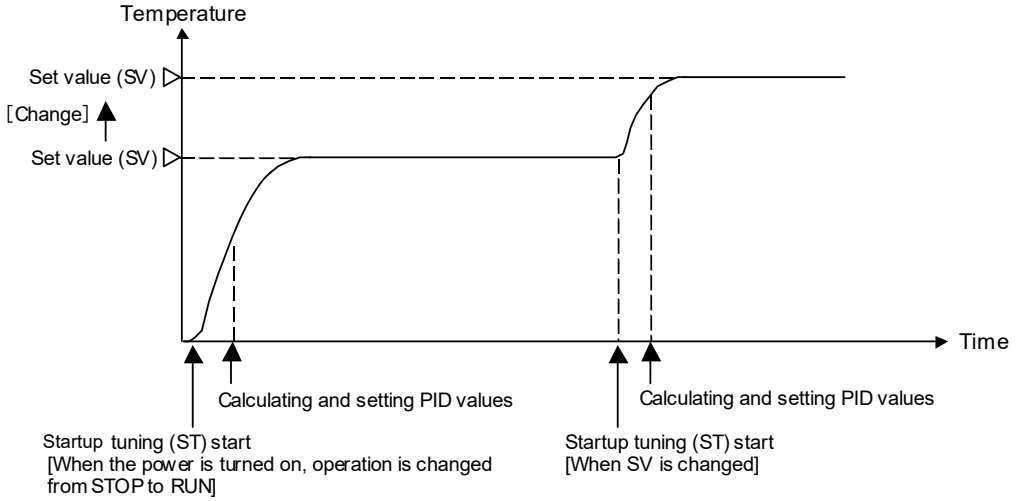
Startup tuning (ST) is a function which automatically computes and sets the PID values (Proportional band: heat-side only) and Control loop break alarm (LBA) time from the response characteristics of the controlled system at power ON, transfer from STOP to RUN, and Set value (SV) change.

■ Description of function

- As simple autotuning, the PID values can be obtained in a short time without disturbing controllability for controlled systems with slow response at power ON. At the same time, Control loop break alarm (LBA) time * is calculated (about twice of the Integral time).

  * When the Control break alarm (LBA) time is set to 0, the time will not be automatically obtained through the ST.

- For controlled systems which require different PID values for each temperature setting, the PID values can be obtained for each Set value (SV) change.



- The setting items related to the Startup tuning (ST) are shown below. Set them according to the application used.

Setting item	Details		Setting mode
Start condition	0 (Factory set value)	When the power is turned on, operation is changed from STOP to RUN, or the Set value (SV) is changed.	Engineering mode
	1	When the power is turned on or operation is changed from STOP to RUN.	
	2	When the Set value (SV) is changed.	
Execution method	oFF (Factory set value)	ST unused	Operation transfer mode
	on1	Execute once	
	on2	Execute always	

When the Startup tuning (ST) function is activated in Heat/Cool PID control, only heat-side PID values are calculated and changed. The Startup tuning (ST) is not available when the temperature is downward. (PID values for cooling cannot be calculated)

The Startup tuning (ST) is not available in case of Position proportioning PID control.

If the Startup tuning (ST) is started when the ST start condition is at power on or switching from STOP to RUN, the control will start with Hot start 2 even if the setting is Hot start 1. For Hot/Cold start setting, refer to **8.19 Changing the Action at Power ON (Hot/Cold Start) (P. 8-124)**.

● AT/ST status monitor

Displays the execution status of the Startup tuning (ST).

- Displays "2" during the Startup tuning (ST).
- Displays "0" when the Startup tuning (ST) is completed.
- When the Startup tuning (ST) is aborted, the display shows −1 up to −4 depending on the reason of the abort.

−1: Aborted. Setting changed.

- ・When the Startup tuning (ST) is disabled (□FF: ST unused).
- ・When the PV bias, PV ratio, or PV digital filter is changed.
- ・When the Output limiter high or low is changed.
- ・When the instrument is switched to STOP by RUN/STOP transfer.
- ・When the instrument is switched to Manual mode using Auto/Manual transfer.
- ・When the instrument is switched to Remote mode using Remote/Local transfer.
- ・When the setting of the Level PID action selection is "2: Switching by the Measured value (PV)."

−2: Aborted. Abnormal input.

When the Measured value (PV) has entered the Input error range.

[Input error range: Input error determination point high ≥ Measured value (PV),
Input error determination point low ≤ Measured value (PV)]

−3: Aborted. Timeout.

When the Startup tuning (ST) will not end approximately 100 minutes after it has been started.

−4: Aborted. Abnormal calculated values.

- ・When the input was switched by Control with PV select.
- ・Internal error of the Startup tuning (ST), etc.

● Caution for using the Startup tuning (ST)

- For the Startup tuning (ST) at power ON or transfer from STOP to RUN, always set the heater power to ON simultaneously with the start of tuning or before the start of tuning.
- Start the Startup tuning (ST) in the state in which the temperature differential between the Measured value (PV) and the Set value (SV) at the start of the Startup tuning (ST) is twice the Proportional band, or greater.
- If in the Heat/Cool PID control, start activating the Startup tuning (ST) function under the condition of "Set value (SV) > Measured value (PV)." Only the PID values on the heat-side are automatically calculated but no PID values on the cool-side are changed. The PID values on the cooling side can be obtained by the Autotuning (AT).
- When the Manipulated output value may be limited by the Output limiter setting, the optimum PID values may not be calculated by the Startup tuning (ST).
- When setting the Output change rate limiter, the optimum PID values may not be computed by Startup tuning (ST).
- When setting the Setting change rate limiter, the optimum PID values are not obtained even when Startup tuning (ST) is executed at Set value (SV) change.
- When the Startup tuning (ST) is started at power on, priority is given to the Startup tuning (ST) and the Proactive function will not start.

● Requirements for Startup tuning (ST) start

Start the Startup tuning (ST) when all following conditions are satisfied:

Operation state	RUN/STOP transfer	RUN
	Auto/Manual transfer	Auto mode
	Remote/Local transfer	Local mode
	Autotuning (AT) setting	PID control
Parameter setting	Startup tuning (ST) is set to ON (Execute once, Execute always)	
	Output limiter high ≥ 0.1 %, Output limiter low ≤ 99.9 % [Heat/Cool PID control type: Output limiter high (heat-side) ≥ 0.1 %]	
	The Level PID action selection is done by other than "Switching by the Measured value (PV)."	
Input value state	The Measured value (PV) is not underscale or over-scale.	
	Input error determination point (high) ≥ Input value ≥ Input error determination point (low)	
	At Startup tuning (ST) at Set value (SV) change, the Measured value (PV) shall be stabilized.	
	Set value (SV) > Measured value (PV) [Heat/Cool PID control]	
Output value state	At startup, output is changed and saturated at the Output limiter high or the Output limiter low [Heat/Cool PID control type: Output limiter high (heat-side)].	

● Requirements for Startup tuning (ST) cancellation

The Startup tuning (ST) will be immediately aborted if any in the cancel condition in the AT/ST status monitor is met. The PID values will be the same as before the Startup tuning (ST) was activated.

☞ For details, refer to "AT/ST status monitor" on the previous page.

The Startup tuning (ST) may be aborted in the following cases except for the conditions in "AT/ST status monitor."

- Autotuning (AT) has been started.
- When the instrument is in FAIL state.
- When the power supply is disconnected.

■ Parameter setting

● Input 1_Startup tuning (ST) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. STU	oFF: ST unused on 1: Execute once * on2 Execute always * When the ST is finished, the control will automatically return to "oFF."	oFF

📖 To display "Input 1_Startup tuning (ST)," you need to specify the control type other than "Position proportioning PID control" at the time of order.

● Input 2_Startup tuning (ST) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. STU	oFF: ST unused on 1: Execute once * on2 Execute always * When the ST is finished, the control will automatically return to "oFF."	oFF

To display "Input 2_Startup tuning (ST)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT/ST status monitor [Setup Setting Mode: Setting group No. 53 (Sn53)]

Parameter symbol	Data range	Factory set value
1.TUNE	0: AT/ST complete 1: AT running now 2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—

● Input 2_AT/ST status monitor [Setup Setting Mode: Setting group No. 54 (Sn54)]

Parameter symbol	Data range	Factory set value
2.TUNE	0: AT/ST complete 1: AT running now 2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—

To display "Input 2_AT/ST status monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

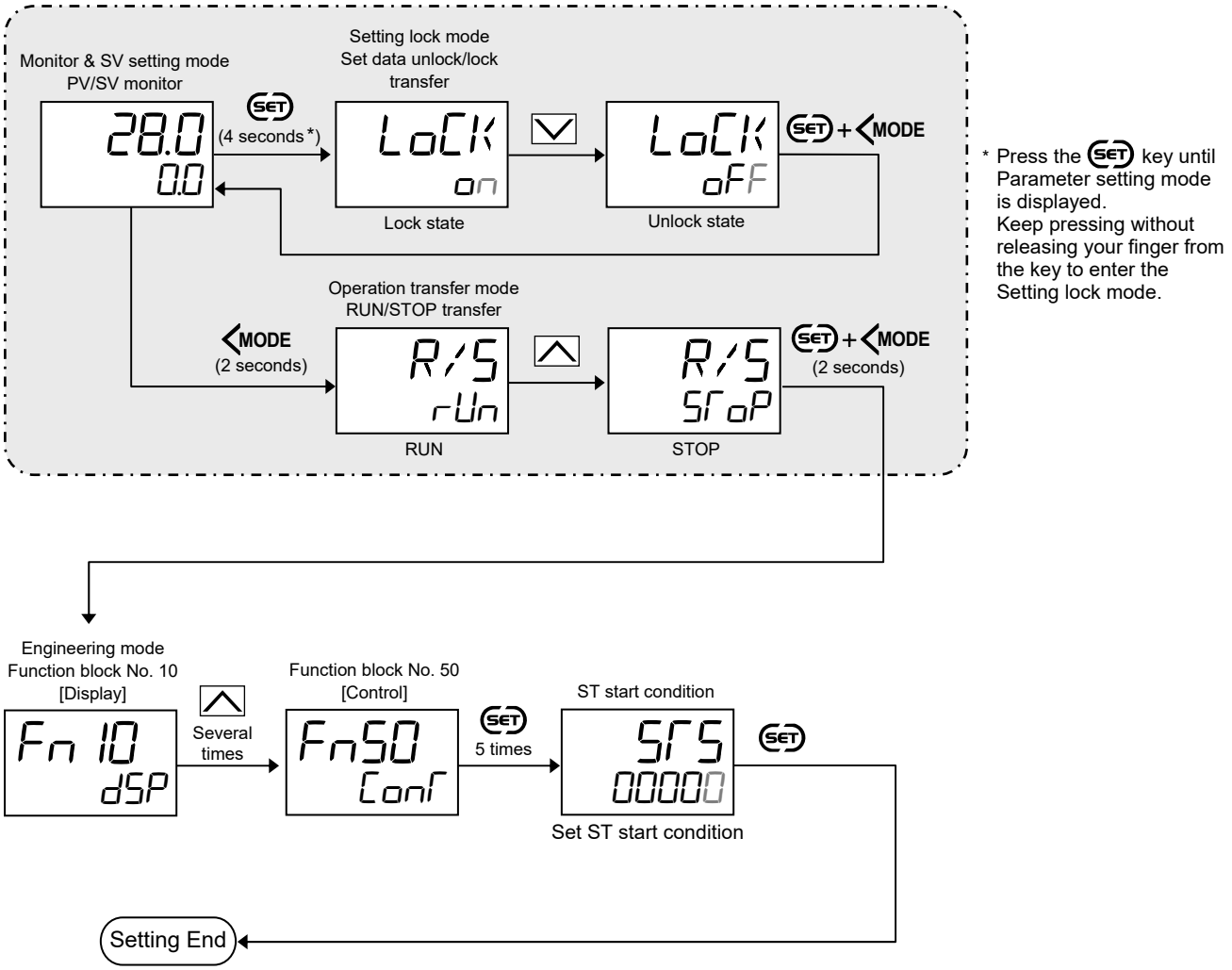
● ST start condition [Engineering Mode: Function block No. 50 (Fn50)]

Parameter symbol	Data range	Factory set value
STS	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0

■ Setting procedure

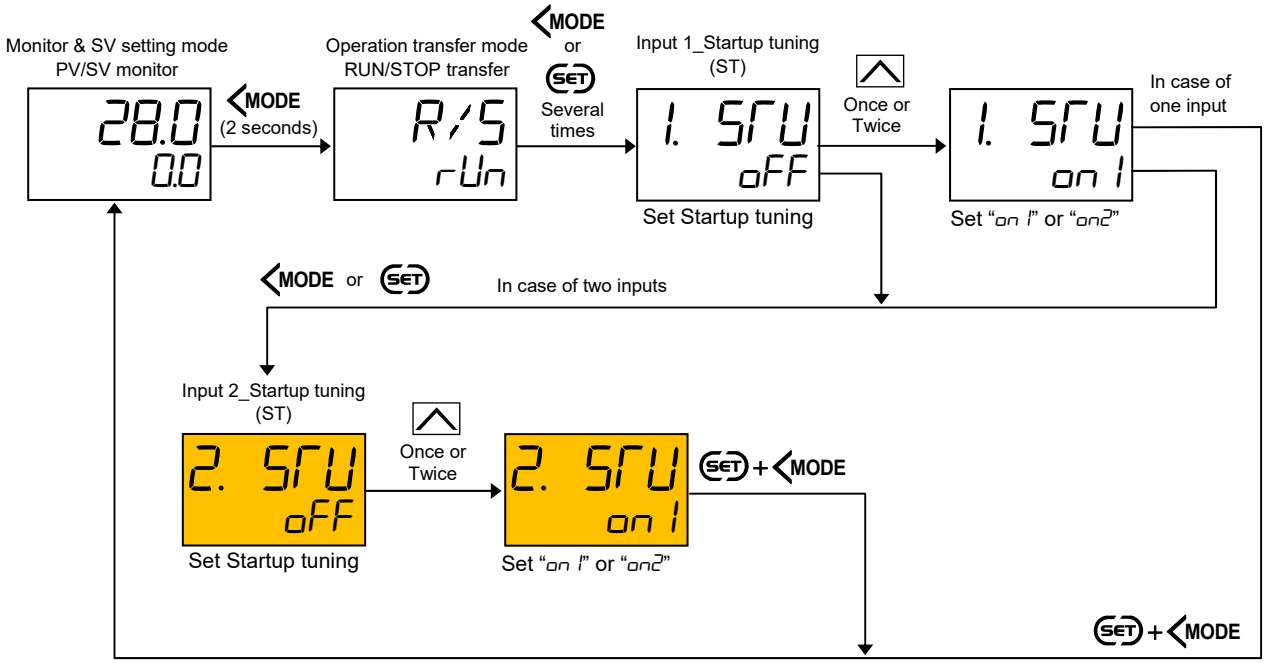
● Set the ST start condition

To enter the Engineering mode



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

● Set the Startup tuning (ST)



● Start the Startup tuning (ST)

Before starting the ST, refer to ●**Requirements for Startup tuning (AT) start (P. 8-20)**. Make sure that all required conditions to start the ST are satisfied.
Startup tuning can be started in the following manner. (started in the manner that satisfies the starting condition)

- Power off the controller once and power on again.
- Stop the control once (STOP) and start the control again (RUN).
- Change the Set value (SV).

The AT lamp lights during the Startup tuning (ST).

After completion of the Startup tuning (ST), the AT lamp goes off.
When the Startup tuning setting is "on 1: Execute once," the setting will go back to "oFF: ST unused" automatically.

8.5 Setting PID Values Manually

To perform PID control, PID parameters shown below need to be set up. These PID parameters can be automatically set using Autotuning (AT) or Startup tuning (ST). Manual adjustment is also available.

- Proportional band (P)
- Integral time (I)
- Derivative time (D)

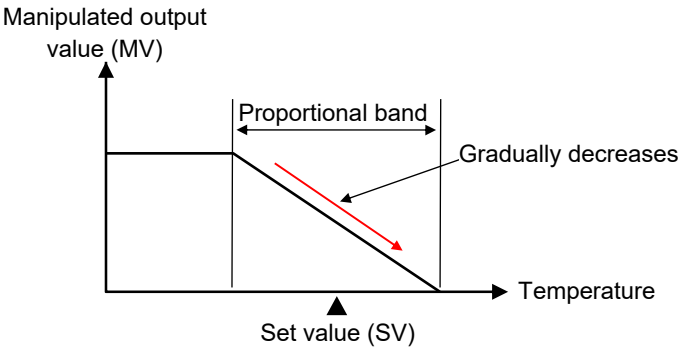
☞ For Autotuning (AT) function, refer to **8.3 Setting PID Values Automatically (Autotuning) (P. 8-11)**. For Startup tuning (ST) function, refer to **8.4 Setting PID Values Automatically (Startup tuning) (P. 8-18)**.

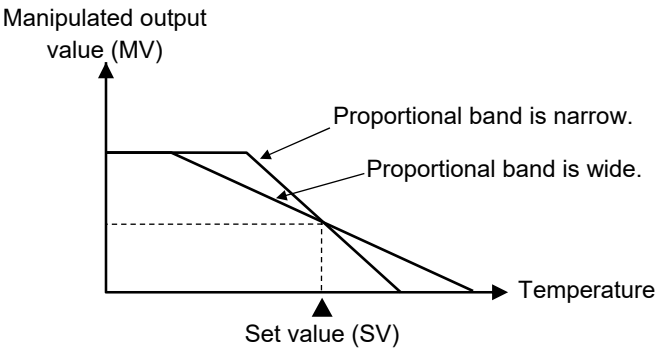
■ Description of function

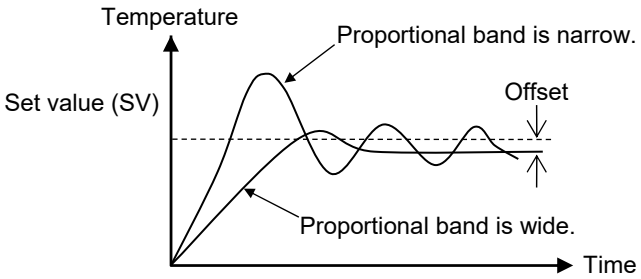
Critical parameters of PID control such as Proportional action (Proportional band: P), Integral action (Integral time: I), and Derivative action (Derivative time: D) are explained below.
Note that this explanation is based on the reverse action (heating control). With the direct action (cooling control), the output increases as the measured value increases.

● Proportional action

In the ON/OFF control action, the manipulated output is turned on and off repeatedly, resulting in oscillatory control.
To eliminate this oscillation, control is performed by producing Manipulated output value (MV) proportional to the deviation between the Set value (SV) and the Measured value (PV).
Technically a zone called “Proportional band” is established around the Set value (SV) and when the Measured value (PV) enters the proportional band, the Manipulated output value (MV) is gradually reduced.
The Measured value (PV) stabilizes within the Proportional band at the equilibrium point, but in many cases the stabilized temperature does not match the Set value (SV).
This deviation between the Set value (SV) and the stabilized temperature is called “Offset.”
With a narrower proportional band the control result becomes closer to that of the ON/OFF control (oscillatory).
With a wider proportional band the output is gradually reduced to stabilize quicker, however, often with a larger offset.



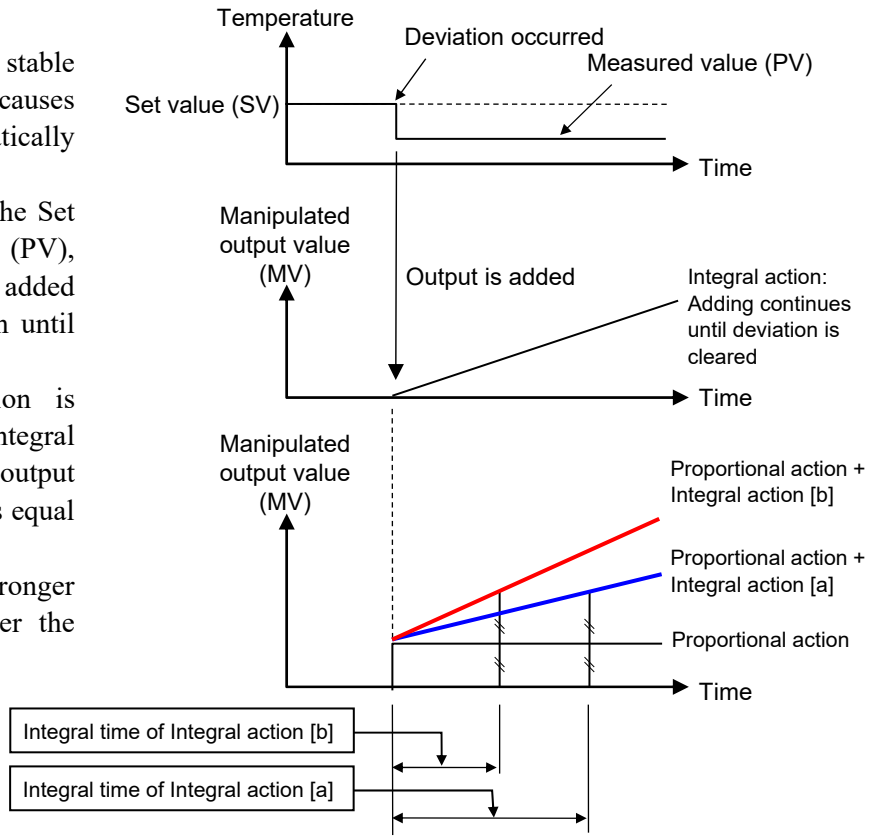




☞ For ON/OFF action, refer to **8.6 Controlling with ON/OFF Action (P. 8-31)**.

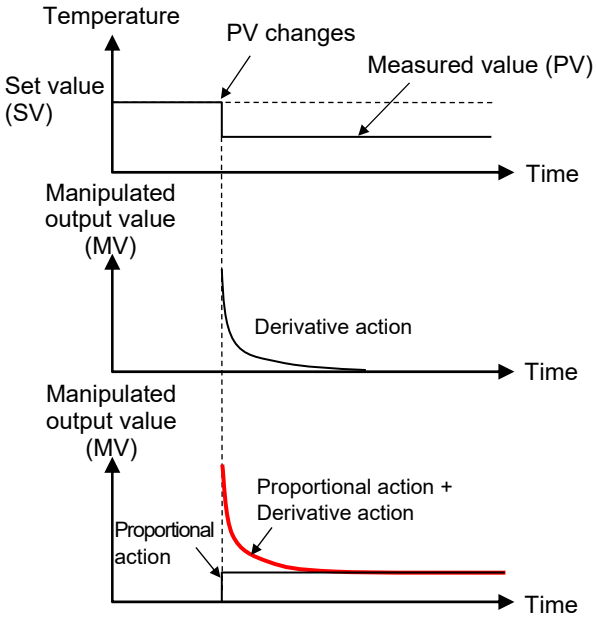
● Integral action

Proportional action provides more stable control than ON/OFF control, but causes offset. This offset can be automatically corrected by Integral action.
As long as deviation exists between the Set value (SV) and the Measured value (PV), the Manipulated output value (MV) is added according to the size of the deviation until no deviation exists.
The strength of the Integral action is expressed by the Integral time. The Integral time is the time till the Manipulated output value (MV) by the Integral action gets equal to that by the Proportional action.
The shorter the Integral time, the stronger the integral effect is, and the longer the weaker.

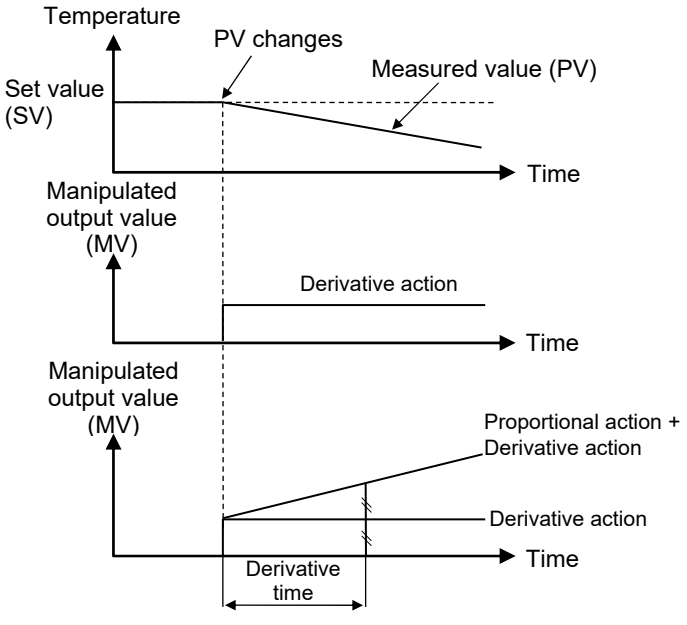


● Derivative action

The Derivative action allows the Manipulated output value (MV) proportional to the changing rate (speed) of the Measured value (PV) to be produced to prevent a fluctuation of the Measured value (PV) before it happens.
The strength of the Derivative action is expressed in the Derivative time. The Derivative time is the time until the Manipulated output value (MV) by the Proportional action gets equal to the Manipulated output value (MV) by the Derivative action when the Measured value (PV) changes at a constant rate.
The longer the Derivative time is, the stronger the Derivative effect is, and the shorter the weaker.
The Derivative effect, if set too strong, produces large Manipulated output (MV) against a small change of the Measured value (PV), thus causing hunting and resulting in unstable control.



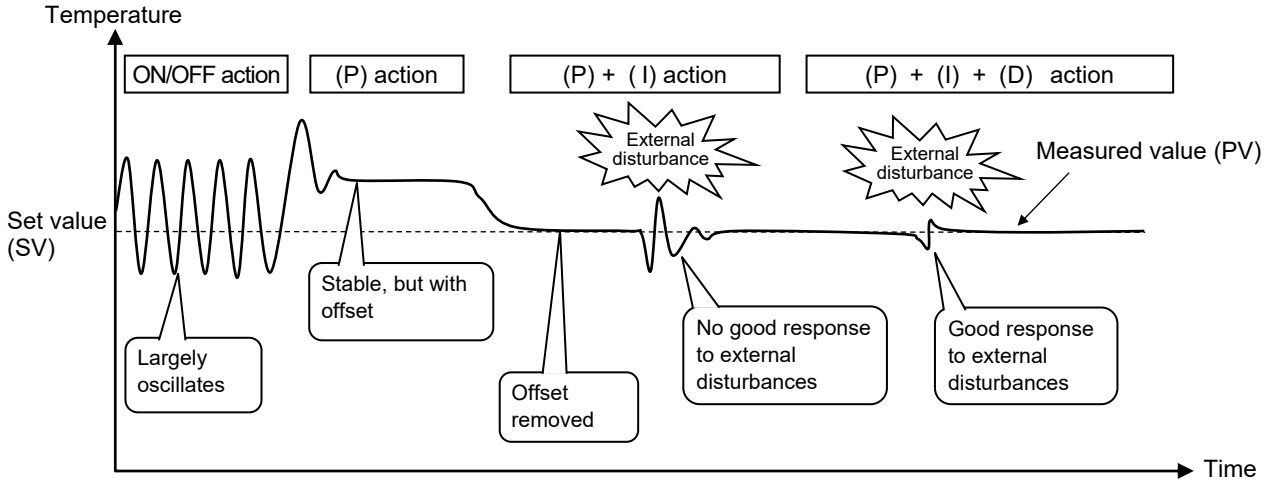
PV changes stepwise



PV gradually changes (PV changes at a constant rate)

● Outline of effect of PID

The following figure shows control behaviors under various control actions; ON/OFF control, proportional control (P), Proportional + Integral action (PI action), and Proportional + Integral + Derivative actions (PID control).



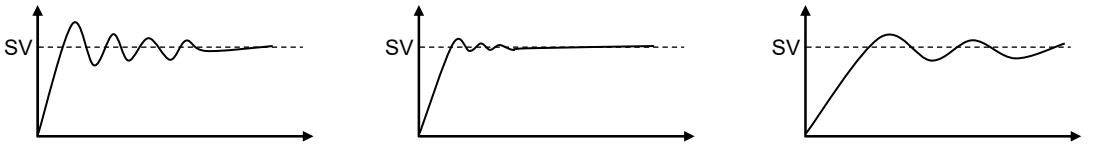
● Adjusting PID parameters (Applications controlled with PID control)

In some applications PID values calculated and obtained through Autotuning (AT) and Startup tuning (ST) may not be appropriate. In such a case the PID values need to be adjusted manually.
Attempt this adjustment referring to the following.

The sample here shows a general tendency. Control results depend on the controlled object and combinations of control constants.

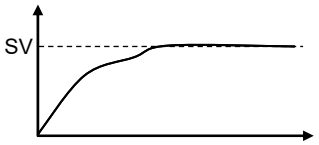
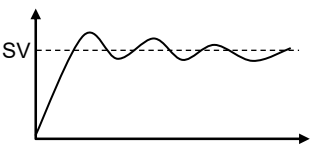
[Adjustment of Proportional band (P)]

Setting the proportional band as small as possible enables the Set value (SV) to be reached faster without overshoot. However, if the proportional band is set too narrow, it will cause hunting and the manipulated output (MV) will become oscillating.



Proportional band is set too narrow | Proportional band is appropriately set | Proportional band is set too wide

[Adjustment of Integral time (I) and Derivative time (D)]

Made larger (wider, longer)	Made smaller (narrower, shorter)
Overshoot, undershoot and hunting are suppressed. Setting the value too long may need longer time till the Set value (SV) is reached. 	Starts up quickly. Setting the value too short may cause overshoot, undershoot or hunting. 

■ Parameter setting

● Input 1_Proportional band [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 2_Proportional band [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Input 2_Proportional band," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Proportional band [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. Pc	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Input 1_Proportional band [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
I. 1	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 1_Integral time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Integral time [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. 1	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 2_Integral time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 1_Integral time [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
I. 1C	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 1_Integral time [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
I. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 1_Derivative time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Derivative time
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

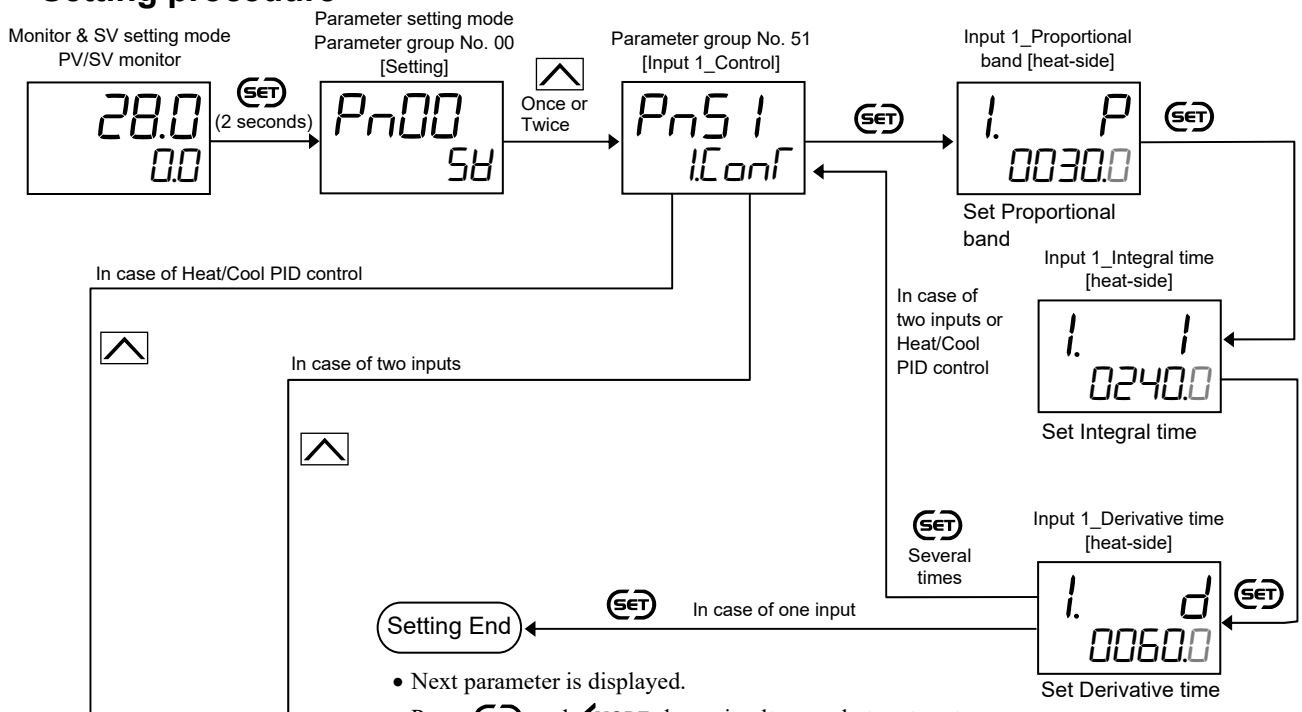
To display "Input 2_Derivative time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 1_Derivative time [cool-side]
[Parameter Setting Mode: Parameter group No. 56 (Pn56)]

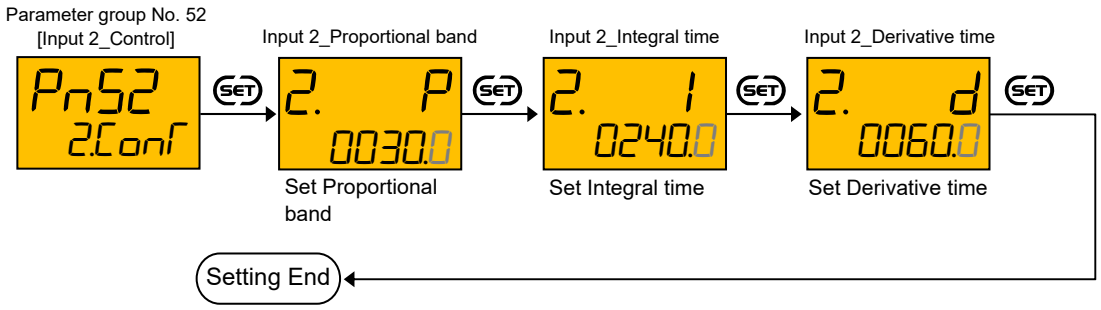
Parameter symbol	Data range	Factory set value
1. dc	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 1_Derivative time [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

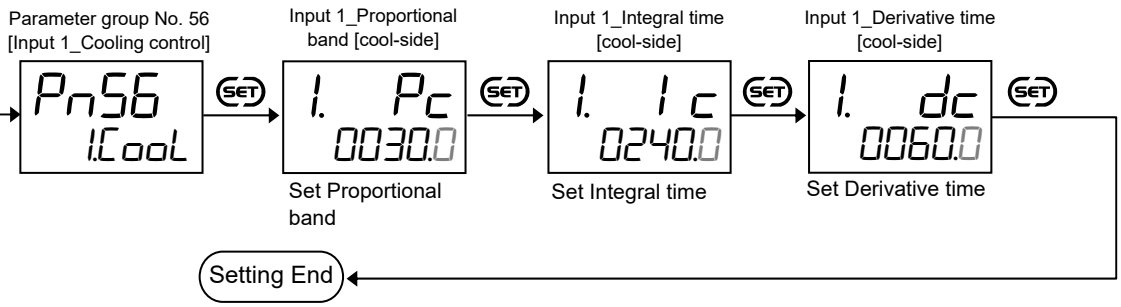
■ Setting procedure



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



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



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

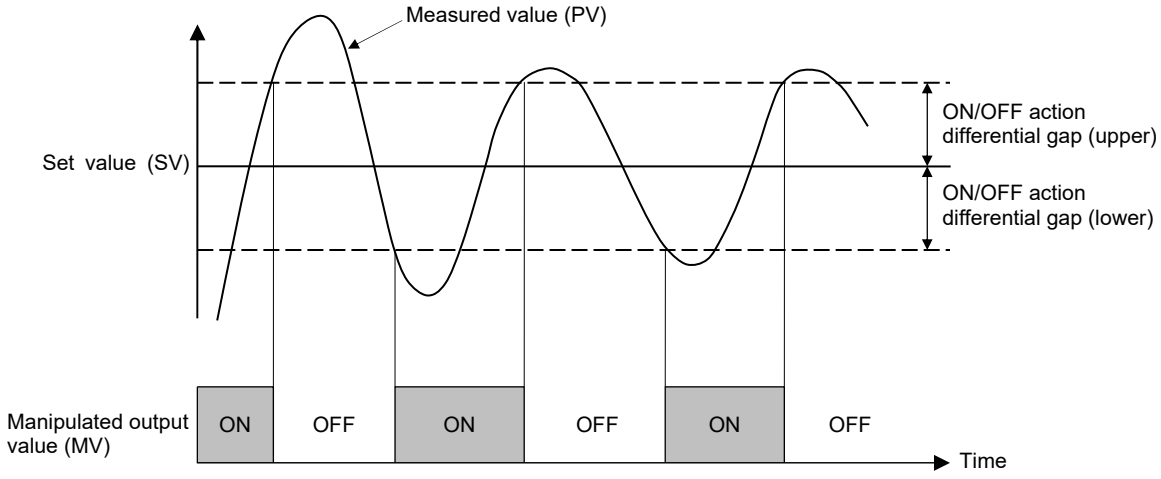
8.6 Controlling with ON/OFF Action

In ON/OFF control, the Manipulated output value (MV) is turned on or off depending on the Measured value (PV) whether it is above or below the Set value (SV).

■ Description of function

When the Measured value (PV) is above the Set value (SV), the Manipulated output value (MV) is turned OFF, and when the Measured value (PV) is below the Set value (SV), the Manipulated output value (MV) is turned ON. **To use the ON/OFF control, set the Proportional band [heat-side] to "0."**

In the ON/OFF control the output is turned on and off around the Set value (SV) and the output may be turned on and off too frequently for a small change of temperature. This is called "chattering" and may reduce the life of the output relay. To prevent this, ON/OFF differential gap should be properly set.



This explanation applies to "Reverse action" (heating control).

The value of the ON/OFF action differential gap is a deviation from the Set value (SV). This gap can be set individually above and below the Set value (SV). For example, in case of a Reverse action (heating control), assuming that the Set value (SV) is 100 °C with a ON/OFF action differential gap (upper) of 5 °C, the Manipulated output value (MV) turns off at 105 °C.

In case of ON/OFF action, the Output changing rate limiter is deactivated.

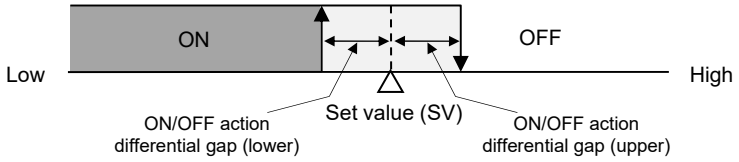
● Cooling control with ON/OFF action

The process of Input 1 can be controlled with the ON/OFF action for the Cooling side (direct action) by setting zero to the Input 1_Proportional band [heat-side] after "0: PID control (direct action)" is set at "Input 1_Control action" in Function block No. 51 in the Engineering mode.
The process of Input 2 can be controlled with the ON/OFF action for the Cooling side (direct action) by setting zero to the Input 2_Proportional band after "0: PID control (direct action)" is set at "Input 2_Control action" in Function block No. 52 in the Engineering mode.
The action is the same as above, but the ON/OFF position of the Manipulated output value (MV) becomes opposite. The ON/OFF action differential gap can be set similarly.

● Heat/Cool control with ON/OFF action

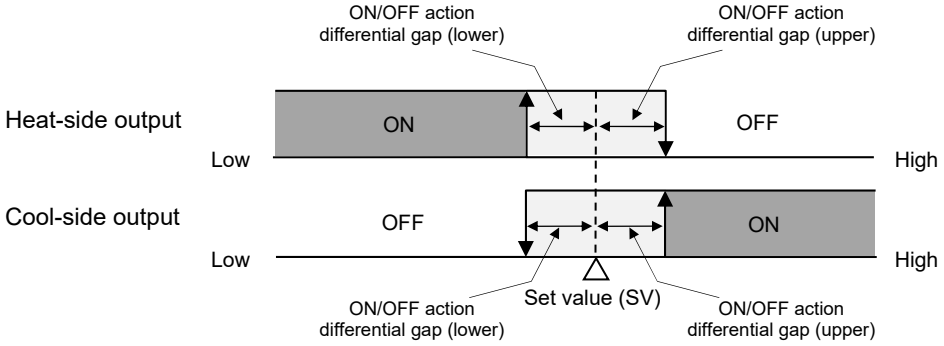
Go to “Input 1_Control action,” Function block No.51 in the Engineering mode.
Select any one from “2: Heat/Cool PID control [water cooling],” “3: Heat/Cool PID control [air cooling],” or “4: Heat/Cool PID control [Cooling linear type]” and set “0” at the Input 1_Proportional band [heat-side].
Then, the controller starts Heat/Cool control with ON/OFF action.

Manipulated output for ON/OFF action [at Heating control]

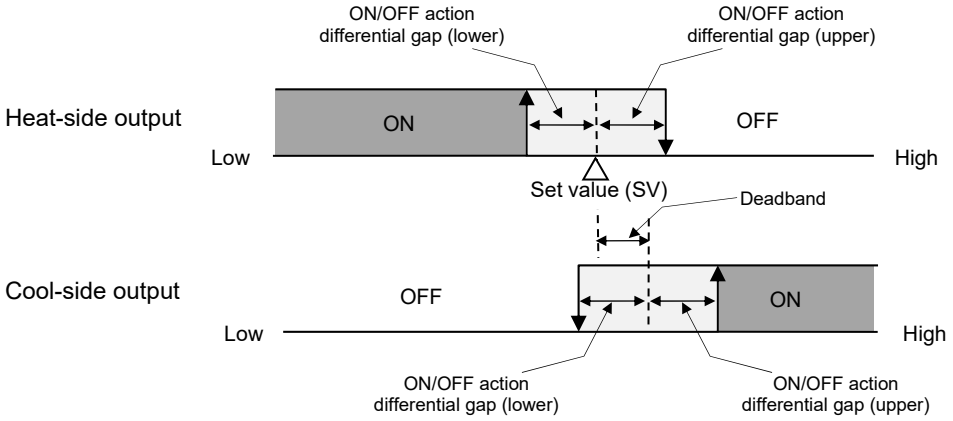


Manipulated output for ON/OFF action [at Heat/Cool control]

● **Overlap/Deadband = 0**



● **Overlap/Deadband > 0**



■ Parameter setting

● Input 1_Proportional band [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 2_Proportional band [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Input 2_Proportional band," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_ON/OFF action differential gap (upper) [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. oHH	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1

To display "Input 1_ON/OFF action differential gap (upper)," zero ("0") must be entered at Input 1_Proportional band [heat-side]."

● Input 1_ON/OFF action differential gap (lower) [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. oHL	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1

To display "Input 1_ON/OFF action differential gap (lower)," zero ("0") must be entered at Input 1_Proportional band [heat-side]."

● Input 2_ON/OFF action differential gap (upper) [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. oHH	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1

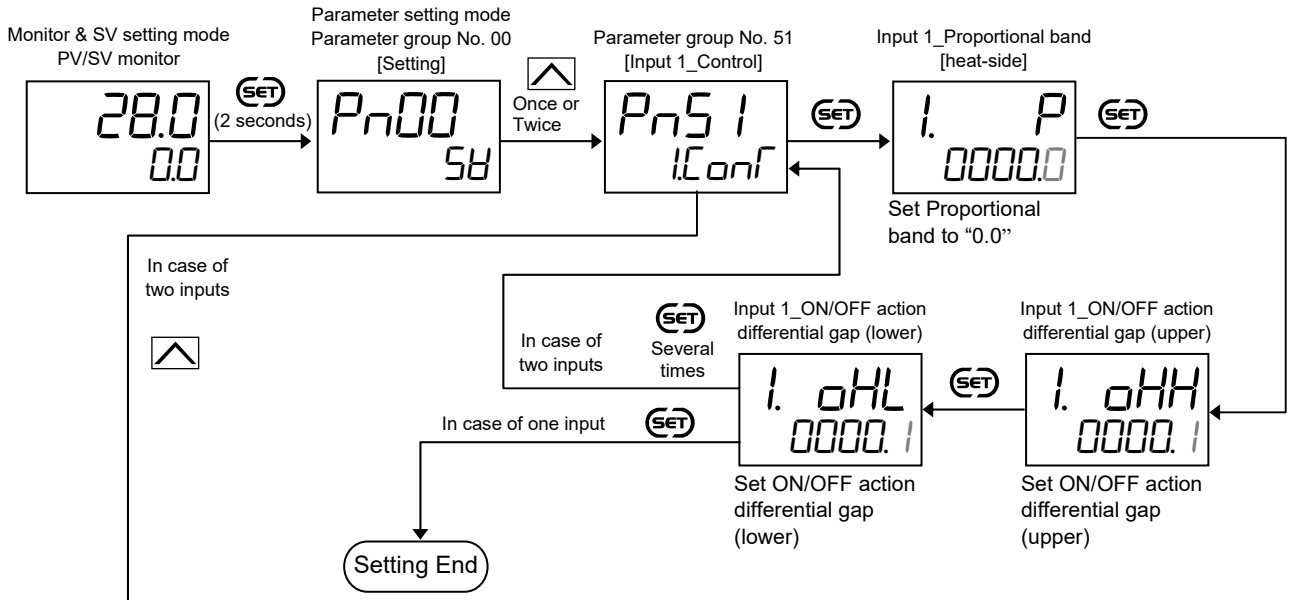
To display "Input 2_ON/OFF action differential gap (upper)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. You also need to enter zero ("0") at the Input 2_Proportional band.

● Input 2_ON/OFF action differential gap (lower) [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

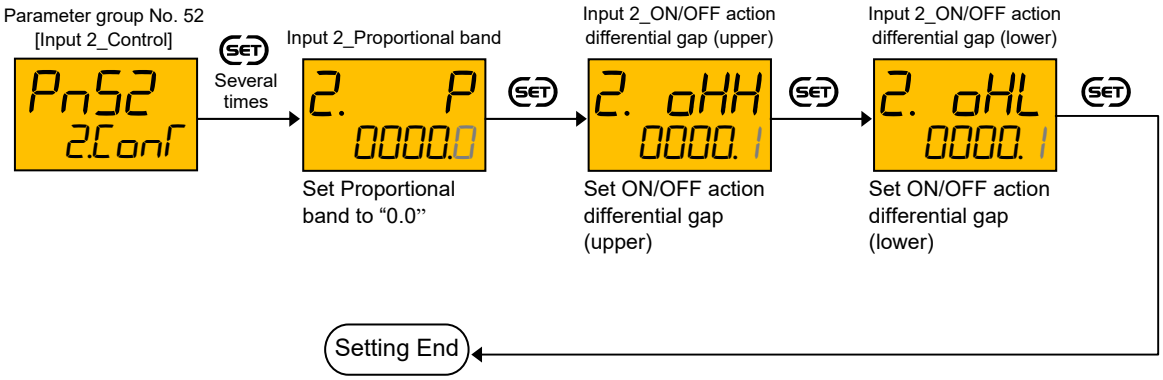
Parameter symbol	Data range	Factory set value
2. oHL	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1

To display "Input 2_ON/OFF action differential gap (lower)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. You also need to enter zero ("0") at the Input 2_Proportional band.

■ Setting procedure



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



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

8.7 Controlling with Heat/Cool Control

With Heat/Cool PID control method, heat-side and cool-side can be controlled by a controller. For example, this is effective when cooling control is required in extruder cylinder temperature control.

■ Description of function

● Cool control type

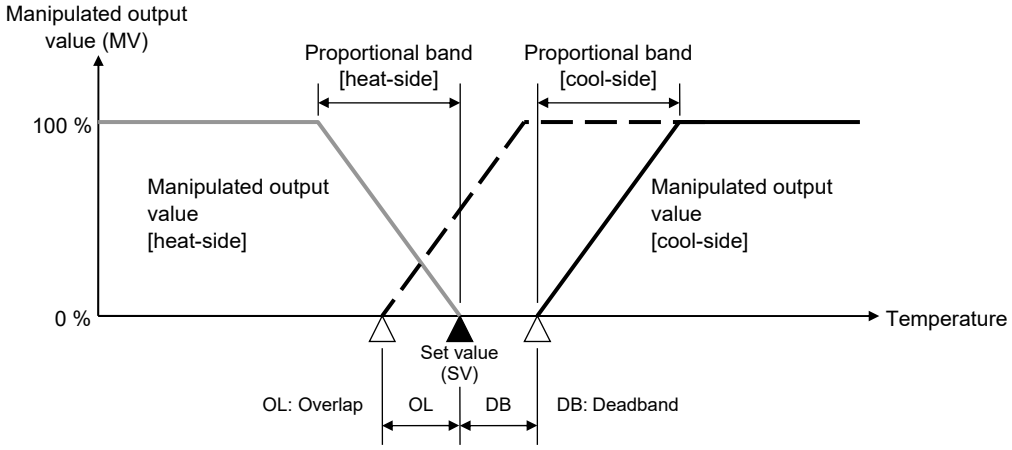
The control on the heat-side is the same as the standard PID control. The control on the cool-side can be selected from a few types according to the controlled object.

・Water cooling/Air cooling: The algorithm assuming plastic molding machine Heat/Cool control is employed. Even in equipment provided with a cooling mechanism having nonlinear characteristics, it responds quickly to attain the characteristic responding to the set value with small overshooting.

・Cooling linear type: The algorithm assuming applications without nonlinear cooling capability is employed.

● Overlap/Deadband

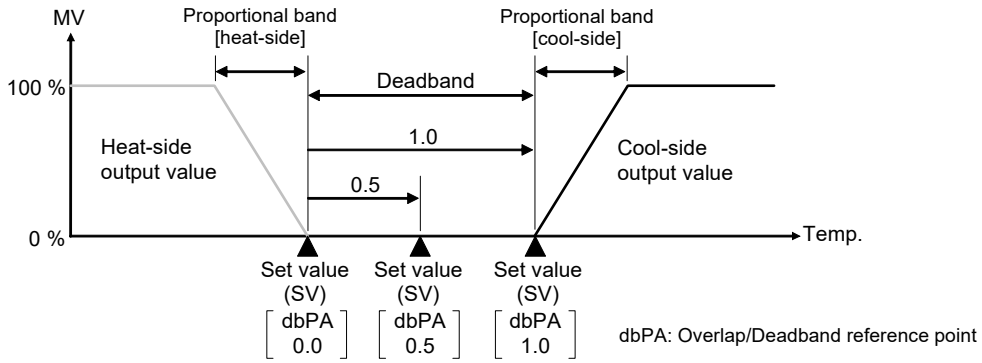
Heat/Cool PID control has a proportional band individually on each side of the heating and the cooling. With the Set value (SV) as a reference point, setting the Overlap/Deadband below the Set value (SV) [setting on the negative side] generates an overlap of the heating and the cooling proportional bands. Setting this parameter above the Set value (SV) [setting on the positive side] generates a deadband.



[Overlap/Deadband reference point]

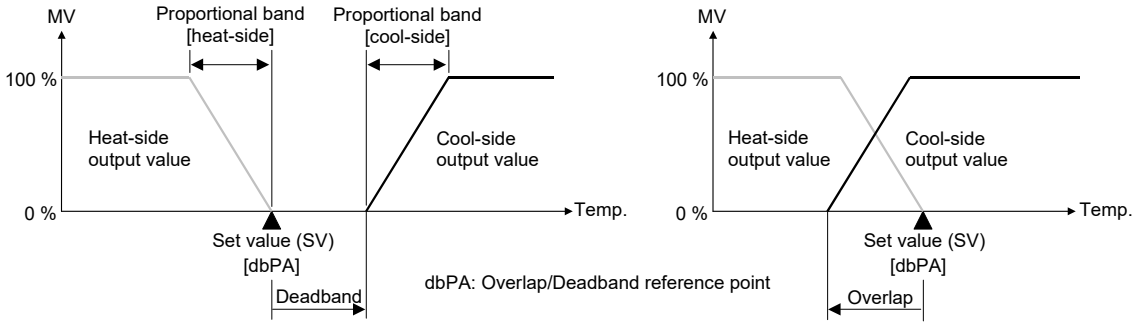
Each Set value (SV) for the Heat/Cool PID control becomes the Overlap/Deadband reference point.

- When setting 0.0, Overlap/Deadband reference point is at 0 % of the output at Proportional band [heat-side].
- When setting 0.5, Overlap/Deadband reference point is at the midpoint of the Overlap/Deadband.
- When setting 1.0, Overlap/Deadband reference point is at 0 % of the output at Proportional band [cool-side].

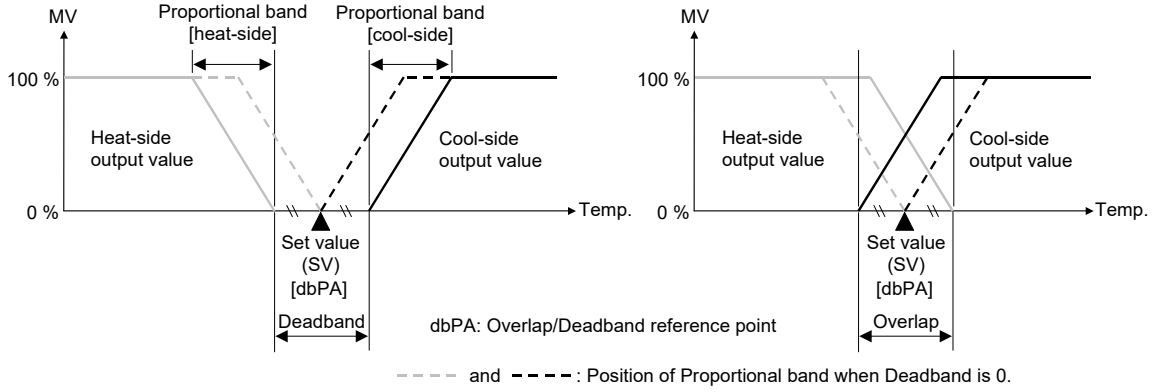


Example: Difference in Overlap/Deadband reference point

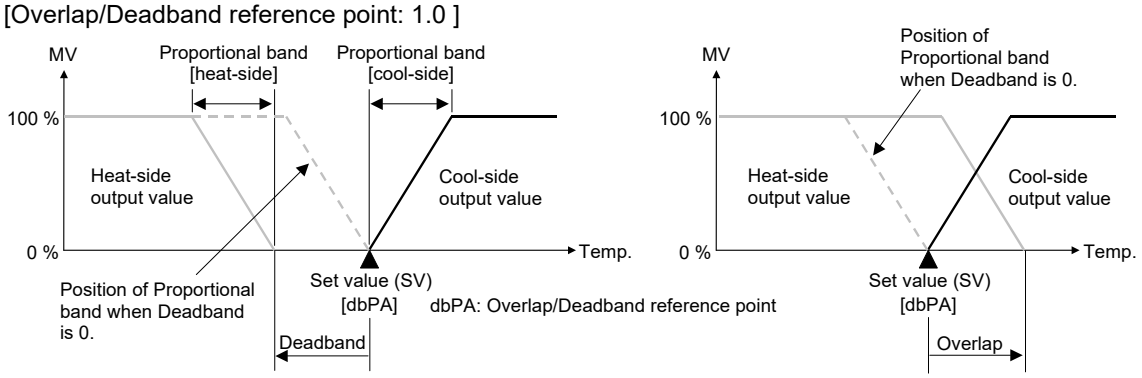
[Overlap/Deadband reference point: 0.0]



[Overlap/Deadband reference point: 0.5]



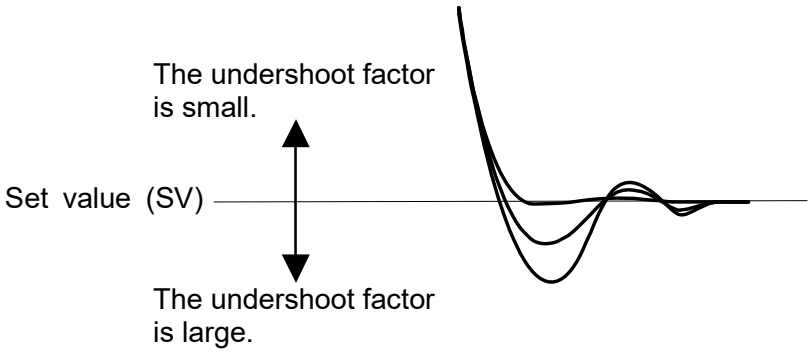
[Overlap/Deadband reference point: 1.0]



To change Deadband when the Overlap/Deadband reference point is 0.5, the Proportional band on heat-side and cool-side shift equidistantly to the midpoint of the Overlap/Deadband.

● Undershoot suppression factor

The Undershoot suppression function suppresses the undershoot that occurs when the Set value (SV) is lowered due to the special cooling characteristic (cooling nonlinear characteristic) of plastic molding machines. The undershoot suppression effect increases as a smaller value is set for the Undershoot suppression factor.



NOTE

If the Undershoot suppression factor is set too small, the undershoot function acts excessively and prevents the Measured value (PV) from reaching the Set value (SV). As a result, the PV stabilizes at an offset or approaches the set value very slowly, preventing normal control.
In this event, change the setting for the Undershoot suppression factor to a slightly higher value.

■ Parameter setting

● Input 1_Proportional band [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 1_Proportional band [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. Pc	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Input 1_Proportional band [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. I	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 1_Integral time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. Ic	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 1_Integral time [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 1_Derivative time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [cool-side] [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. dc	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 1_Derivative time [cool-side]," you need to specify "Heat/Cool PID control" at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Overlap/Deadband [Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. db	TC/RTD inputs: –(Input 1_Input span)to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of Input 1_Input span (When Control with PV select: –100.0 to +100.0 % of PV select input span) Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0

To display "Input 1_Overlap/Deadband," you need to specify "Heat/Cool PID control" at the time of order, or "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

● Input 1_Control action [Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. oS	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Input 1_Control action is changed.

● Undershoot suppression factor [Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
US	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000

📖 To display "Undershoot suppression factor," you need to specify "Heat/Cool PID control" at the time of order, or "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

● Overlap/Deadband reference point [Engineering Mode: Function block No. 56 (Fn56)]

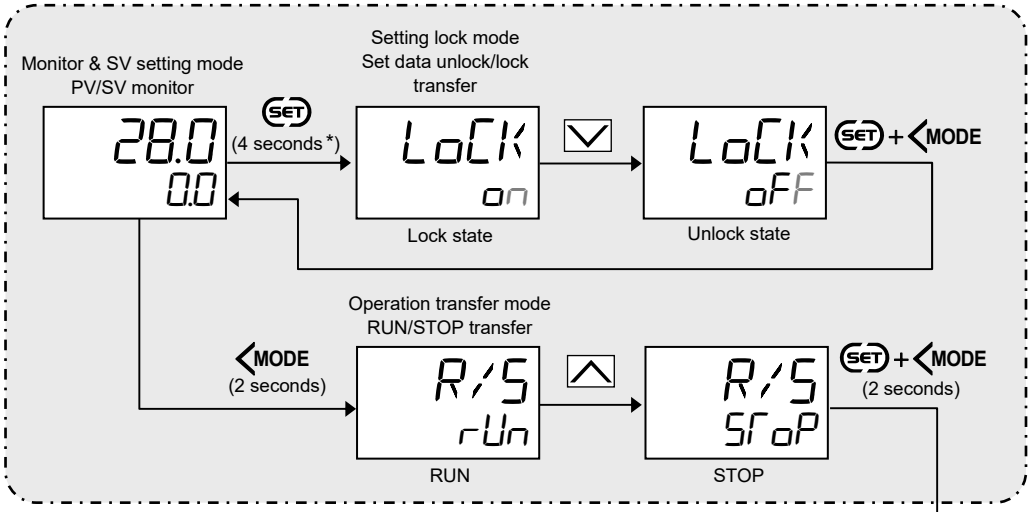
Parameter symbol	Data range	Factory set value
dbPA	0.0 to 1.0	0.0

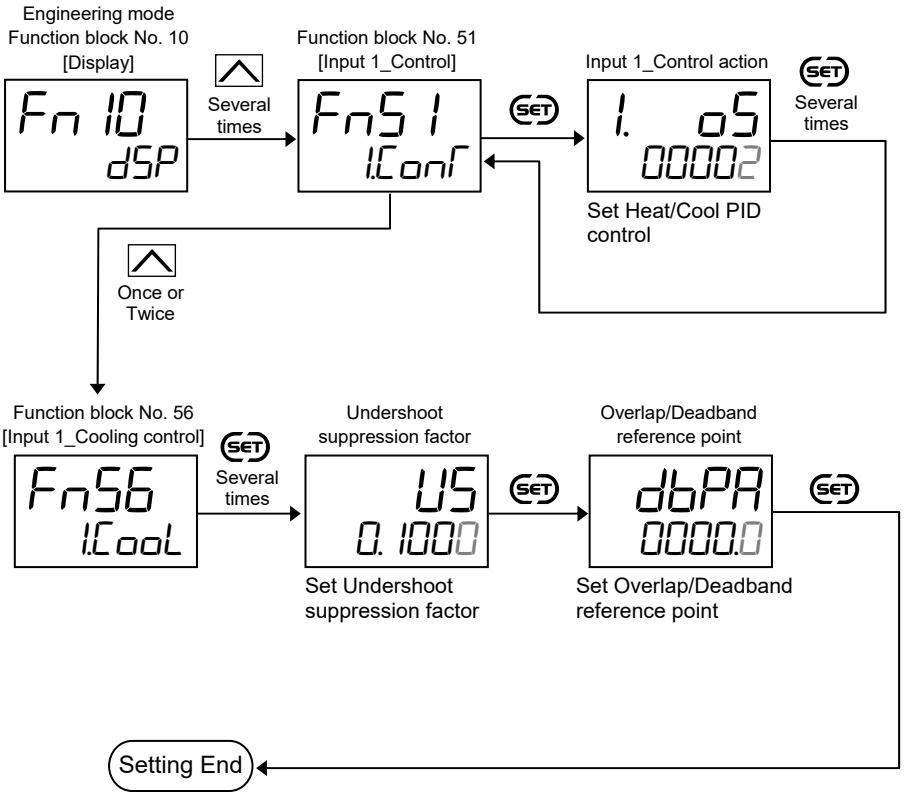
📖 To display "Overlap/Deadband reference point," you need to specify "Heat/Cool PID control" at the time of order, or "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

■ Setting procedure

● Selecting Heat/Cool PID control

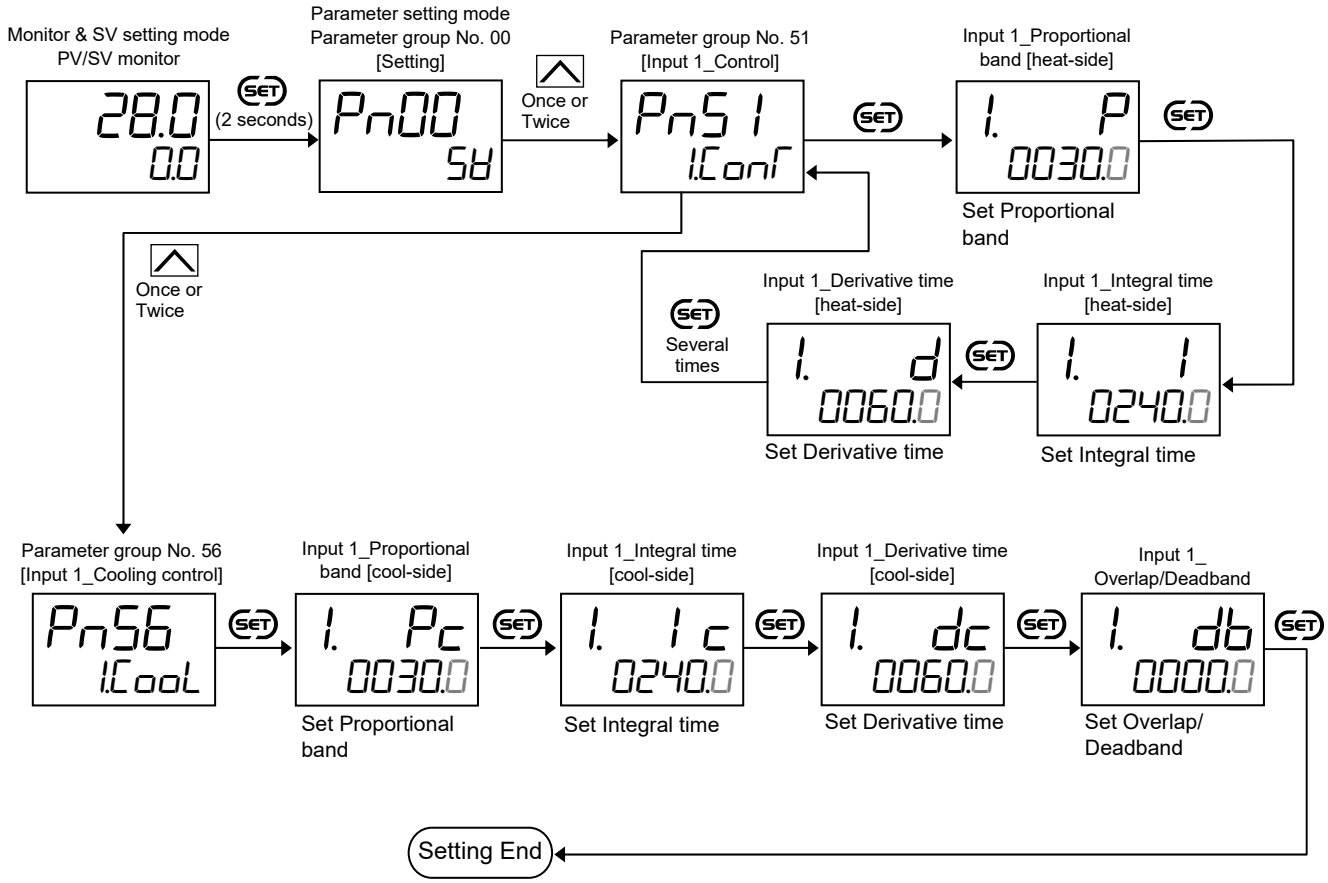
To enter the Engineering mode





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

● Setting parameters for Heat/Cool PID control



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

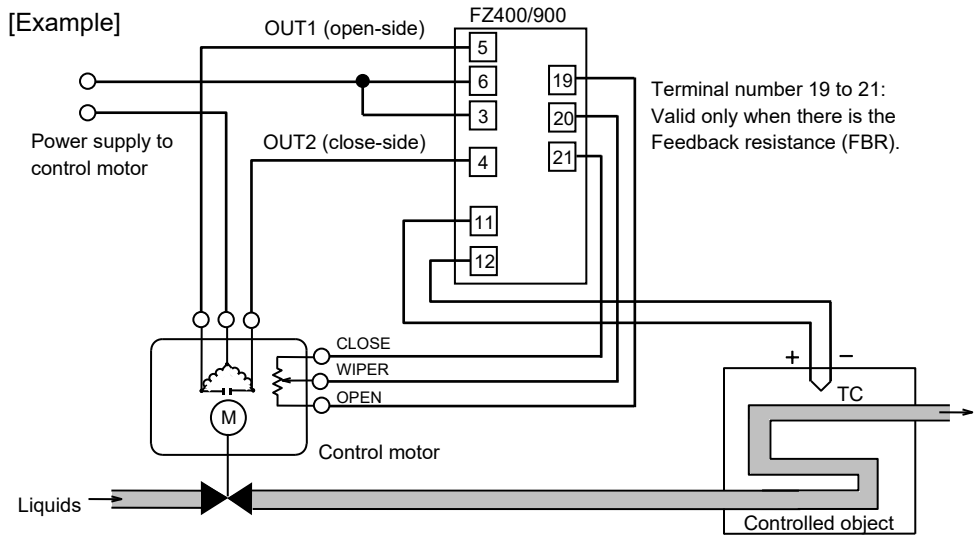
The Parameters in Heat/Cool PID control can be calculated also in Autotuning (AT). (Overlap/Deadband is excluded)
For Autotuning (AT), refer to **8.3 Setting PID Values Automatically (Autotuning) (P. 8-11)**.

8.8 Controlling with Position Proportioning Control

Position proportioning PID control converts the control output value of the controller into the corresponding signal to control a motor driven valve (control motor) and then performs temperature control of a controlled object by regulating fluid flow.

■ Description of function

In Position proportioning PID control of this controller, it is possible to select the presence or absence of Feedback resistance (FBR) input which monitors the degree of valve position (available only on FZ400/900). In addition, the direct action or reverse action can be selected.



The details of setting differ depending on the presence or absence of Feedback resistance (FBR) input.

● When the Feedback resistance (FBR) is provided (available only on FZ400/900):

– High/Low limit of valve position (limit value of FBR input) can be set.
[Output limiter high, Output limiter low]

– The valve position can be manually changed. [Manipulated output value (MV) setting in Manual mode]

– The feedback adjustment is necessary. [Feedback adjustment preparation]

– Action taken when Feedback resistance (FBR) input breaks can be selected.
[Action at Feedback resistance (FBR) input error]

– The close-side (or open-side) output remains ON when the valve position is fully closed (or opened).
[Action at saturated output]

● When the Feedback resistance (FBR) is not provided:

– Control motor operation can be restricted by the Integrated output limiter. [Integrated output limiter]

– The UP/DOWN key is used to output opening or closing signal in Manual mode.

UP key (open-side): While the UP key is being pressed, open-side output (OUT1) is output continuously. Releasing the UP key turns off the output on the open-side to hold the opened state at that time.

DOWN key (close-side): While the DOWN key is being pressed, close-side output (OUT2) is output continuously. Releasing the DOWN key turns off the output on the closed-side to hold the opened state at that time.

☞ For manual operation of Position proportioning PID control, refer to **8.9 Controlling with Manual Control (P. 8-56)**.

Parameter Valid/Invalid depending on the presence or absence of FBR input (×: Valid, —: Invalid)

Applicable parameters	When the Feedback resistance (FBR) input is provided	When the Feedback resistance (FBR) input is not provided
Input 1_ Manipulated output value at STOP [heat-side] (I. RMV) Engineering mode [Function block No. 51 (Fn51)]	×	—
Input 1_Output limiter high (I. oLH) Input 1_Output limiter low (I. oLL) Parameter setting mode [Parameter group No. 51 (Pn51)]	×	—
Open/Close output neutral zone (Ydb) * Setup setting mode [Setting group No. 55 (Sn55)]	×	×
Open/Close output differential gap (YHS) * Setup setting mode [Setting group No. 55 (Sn55)]	×	×
Action at feedback resistance (FBR) input error (YbR) Engineering mode [Function block No. 55 (Fn55)]	×	—
Feedback adjustment (Pos) Engineering mode [Function block No. 55 (Fn55)]	×	—
Control motor time (MoT) * Engineering mode [Function block No. 55 (Fn55)]	×	×
Integrated output limiter (oLA) Engineering mode [Function block No. 55 (Fn55)]	—	×
Valve action at STOP (VAL) * Engineering mode [Function block No. 55 (Fn55)]	×	×
Action at saturated output (YASo) Engineering mode [Function block No. 55 (Fn55)]	×	—

* Always set this item regardless of the presence or absence of opening Feedback resistance (FBR) input.

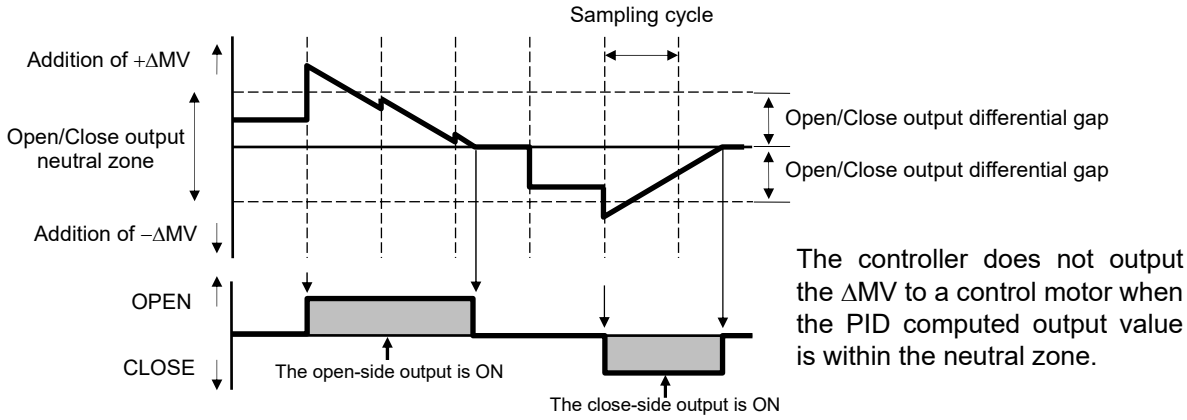
Position proportioning PID control can be performed if two output points are selected when ordering. If Current output or Continuous voltage output is specified, the Position proportioning PID control cannot be selected. [Output value: −5.0 % (fixed)]

When the control action is the Position proportioning PID control, the Startup tuning (ST) is not available. Proportional cycle time and Output change rate limiter are also invalid.

● Open/Close output neutral zone

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

[Example] If the Open/Close output differential gap is set to 1/2 (a half) of the Open/Close output neutral zone (Factory set value)

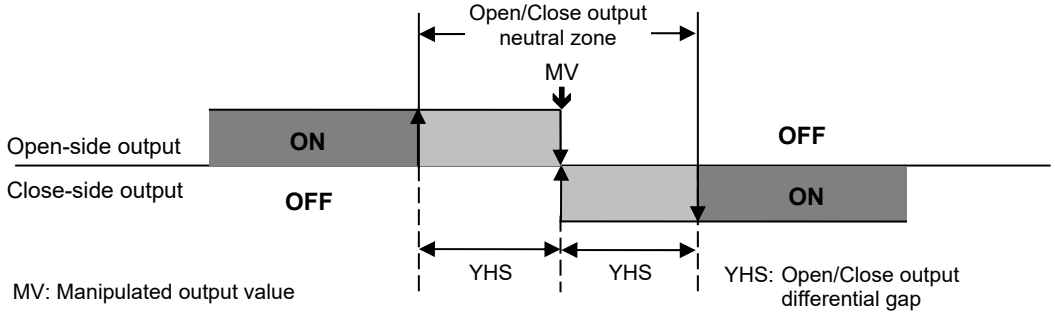


● Open/Close output differential gap

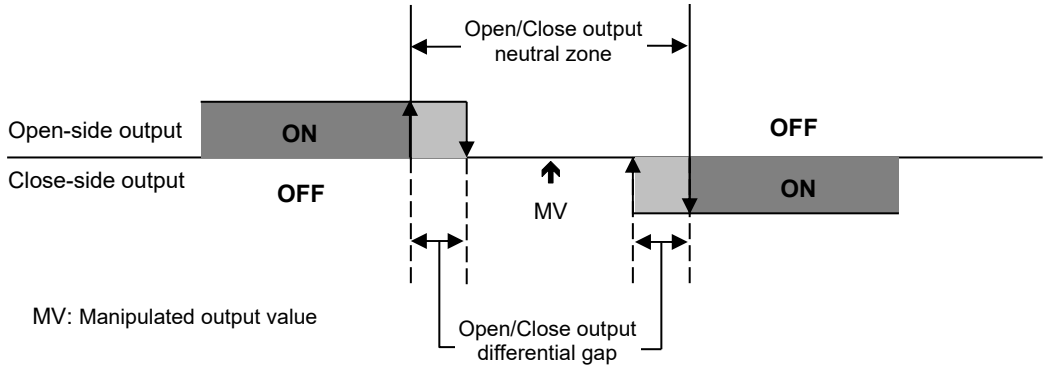
Setting the Open/Close output differential gap is useful in preventing the Manipulated output (MV) for Open/Close side from turning on and off all the time due to the fluctuation of the Feedback resistance input.

Changing the value of the Open/Close output neutral zone will make the Open/Close output differential gap 1/2 (a half) of the Open/Close output neutral zone.

[Example 1] If the Open/Close output differential gap is set to 1/2 (a half) of the Open/Close output neutral zone (Factory set value)



[Example 2] Narrowing the Open/Close output differential gap



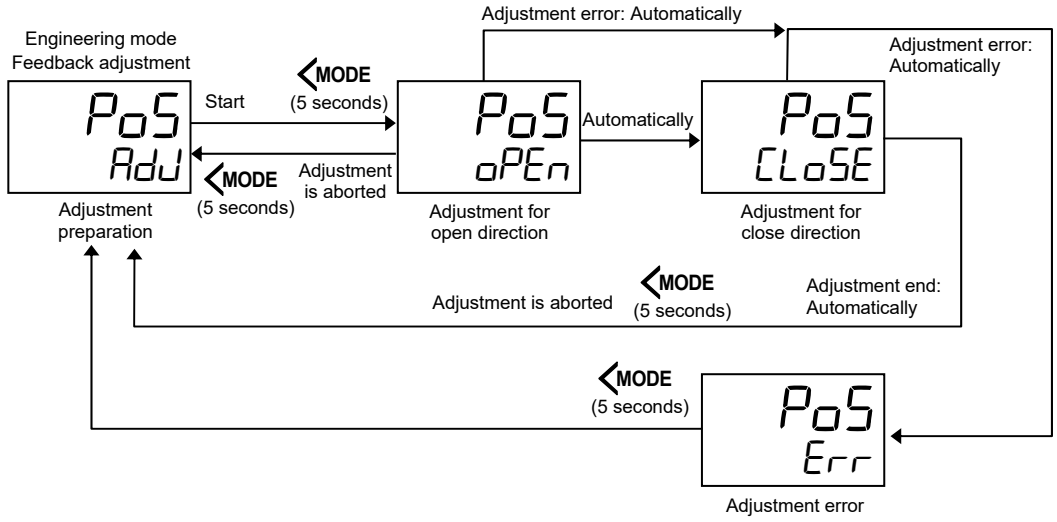
● Feedback adjustment

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

If opening adjustment is performed, the control motor time is automatically computed.
If the calculated value is 5 seconds or shorter, the Control motor time will be set to the low limit value (5 seconds).

An error occurs in Feedback adjustment if
- Feedback resistance (FBR) input is not connected.
- Wiring of Feedback resistance (FBR) input is incorrect.
- Wiring of Feedback resistance (FBR) input is incorrect.
- The valve movement from fully closed to fully opened is completed less than 50 %.
- Feedback adjustment time exceeds 1000 seconds.

[Adjustment procedure]



● Control motor time

This is the time required until the control motor is fully opened from its fully closed state.
If opening adjustment is performed, the control motor time is automatically computed. If the calculated value is 5 seconds or shorter, the Control motor time will be set to the low limit value (5 seconds). If the calculated value is 1000 seconds or more, it is handled as an error and the set value will not be updated.

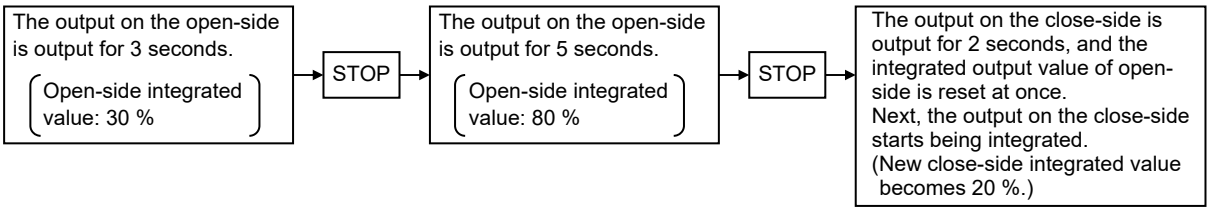
● Integrated output limiter

This is a restricted value when the output on the open or closed side is integrated. If the output on the open (or closed) side is output in succession, it is integrated and if the result reaches the Integrated output limiter value, the output on the open (or closed) side is turned off. In addition, if the output on the open (or closed) side is reversed, the integrated value is reset.

The Integrated output limiter is invalid when the Feedback resistance (FBR) input is used.
This setting is invalid in the Manual mode.

[Setting example]

If control is started at the fully closed state when the control motor time is set at 10 seconds and the Integrated output limiter value is set at 100 %, the following results.



● Action at feedback resistance (FBR) input error

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

Data range 0: Action depending on the value action at STOP
1: Control action continued

● Valve action at STOP

Select the valve action when Feedback resistance (FBR) input is disabled or "0 (Action depending on the value action setting at STOP)" is set for the action when a Feedback resistance (FBR) input break occurs.

Data range 0: Close-side output OFF, Open-side output OFF
1: Close-side output ON, Open-side output OFF
2: Close-side output OFF, Open-side output ON

● Action at saturated output

Set to maintain ON state for the close-side (or open-side) output when the valve position is fully closed (or opened).

[When the Action at saturated output is invalid]

The close-side output turns OFF when the valve position is fully closed (FBR input value ≤ 0 %).
The open-side output turns OFF when the valve position is fully opened (FBR input value ≥ 100 %).

[When the Action at saturated output is valid]

The close-side output remains ON when the valve position is fully closed (FBR input value ≤ 0 %).
The open-side output remains ON when the valve position is fully opened (FBR input value ≥ 100 %).

NOTE

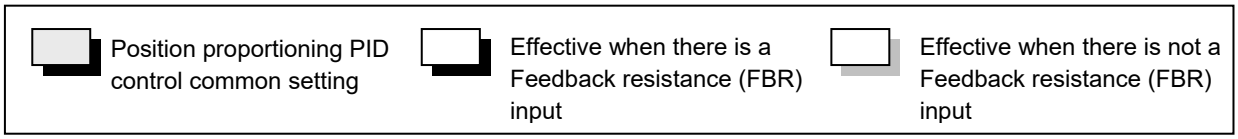
To validate the Action at saturated output, make sure to use valve with limit switch.

Refer to the Action at Feedback resistance (FBR) input error for the valve action when the FBR input is broken.

The Action at saturated output is invalid when the value of Output limiter high or Output limiter low is between 0.1 % and 99.9 %.

● Setting flowchart

This section describes the Position proportioning PID control dedicated setting items and the setting items which are effective when there is or is not a Feedback resistance (FBR) input. The following setting items are all set in the Engineering mode.



Select the Control action

Select the Position proportioning PID control (direct/reverse action).
[Position proportioning PID control common setting]

↓

Set the Manipulated output value (MV) at STOP mode

Set the valve position at control STOP.
[Effective when there is a Feedback resistance (FBR) input]

↓

Set the Output limiter

Set the high-limit/low-limit value of the valve position.
[Effective when there is a Feedback resistance (FBR) input]

↓

Set the Open/Close output neutral zone

Set the output OFF zone between open-side and close-side outputs.
[Position proportioning PID control common setting]

↓

Set the Open/Close output differential gap

Set the differential gap of open-side and close-side outputs.
[Position proportioning PID control common setting]

↓

Set the action at Feedback resistance (FBR) input error

Set the action at Feedback resistance (FBR) input error.
[Effective when there is a Feedback resistance (FBR) input]

↓

Feedback adjustment

Adjust the Feedback resistance (FBR) input.
[Effective when there is a Feedback resistance (FBR) input]

↓

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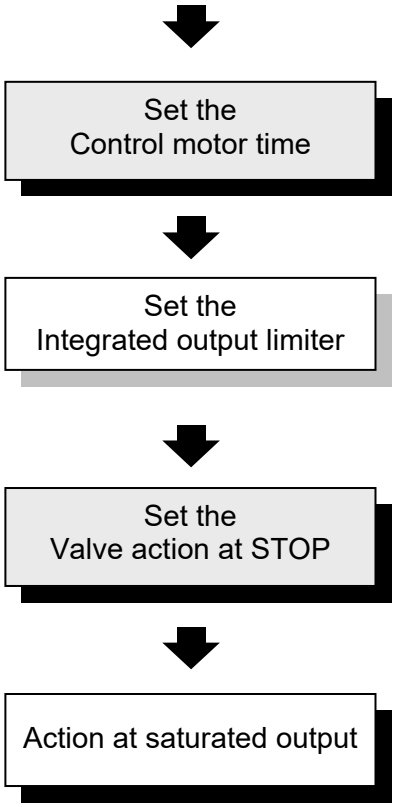


Set the Control motor time required for rotation from the fully closed position to the fully opened position.
[Position proportioning PID control common setting]

Set the Integrated output limiter which integrates the output and sets the output to OFF when the result reached the set value when an open-side (or close-side) output is outputted continuously.
[Effective when there is not a Feedback resistance (FBR) input]

Set the action of open-side and close-side outputs at control STOP.
[Position proportioning PID control common setting]

Set to maintain ON state for the close-side (or open-side) output when the valve position is fully closed (or opened).
[Effective when there is a Feedback resistance (FBR) input]

■ Parameter setting

● Input 1_Control action [Engineering Mode: Function block No. 51 (FnS I)]

Parameter symbol	Data range	Factory set value
1. oS	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Input 1_Control action is changed.

● Input 1_ Manipulated output value at STOP [heat-side] [Engineering Mode: Function block No. 51 (FnS I)]

Parameter symbol	Data range	Factory set value
1. RMV	–5.0 to +105.0 %	–5.0

● Input 1_Output limiter high [heat-side] [Parameter Setting Mode: Parameter group No. 51 (PnS I)]

Parameter symbol	Data range	Factory set value
1. oLH	Input 1_Output limiter low [heat-side] to 105.0 %	105.0

📖 Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter high [heat-side] is changed.

● Input 1_Output limiter low [heat-side] [Parameter Setting Mode: Parameter group No. 51 (PnS I)]

Parameter symbol	Data range	Factory set value
1. oLL	–5.0 % to Input 1_Output limiter high [heat-side]	–5.0

📖 Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Output limiter low [heat-side] is changed.

● Open/Close output neutral zone [Setup Setting Mode: Setting group No. 55 (SnSS)]

Parameter symbol	Data range	Factory set value
ydb	0.1 to 10.0 % of output	2.0

To display the "Open/Close output neutral zone," you need to set the parameters for the Position proportioning PID control at "Input 1_Control action" in Function block No. 51 in the Engineering mode.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized when the Open/Close output neutral zone is changed.

● Open/Close output differential gap [Setup Setting Mode: Setting group No. 55 (SnSS)]

Parameter symbol	Data range	Factory set value
yHS	0.1 to 5.0 % of output	1.0

To display the "Open/Close output differential gap," you need to set the parameters for the Position proportioning PID control at "Input 1_Control action" in Function block No. 51 in the Engineering mode.

● Action at feedback resistance (FBR) input error [Engineering Mode: Function block No. 55 (FnSS)]

Parameter symbol	Data range	Factory set value
ybR	0: Action depending on the value action at STOP 1: Control action continued	0

To display "Action at feedback resistance (FBR) input error," specify "Feedback resistance (FBR) input" at the time of order, AND "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Position proportioning PID control.

● Feedback adjustment [Engineering Mode: Function block No. 55 (FnSS)]

Parameter symbol	Data range	Factory set value
PoS	When the <MODE key is pressed and held for 5 seconds, Feedback adjustment is automatically started. AdJ: Adjustment end oPEn: During adjustment on the open-side CLoSE: During adjustment on the close-side Err: Adjustment error	AdJ

To display "Feedback adjustment," specify "Feedback resistance (FBR) input" at the time of order, AND "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Position proportioning PID control.

● Control motor time
[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
MoT	5 to 1000 seconds	10

To display the "Control motor time," you need to set the parameters for the Position proportioning PID control at "Input 1_Control action" in Function block No. 51 in the Engineering mode.

● Integrated output limiter
[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
oLA	0.0 to 200.0 % of control motor time 0.0: OFF	150.0

To display the "Integrated output limiter," you need to set the parameters for the Position proportioning PID control at "Input 1_Control action" in Function block No. 51 in the Engineering mode.

● Valve action at STOP
[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
VAL	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0

To display the "Valve action at STOP," you need to set the parameters for the Position proportioning PID control at "Input 1_Control action" in Function block No. 51 in the Engineering mode.

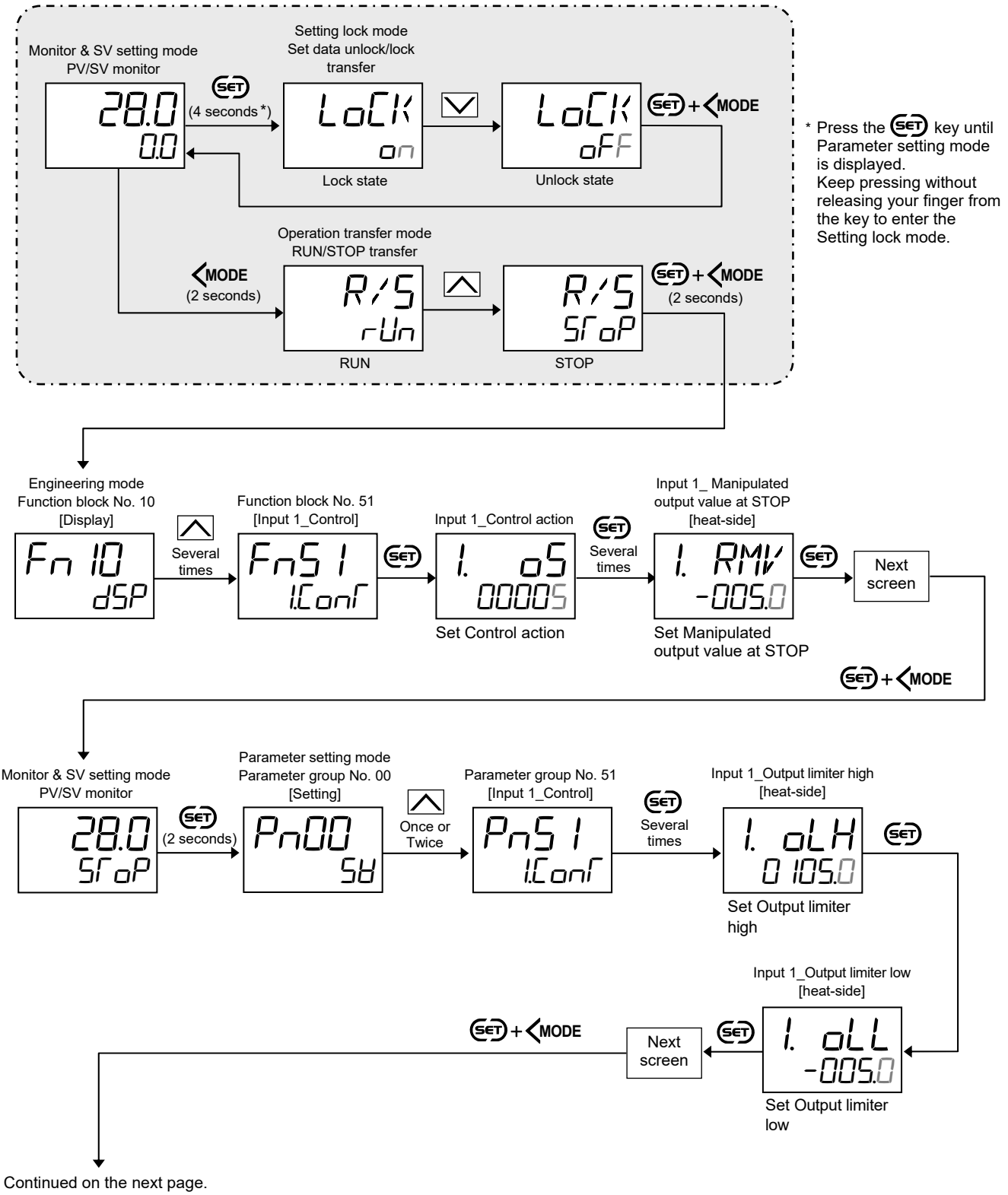
● Action at saturated output
[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
YASo	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0

To display "Action at saturated output," specify "Feedback resistance (FBR) input" at the time of order, AND "Input 1_Control action" (Function block No. 51 in Engineering mode) must be set to Position proportioning PID control.

■ Setting procedure

To enter the Engineering mode



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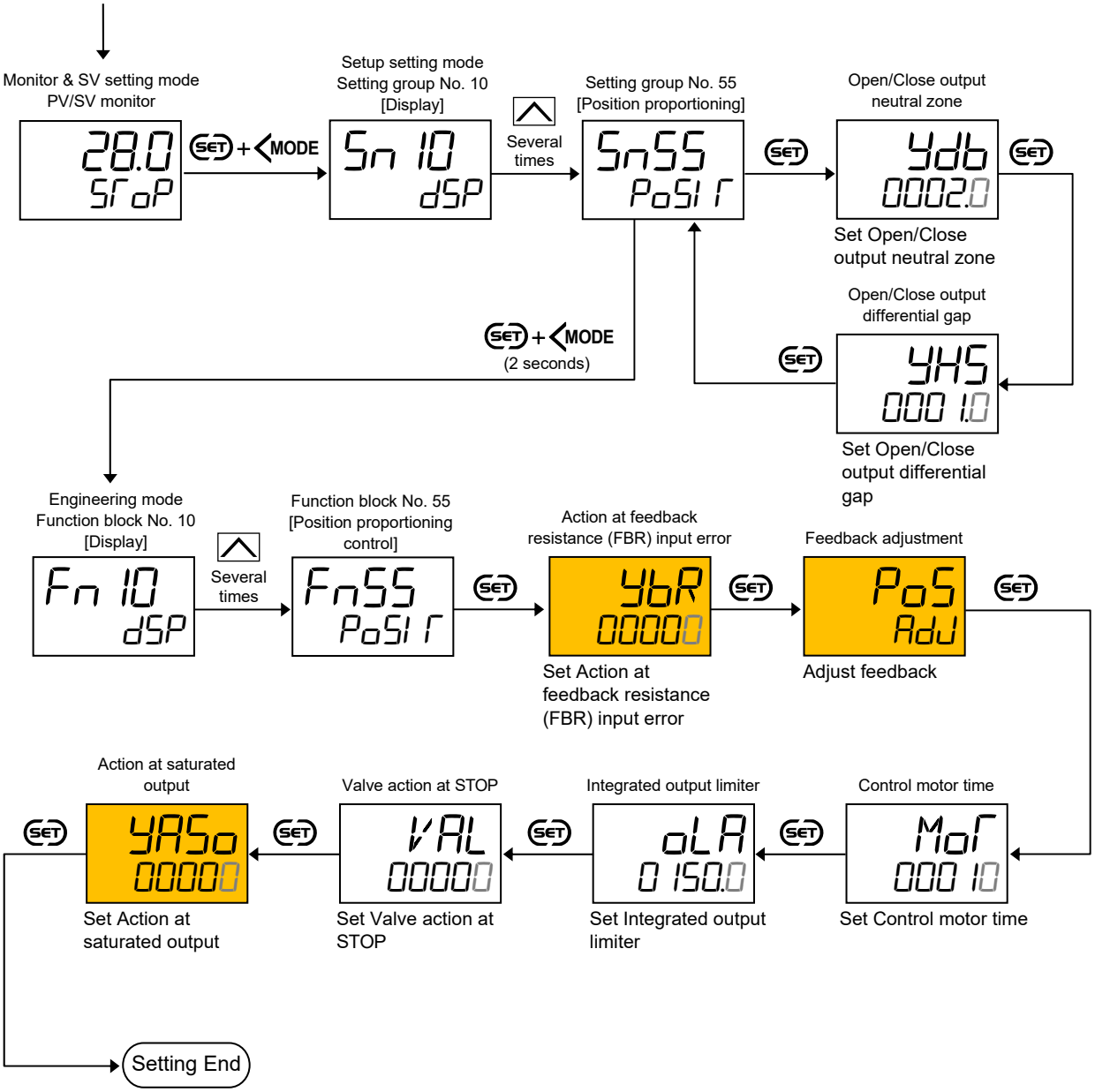


- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

8.9 Controlling with Manual Control

To conduct the Manual control, you need to select the Manual mode using the Auto/Manual transfer.
The Auto/Manual transfer can be made by a key operation, Digital input (DI) or communication (optional).

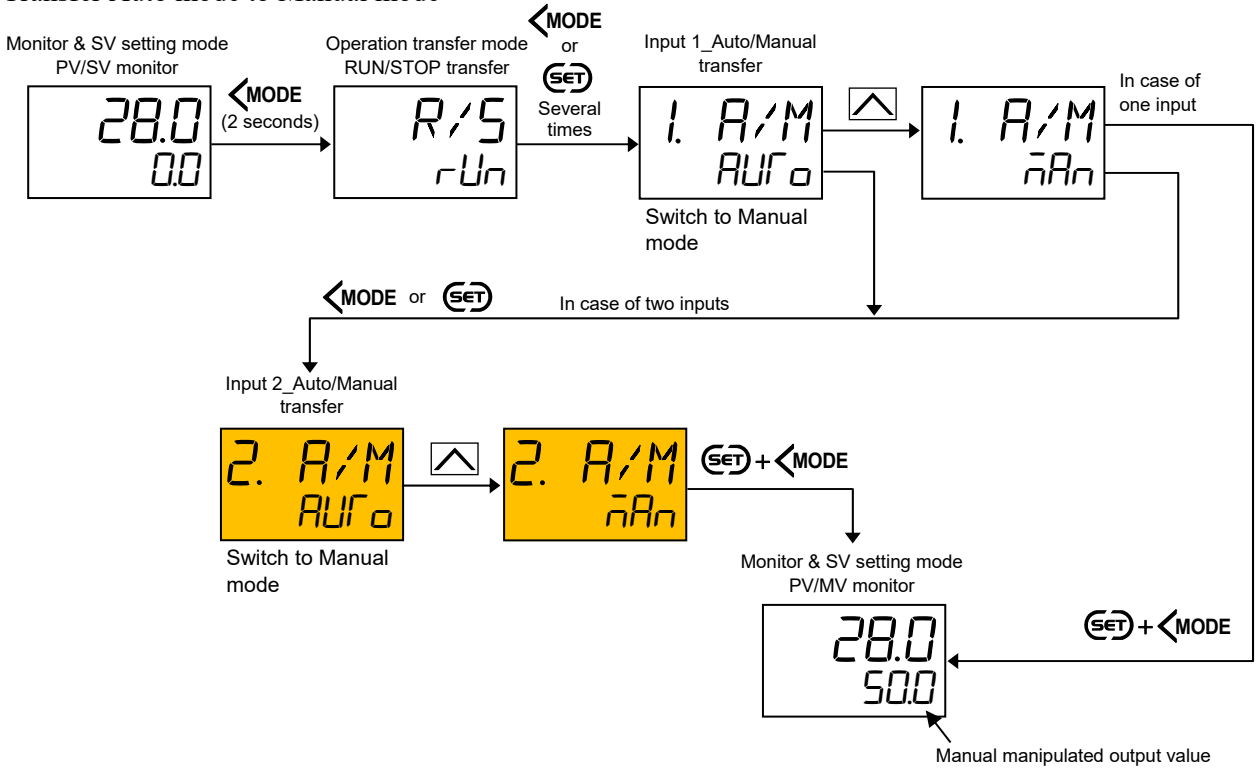
☞ For the detail of the Auto/Manual transfer through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.

☞ For the detail of the Manipulated output value (balanceless bumpless) associated with the Auto/Manual transfer, refer to **6.8 Suppressing Sudden Change in Output (Balanceless Bumpless) (P. 6-33)**.

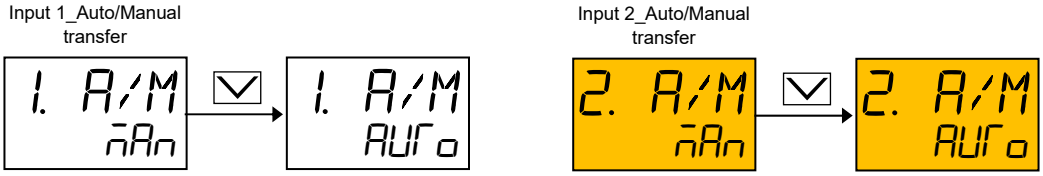
■ Setting procedure

● Selection by front key operation

Transfer Auto mode to Manual mode



Transfer Manual mode to Auto mode



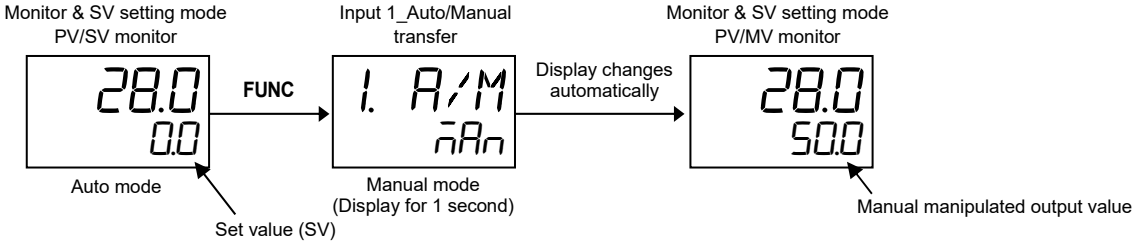
During the manual mode, the Manual (MAN) mode lamp is lit.
Refer to P. 8-59 for the Display position of the lamp.

● Changing the mode with the direct key (FZ400/900 only)

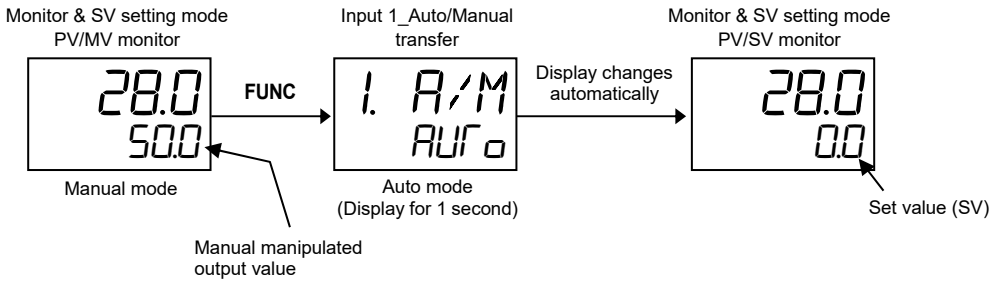
Assigning the “Auto/Manual transfer” function to the FUNC key facilitates the Auto/Manual switching. Each time FUNC key is pressed, Auto mode and Manual mode are toggled.

☞ For the “FUNC key assignment,” refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

Transfer Auto mode to Manual mode (Input 1_Auto/Manual transfer)



Transfer Manual mode to Autol mode (Input 1_Auto/Manual transfer)



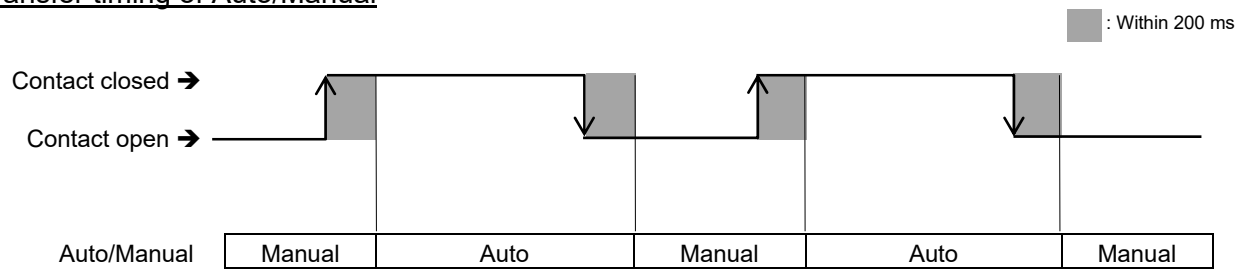
Selection of key action is possible from “Press once” and “Press and hold” to enable the switching. For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Auto/Manual using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

☞ For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Auto/Manual



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Auto/Manual transfer state

The table below shows the actual Auto/Manual modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

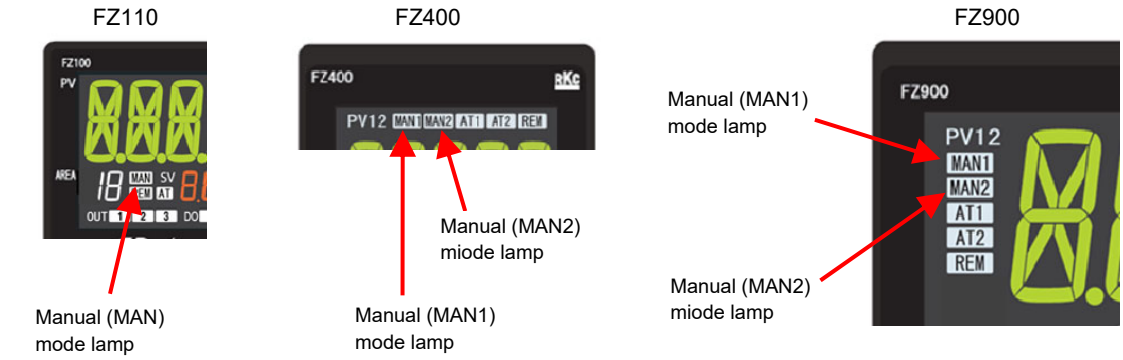
Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Auto mode	Auto mode	Auto mode
	Manual mode	Manual mode
Manual mode	Auto mode	
	Manual mode	

Priority to Manual mode

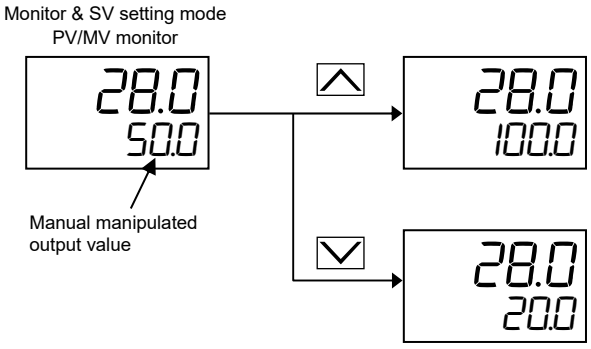
● Setting Manipulated output value in Manual mode

In the Manual mode, the Manipulated output value (MV) can be manually set.
Make sure the Manual mode lamp is on (the instrument is in the manual mode) before starting the operation.

[Position of the Manual mode lamp]



[Adjusting the output]

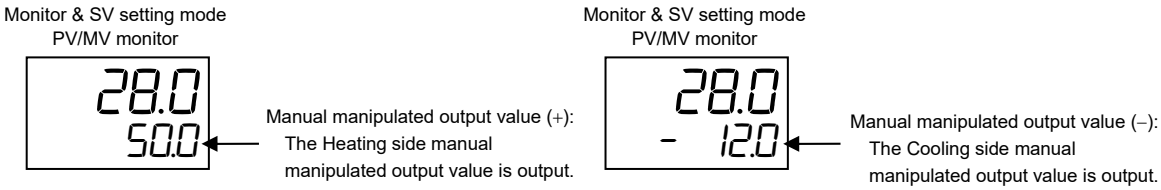


- ⌃ key: Increase the Manipulated output value (MV).
- ⌄ key: Decrease the Manipulated output value (MV).
- Press and hold the ⌃ key or ⌄ key makes numeric value change faster.

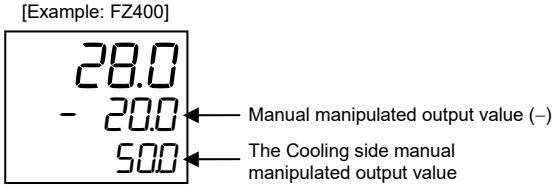
For Heat/Cool PID control:

When the Manual manipulated output is positive (+), the Heating side manual manipulated output value is output. When the Manual manipulated output is negative (–), the Cooling side manual manipulated output value is output.

When the Overlap is set on the instrument, the internally calculated value is output in the overlap range.

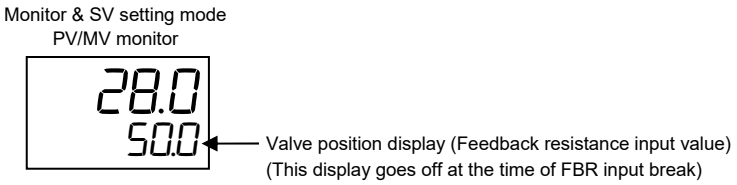


When the Manipulated output value is selected on FZ400/900, priority is given to the display of the Heating side manual manipulated output value.
When the Manual manipulated output value enters the negative range, the output is transferred to the Cooling side manual manipulated output value.

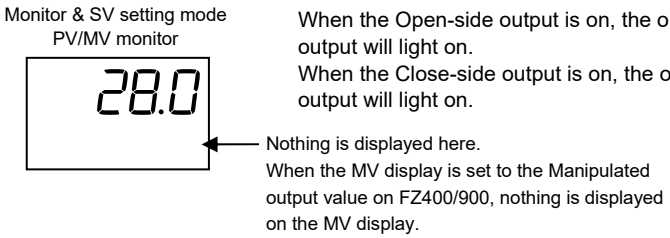


For Position proportioning PID control:

- When there is a Feedback resistance (FBR) input, the valve position can be set by ⋀ or ⋁ key. When the Feedback resistance (FBR) input is disconnected, the input display of the Feedback resistance (FBR) goes off.



- When there is no Feedback resistance (FBR) input, the output becomes ON while the ⋀ key [Open-side output] or ⋁ key [Close-side output] is pressed and the output becomes OFF when your finger is removed from the key. MV is hidden.



For ON/OFF action:

Either Output limiter high or Output limiter low will be output.

[Condition for output]

- The Output limiter low will be output when the Manual manipulated output value ≤ the Output limiter low (or 0.0 %.)
- The Output limiter high will be output when the Manual manipulated output value > the Output limiter low (or 0.0 %.)

■ Parameter setting

● Input 1_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. A/M	AUTo: Auto mode mAn: Manual mode	AUTo

● Input 2_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. A/M	AUTo: Auto mode mAn: Manual mode	AUTo

To display “Auto/Manual transfer,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

8.10 Using Remote Setting Input

The Remote setting input uses the external signal (Input 2) as the Input 1_set value (SV).
To use the Remote setting input, the mode must be switched to the Remote mode with the Remote/Local transfer. The Remote/Local transfer can be made by a key operation, Digital input (DI) or Communication (optional).

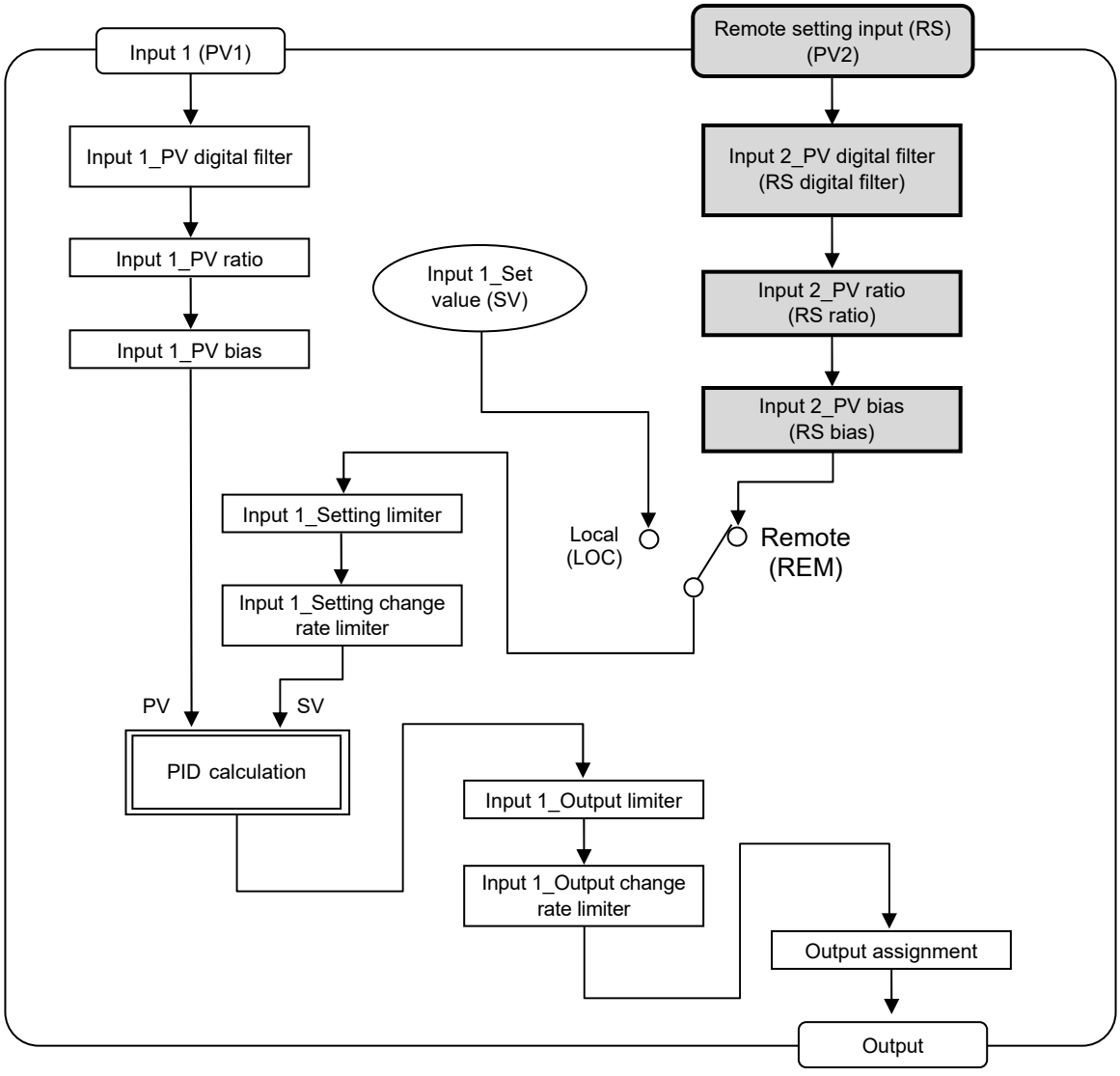
📖 To use the Remote setting input function (on FZ400/900), you need to specify the "Remote setting input" at the time of order, or configure the "Measured input 2" (that must be also specified at the time order) to the Remote setting input at "Select function for input 2" in Function block No. 58 in the Engineering mode.
Concerning FZ110, "Remote settingt input" must be specified at the time of order.

📖 The signal type of the Remote setting input can be set at "Input 2_Input type" in Function block No. 22 in the Engineering mode.

☞ For the detail of the Remote/Local transfer through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.

■ Description of function

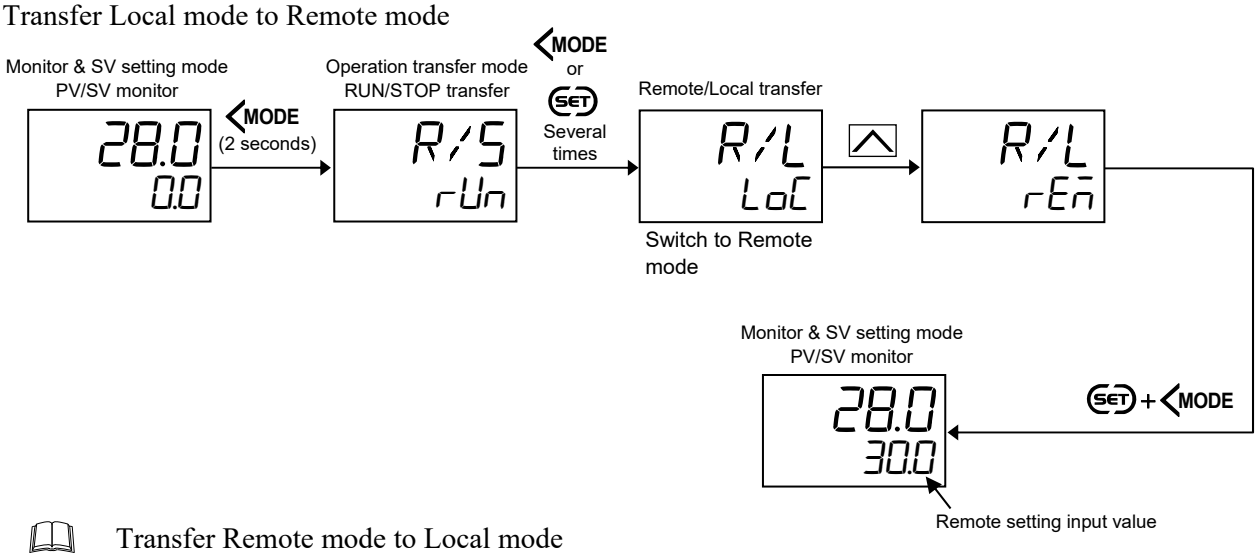
[Description of Remote setting input]



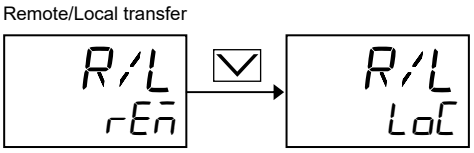
■ Mode transfer

● Selection by front key operation

Transfer Local mode to Remote mode



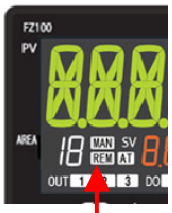
Transfer Remote mode to Local mode



During the Remote mode, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]

FZ110



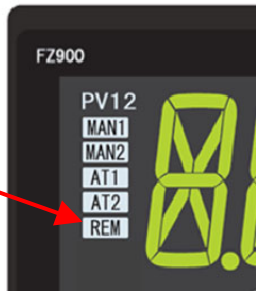
Remote (REM) mode lamp

FZ400

Remote (REM) mode lamp

FZ900

Remote (REM)
mode lamp



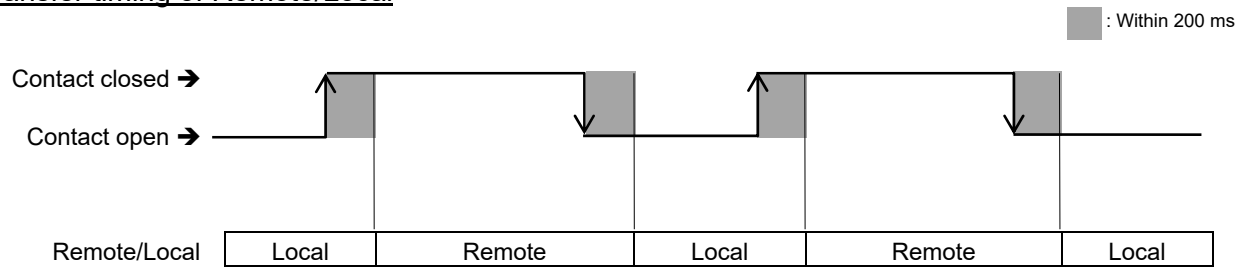
For FZ400/900, the FUNC key may be configured to switch between Remote and Local.
For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Remote/Local using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

☞ For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Remote/Local



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Remote/Local transfer state

The table below shows the actual Remote/Local modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Remote mode	Remote mode	Remote mode	
	Local mode	Local mode	Priority to Local mode
Local mode	Remote mode		
	Local mode		

■ Parameter setting

● Remote/Local transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "Remote setting input" is selected at Select function for input 2 LoC: Local mode rEm: Remote mode	LoC

📖 To display "Remote/Local transfer" (on FZ400/900), you need to specify the "Remote setting input" at the time of order, or configure the "Measured input 2" (that must be also specified at the time order) to the Remote setting input at "Select function for input 2" in Function block No. 58 in the Engineering mode.
Concerning FZ110, "Remote settingt input" must be specified at the time of order.

● Input 2_Input type [Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. INP	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PL II 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC ● When Measured input 2 is selected for FZ400/900: 0 to 24 * ● When Remote setting input is selected for FZ400/900: 15 to 24 ● When Remote setting input is selected for FZ110: 15 to 22	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17

* When the "Measured input 2" is specified at the time of order, the Remote setting input type is selectable from TC and RTD by selecting the Remote setting input at "Select function for input 2." **When the Remote setting input is set to TC or RTD, set "1: Downscale" at the "Input 2_Burnout direction" in Function block No. 22 in the Engineering mode for safety reason.**

📖 To display Input 2_Input type, "Measured input 2" or "Remote setting input" must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

📖 Input 2_Input type is not displayed if "No function" is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the input type is changed.

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

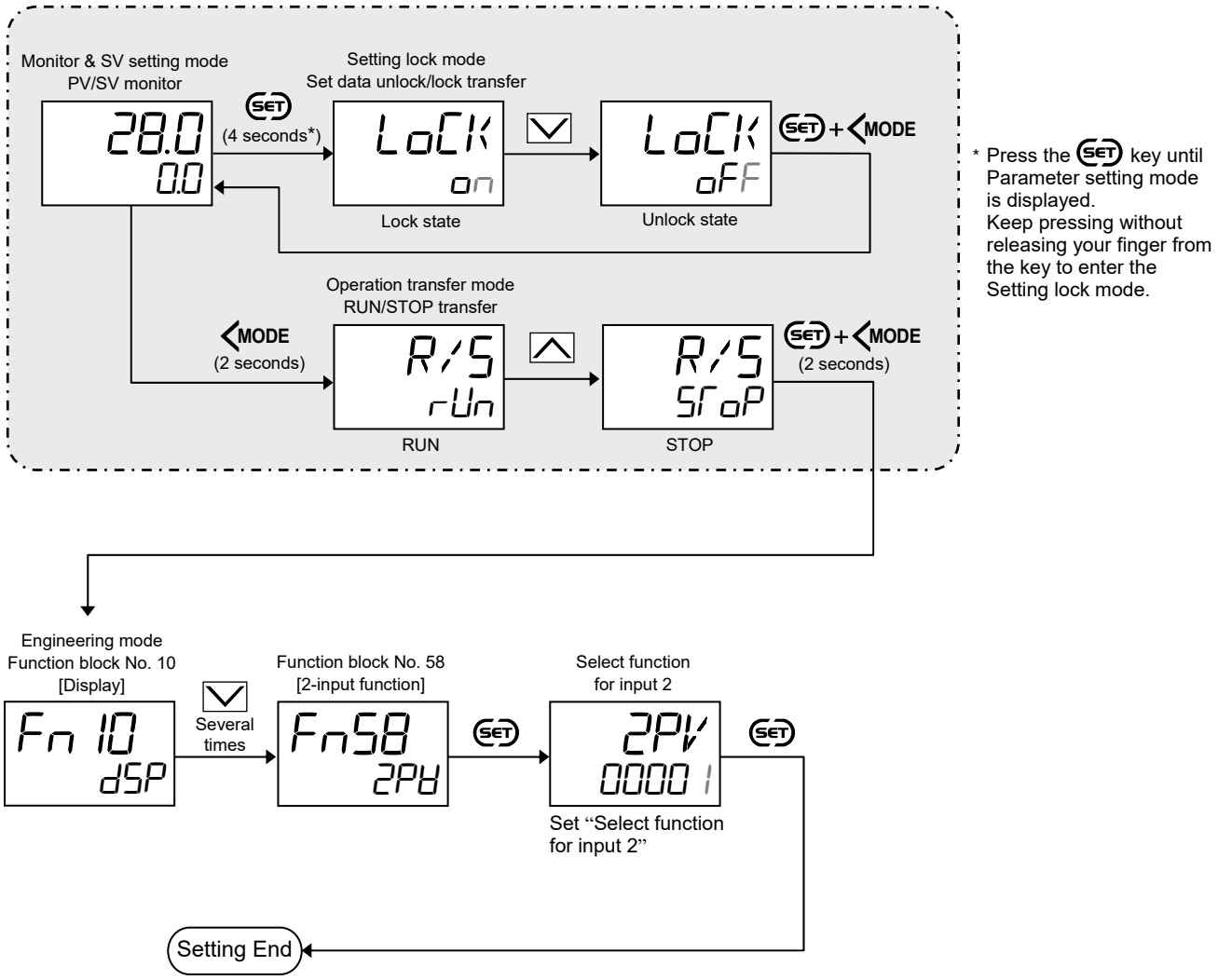
Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

■ Setting procedure

To enter the Engineering mode



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

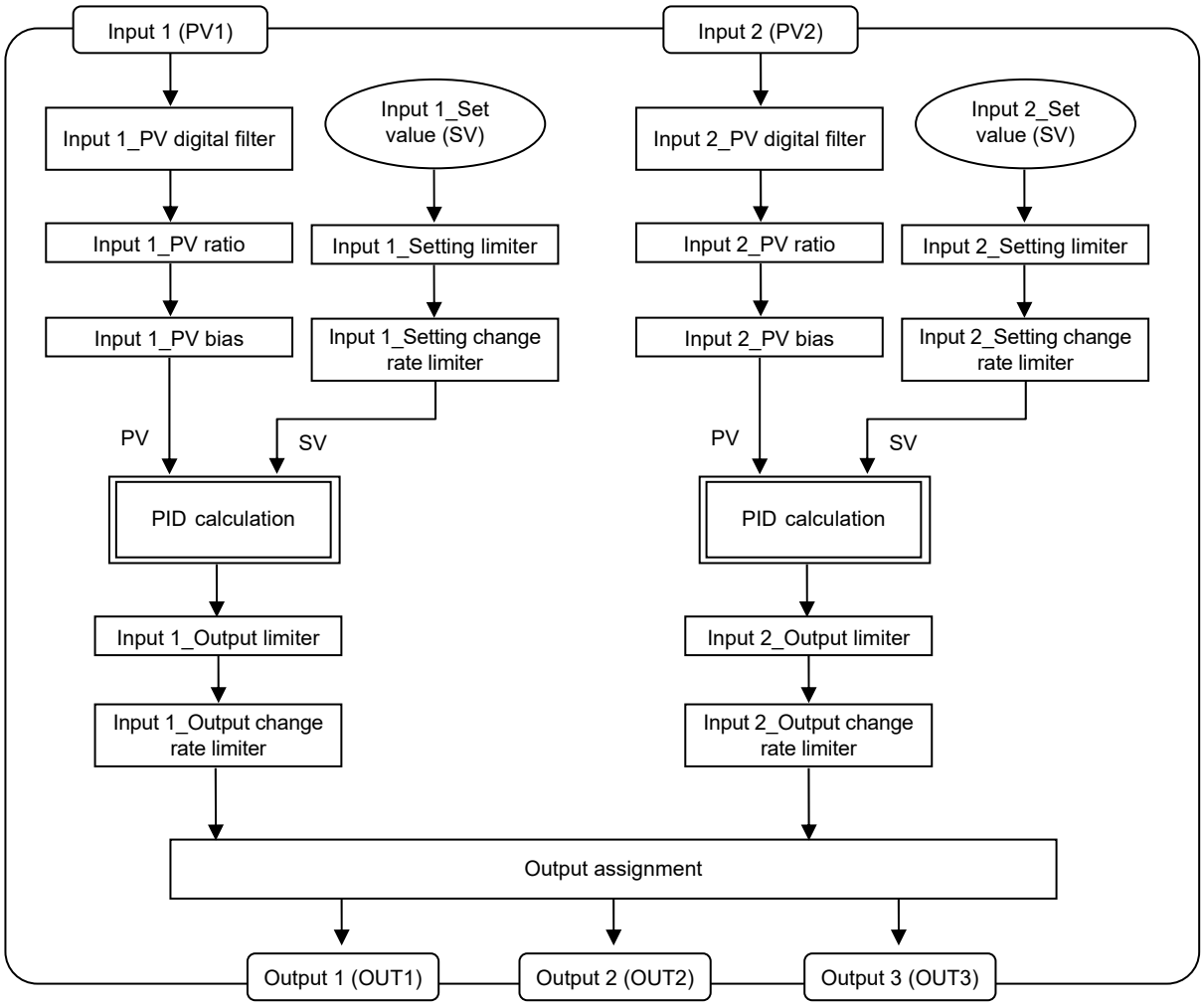
8.11 Executing 2-Loop Control [FZ400/900]

When two inputs are supplied on the FZ400/900, independent dual loop control can be performed on Input 1 and Input 2.

■ Description of function

The 2-loop control enables two single loop control on a single instrument.
Input 1 and Input 2 are independent from each other and setting must be done separately on each channel.

[Description of 2-loop control]

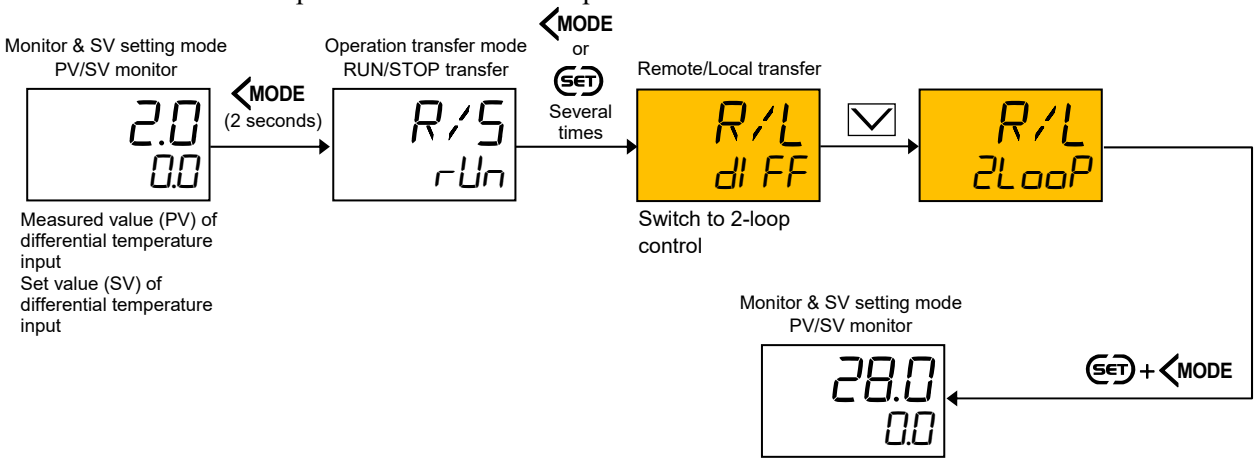


☞ The 2-loop control and the Differential temperature control are switchable. For the detail of the Differential temperature control, refer to **8.12 Executing Differential Temperature Control [FZ400/900] (P. 8-70)**.

■ Mode transfer

● Selection by front key operation

Transfer Differential temperature control to 2-loop control

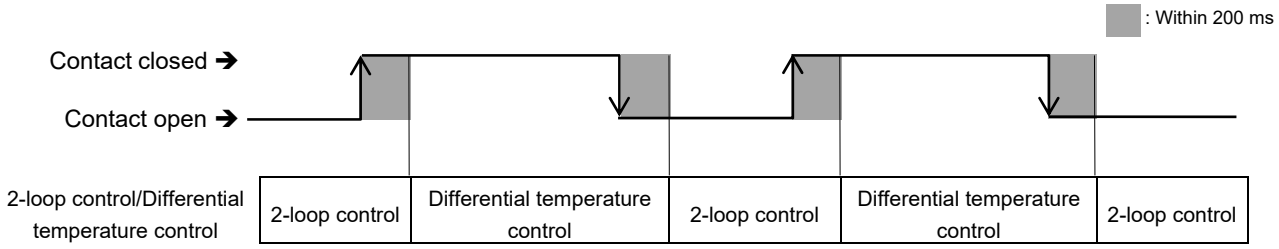


● Switching the mode with Digital Input (DI)

To switch the Remote/Local (2-loop control/ Differential temperature control) using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

☞ For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Remote/Local(2-loop control/ Differential temperature control)



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Remote/Local transfer (2-loop control/ Differential temperature control) state

The table below shows the actual 2-loop control/ Differential temperature control status and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Differential temperature control	Differential temperature control	Differential temperature control	
	2-loop control	2-loop control	Priority to 2-loop control
2-loop control	Differential temperature control		
	2-loop control		

■ Parameter setting

● Remote/Local transfer (2-loop control/ Differential temperature control) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "2-loop control/Differential temperature control" is selected at Select function for input 2 2LooP: 2-loop control dI FF: Differential temperature control	2LooP

To display "Remote/Local transfer" (2-loop control/Differential temperature control), specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

For the detail of Select function for input 2, refer to P. 8-66.

8.12 Executing Differential Temperature Control [FZ400/900]

Input 1 is controlled by setting a temperature difference between Input 1 and Input 2.

■ Description of function

Differential temperature control is conducted, while Input 1 is used as Control temperature and Input 2 is used as Reference temperature.
Temperature difference is set on Input 1 against Input 2, and the Input 1 is controlled so that the set temperature difference could be obtained. As the input 2 can also be controlled, the differential temperature control is possible while keeping the reference temperature constant.
This function is available only on FZ400/900.

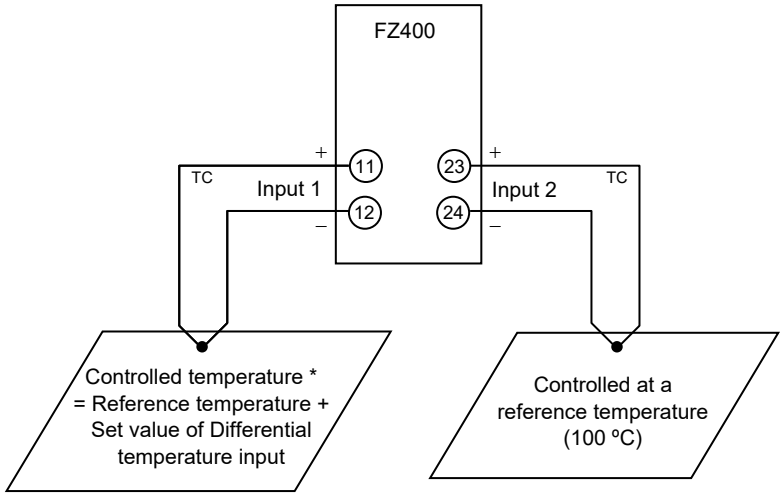
In case of Differential temperature control, the Input 1_Set value (SV) is not used for control. The Input 1_Monitor Set value (SV)* of is used in actual control.

* Input 1_Monitor Set value (SV) = Controlled temperature
= Input 2_Measured value (PV) [Reference temperature] + Set value of Differential temperature input

[Example] Control is done with the Reference temperature (PV of Input 2) at 100 °C, and the Input 1 is controlled by the Differential temperature.

* Example of Controlled temperature when the set value of Differential temperature input is set as follows.

Set value of Differential temperature input	Controlled temperature
–50 °C	50 °C
0 °C	100 °C
100 °C	200 °C



The sensor type used on Input 1 and Input 2 can be different respectively.

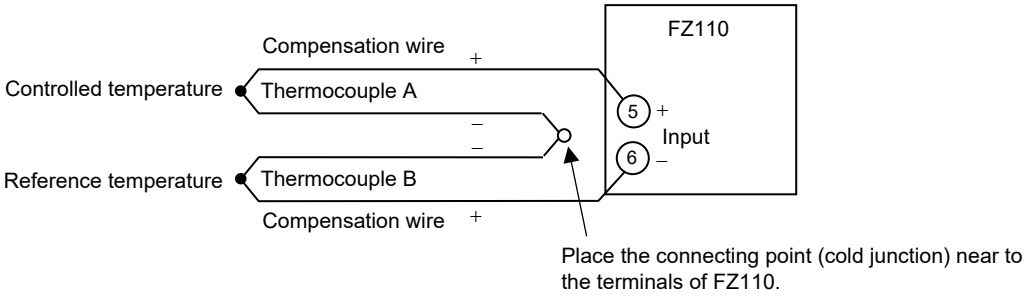
[Setting items]

- Remote/Local transfer (2-loop control/ Differential temperature control) [Operation trandfer mode]
  Transfer to Differential temperature control
- Input 2_Set value (SV) [Parameter setting mode: Parameter group No. 00]:
  Setting Reference temperature
- Set value of Differential temperature input [Parameter setting mode: Parameter group No. 00]:
  Setting Differential temperature
- Select function for input 2 [Engineering mode: Function block No. 58]:
  Select 2-loop control/Differential temperature control
- Other items required for controlling Input 1 and Input 2 (e.g. setting PID values)

The 2-loop control and the Differential temperature control are switchable. For the detail of the 2-loop control, refer to **8.11 Executing 2-Loop Control [FZ400/900] (P. 8-67)**.

Differential temperature control can be conducted even if the instrument has only one input.
Wiring as follows may be an example of Differential temperature control. In this case, Reference temperature cannot be controlled. Prepare a sample (another controller) if the Reference temperature also needs to be controlled.
In case of the Differential temperature control with this wiring, such a setting as Remote/Local transfer (2-loop control/Differential temperature control) is not required. Control is conducted by a single loop.

[Wiring examle]



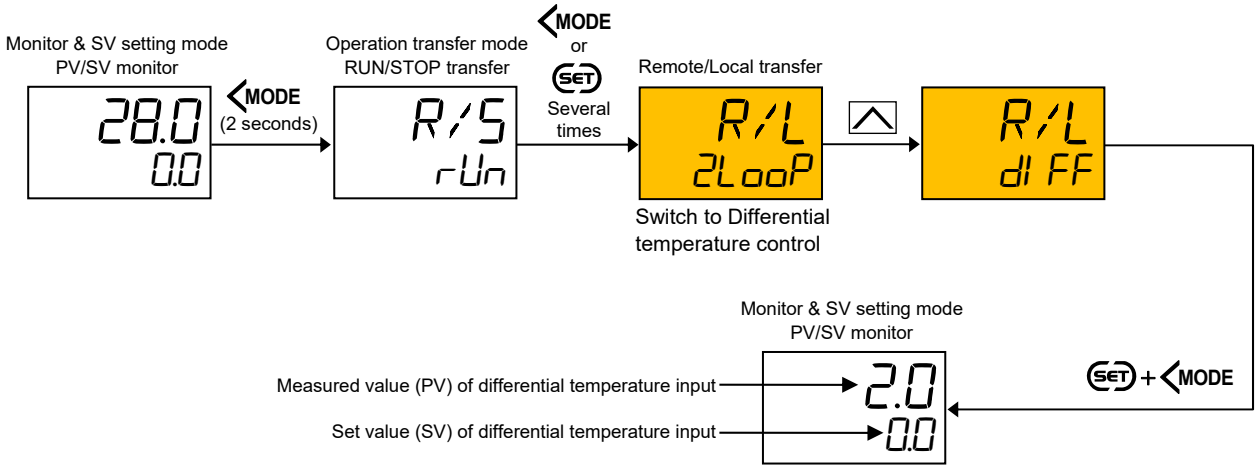
Prerequisites for control

- Both thermocouples must be of the same type.
- Setting of Temperature compensation calculation should be “0: No Temperature compensation calculation”
  In the above example, the setting of “Input 1_Temperature compensation calculation” (Function block No. 21 in the Engineering mode) should be “0: No Temperature compensation calculation”

■ Mode transfer

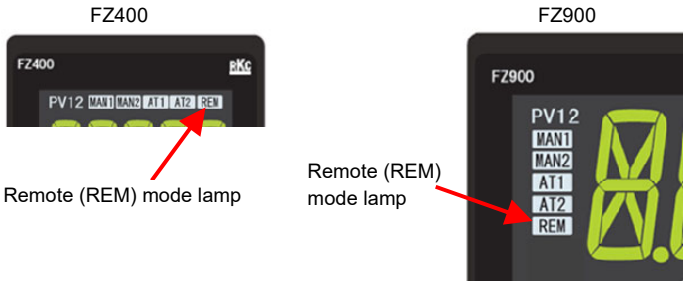
● Selection by front key operation

Transfer 2-loop control to Differential temperature control



During the Differential temperature control, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]



For FZ400/900, the FUNC key may be configured to switch between 2-loop control and Differential temperature control. For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

Mode transfer by other than the front key should be referred to **8.11 Executing 2-Loop Control [FZ400/900] (P. 8-67)**.

■ Parameter setting

● Remote/Local transfer (2-loop control/ Differential temperature control) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "2-loop control/Differential temperature control" is selected at Select function for input 2 2LooP: 2-loop control dIFF: Differential temperature control	2LooP

To display "Remote/Local transfer" (2-loop control/Differential temperature control), specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Set value (SV) [Parameter Setting Mode: Parameter group No. 00 (Pn00)]

Parameter symbol	Data range	Factory set value
2. SV	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0

To display "Input 2_Set value (SV)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Set value (SV) of differential temperature input [Parameter Setting Mode: Parameter group No. 00 (Pn00)]

Parameter symbol	Data range	Factory set value
dSV	−(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0

To display "Set value (SV) of differential temperature input," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, and Remote/Local transfer must be select Differential temperature control.

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

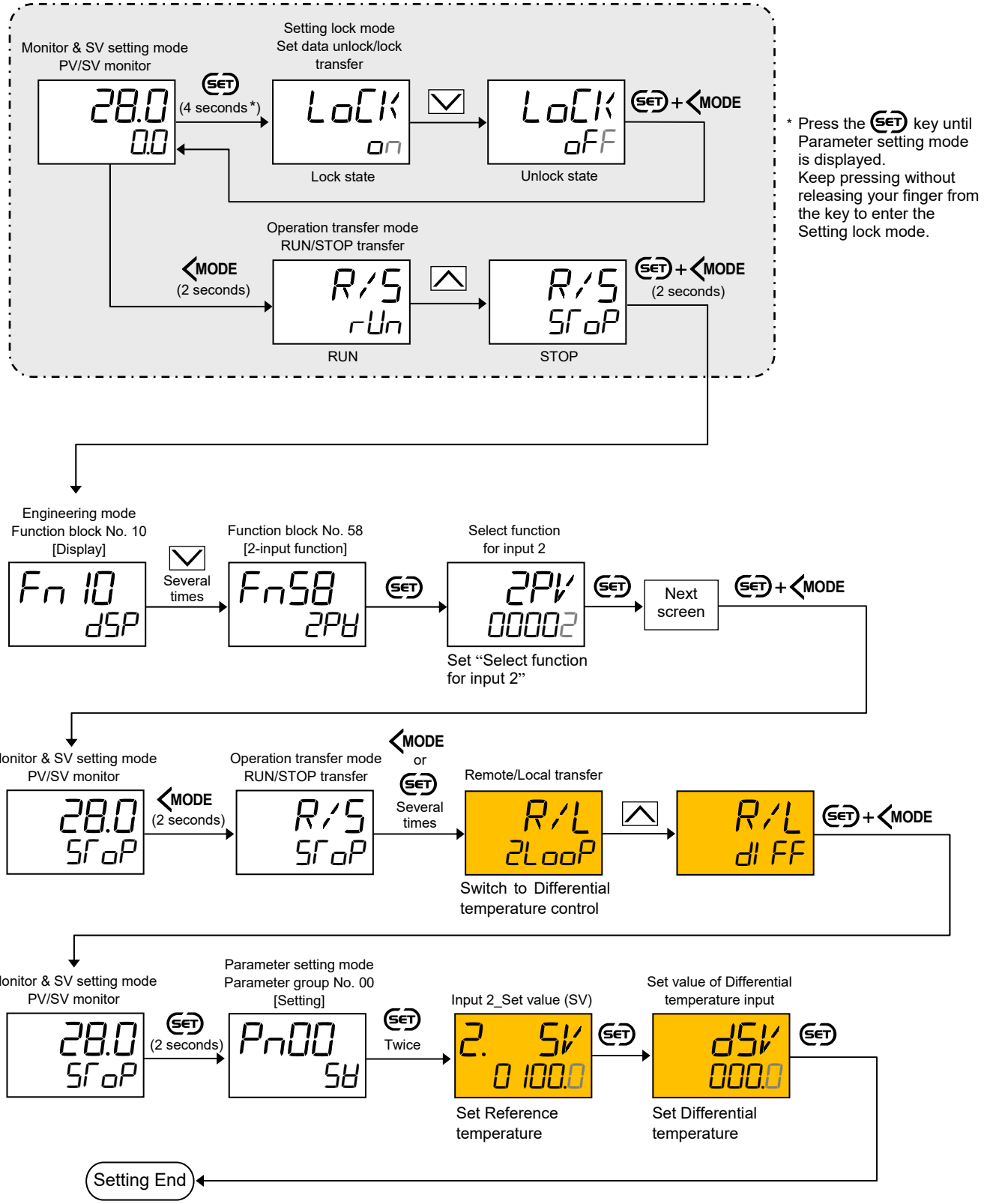
Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

■ Setting procedure

To enter the Engineering mode



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

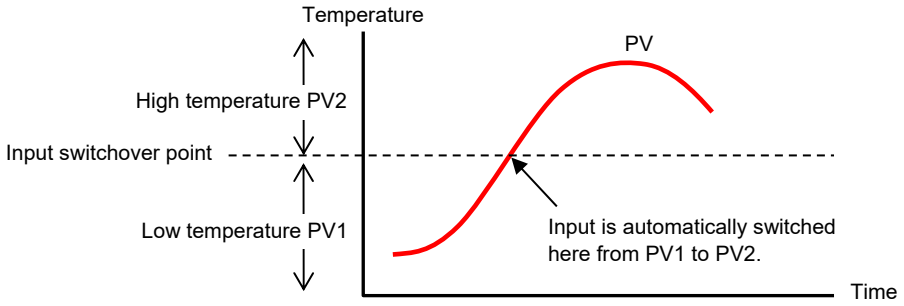
8.13 Executing Control with PV select [FZ400/900]

The Control with PV select is a function to control by switching between two inputs for high and low temperature ranges when two different sensors are used in the single controlled object.

■ Description of function

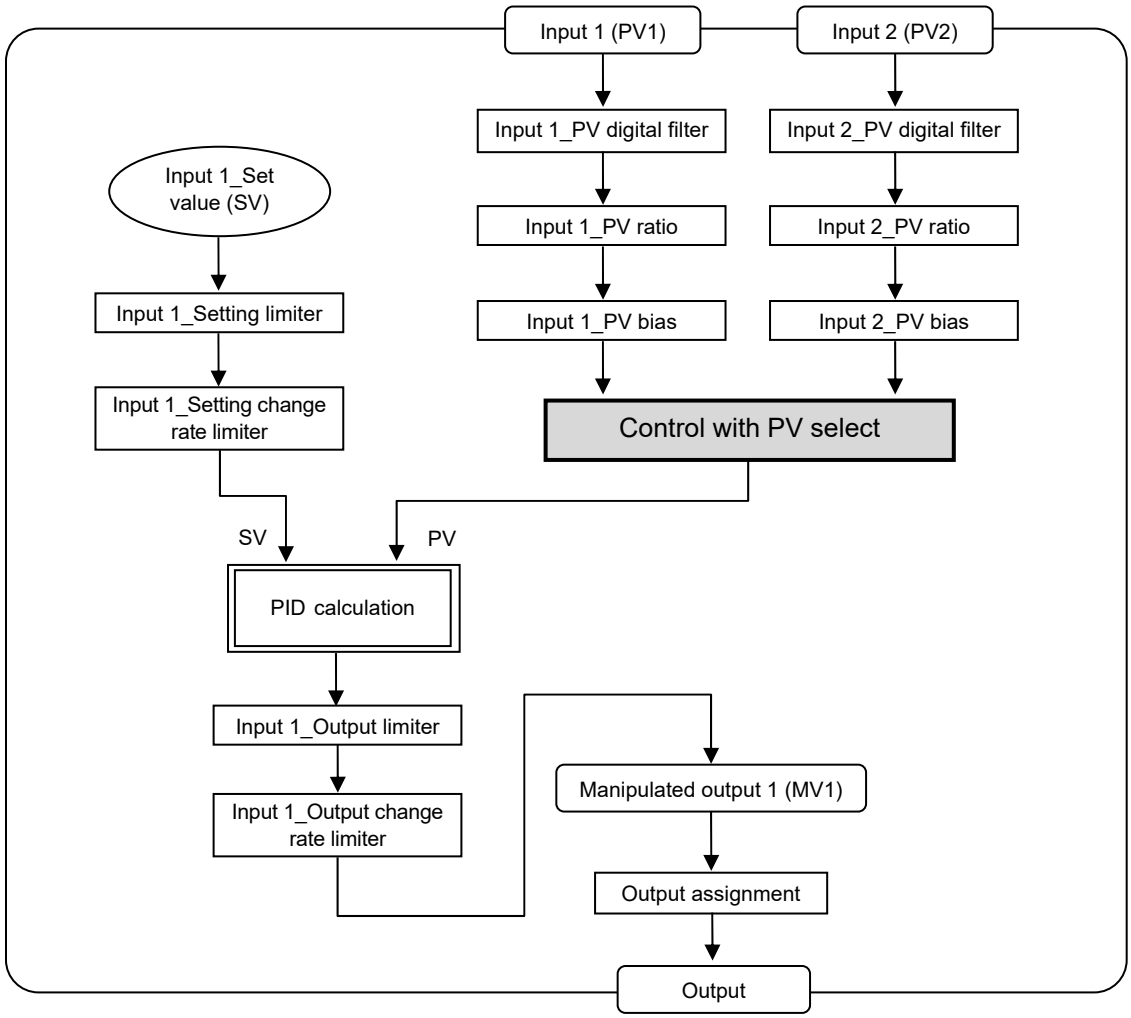
In the Control with PV select, two inputs are used by switching between them: Input 1 (for low temperature range as PV1) and Input 2 (for high temperature range as PV2). Parameters on the Input 1 are used for control computation. Output is also provided on the Input 1 side as Manipulated output 1 (MV1).

[Pictorial explanation of Input switchover]



There are two ways to switch between Input 1 (PV1) and Input 2 (PV2): Switch using the set value and switch by using signal (key operation, digital input, and communication).

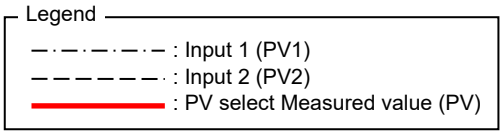
[Description of Control with PV select]



● Switching by Set value

The set value (PV select transfer level) is set and used as a trigger for switching between Input 1 (PV1) and Input 2 (PV2). When this set value is exceeded, the present input is transferred to the other.
When the PV select transfer time is set, the transfer action takes place in the set period correcting the input.

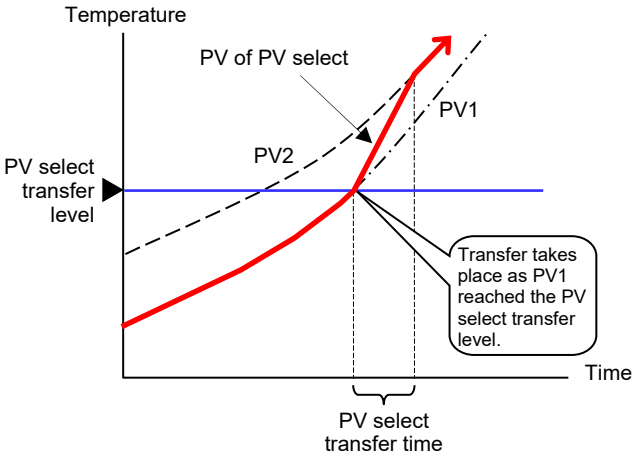
[Direction of input switchover]
At temperature rise: PV1 to PV2
At temperature fall: PV2 to PV1



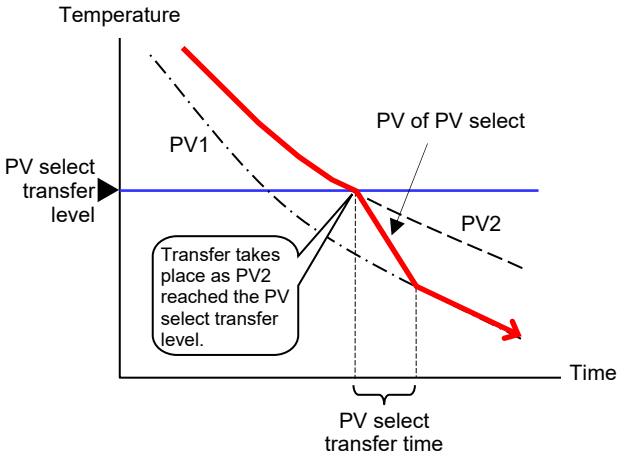
• When PV1 < PV2

When the PV select transfer time is set

<At temperature rise>

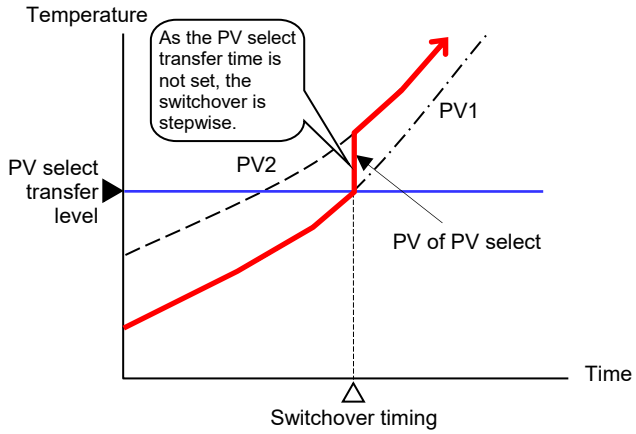


<At temperature fall>

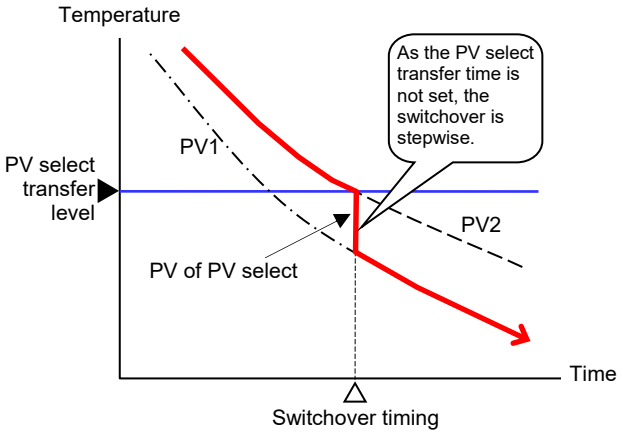


When the PV select transfer time is not set (Set value: 0.0)

<At temperature rise>



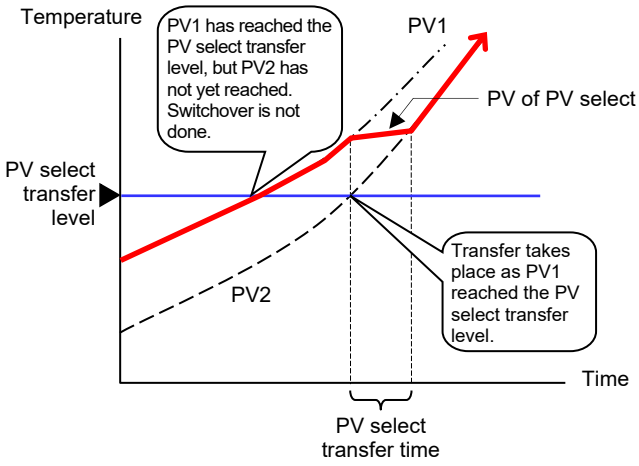
<At temperature fall>



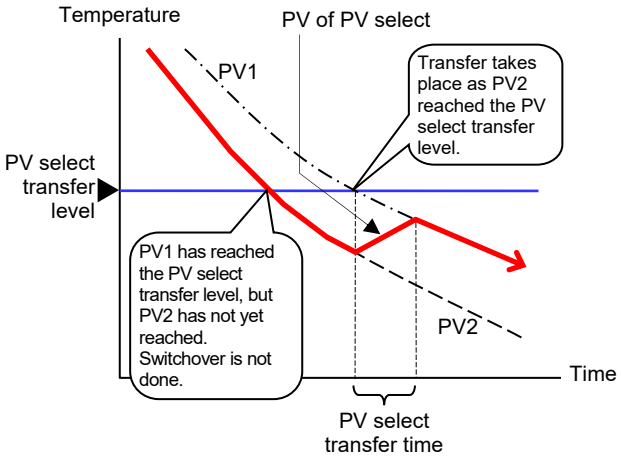
- When PV1 > PV2

When the PV select transfer time is set

<At temperature rise>

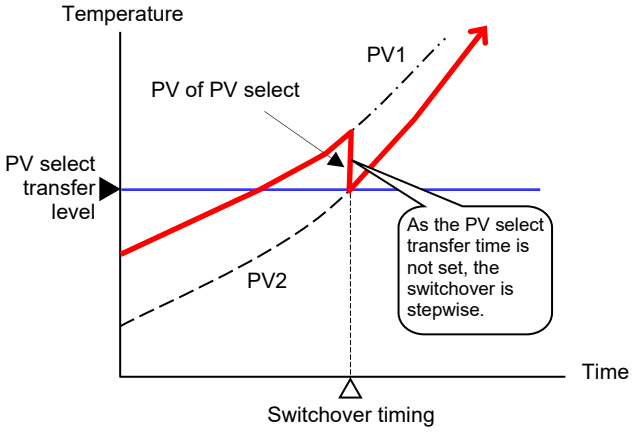


<At temperature fall>

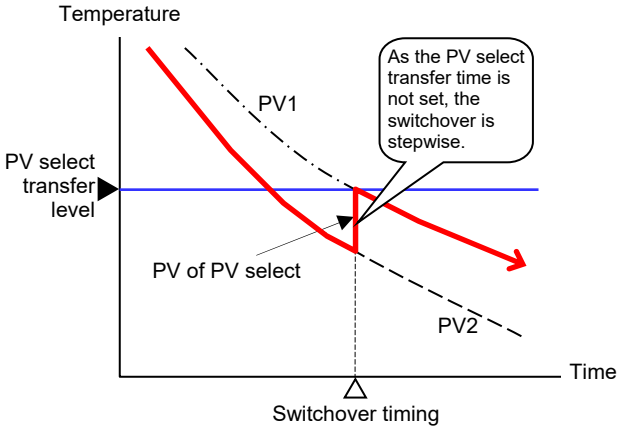


When the PV select transfer time is not set (Set value: 0.0)

<At temperature rise>



<At temperature fall>



● Switchover by signal (key operation, digital input, and communication)

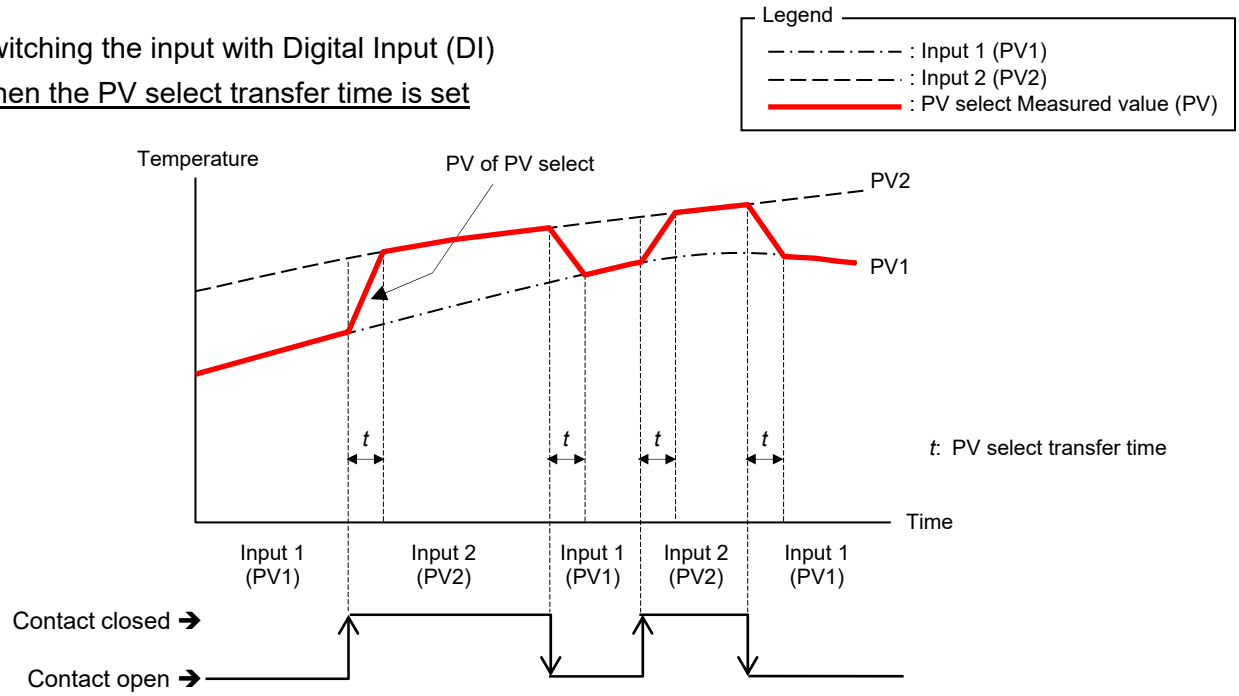
The switchover between Input 1 (PV1) and Input 2 (PV2) is done by using key operation, digital input or communication.
When the PV select transfer time is set, the transfer action takes place in the set period correcting the input.

In the case of switchover by the signal (key operation, digital input, or communication), there are no restrictions on the switchover direction of the inputs whether the temperature is on the rise or on the decline.

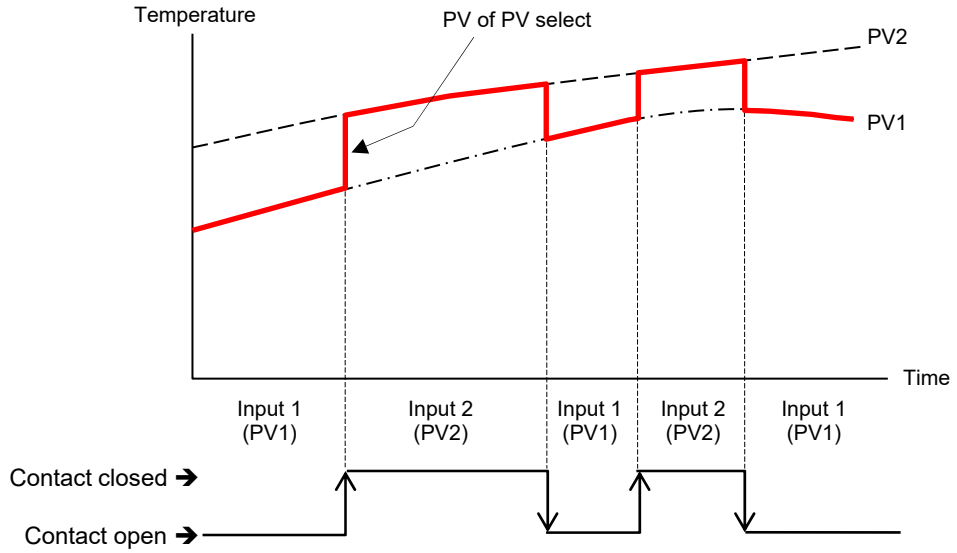
For the detail of the input switchover through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.

- Switching the input with Digital Input (DI)

<u>When the PV select transfer time is set</u>

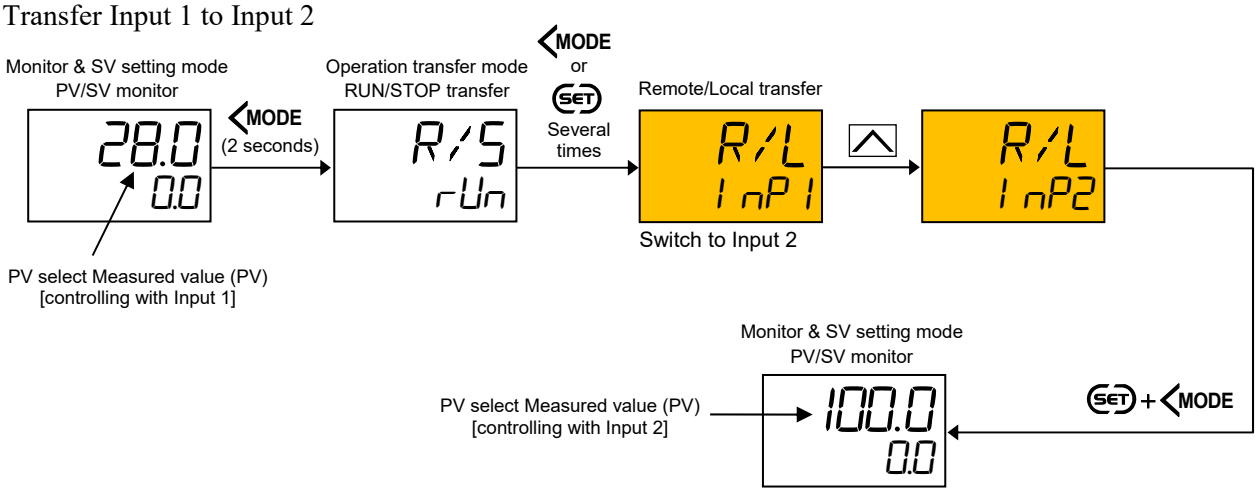


<u>When the PV select transfer time is not set (Set value: 0.0)</u>

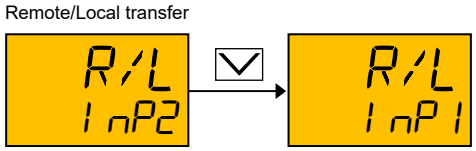


- Selection by front key operation

Transfer Input 1 to Input 2



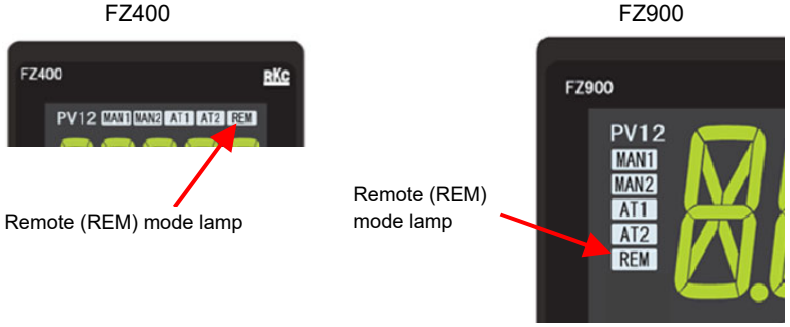
Transfer Input 2 to Input 1



During the switchover by the set value (PV select transfer level), Remote/Local transfer (PV switchover) is not possible, but the transfer status can be checked on the Remote/Local transfer (PV switchover) screen to see if the control is done by Input 1 or Input 2.

The Remote (REM) mode lamp lights on when the “Input 2 is used” as the Measured value (PV) of the PV select and “when Input 1 is switched to Input 2.” When “Input 1 is used” and “when Input 2 is switched to Input 1,” the Remote (REM) mode lamp goes off.

[Position of the Remote mode lamp]



For FZ400/900, the FUNC key may be configured to switch between Input 1 and Input 2.
For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

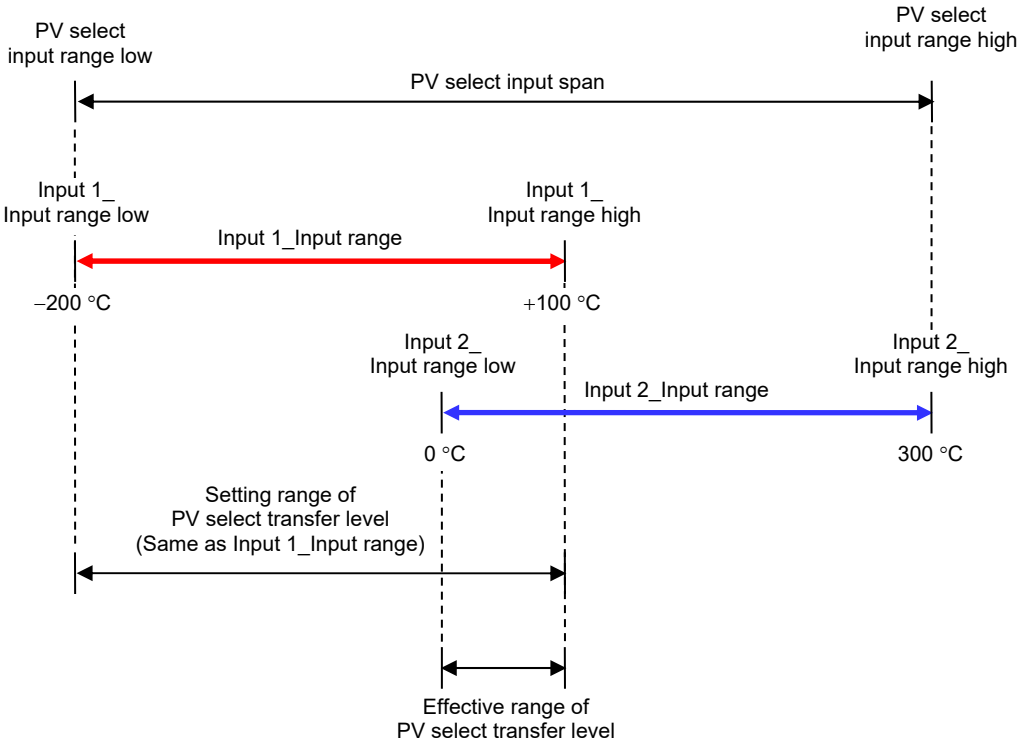
Input range and input span of the PV select

The “PV select input span ,” the “PV select input range high” and the “PV select iput range low” mean “Input span,” “Input range high” and “Input range low” at the time of Control with PV select respectively.

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



In the above example, the effective range of the PV select transfer level is 0 to 100 ºC. This means that the action when the PV select transfer level is set somewhere between −200 ºC and 0 ºC is equal to the action of the 0 ºC setting.

When the input is transferred after the start of the Startup tuning (ST), the ST will be aborted. In the case of Autotuning (AT), if the input is transferred after the output has been transferred, the AT will be aborted.

When either one of Input 1 (PV1) or Input 2 (PV2) is disconnected, the PV select transfer time will be invalid.

■ Parameter setting

● Remote/Local transfer (Control with PV select) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "Control with PV select" is selected at Select function for input 2 InP1: Input 1 InP2: Input 2	InP1

To display "Remote/Local transfer" (Control with PV select), specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Control with PV select.

When "Switching by level" is selected at "Selection of PV select trigger," the parameter becomes display only.

● PV select transfer level [Setup Setting Mode: Setting group No. 58 (Sn58)]

Parameter symbol	Data range	Factory set value
2PV.LV	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_Input range high

To display "PV select transfer level," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Control with PV select.

● PV select transfer time [Setup Setting Mode: Setting group No. 58 (Sn58)]

Parameter symbol	Data range	Factory set value
2PV.TM	0.0 to 100.0 seconds	0.0

To display "PV select transfer time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Control with PV select.

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

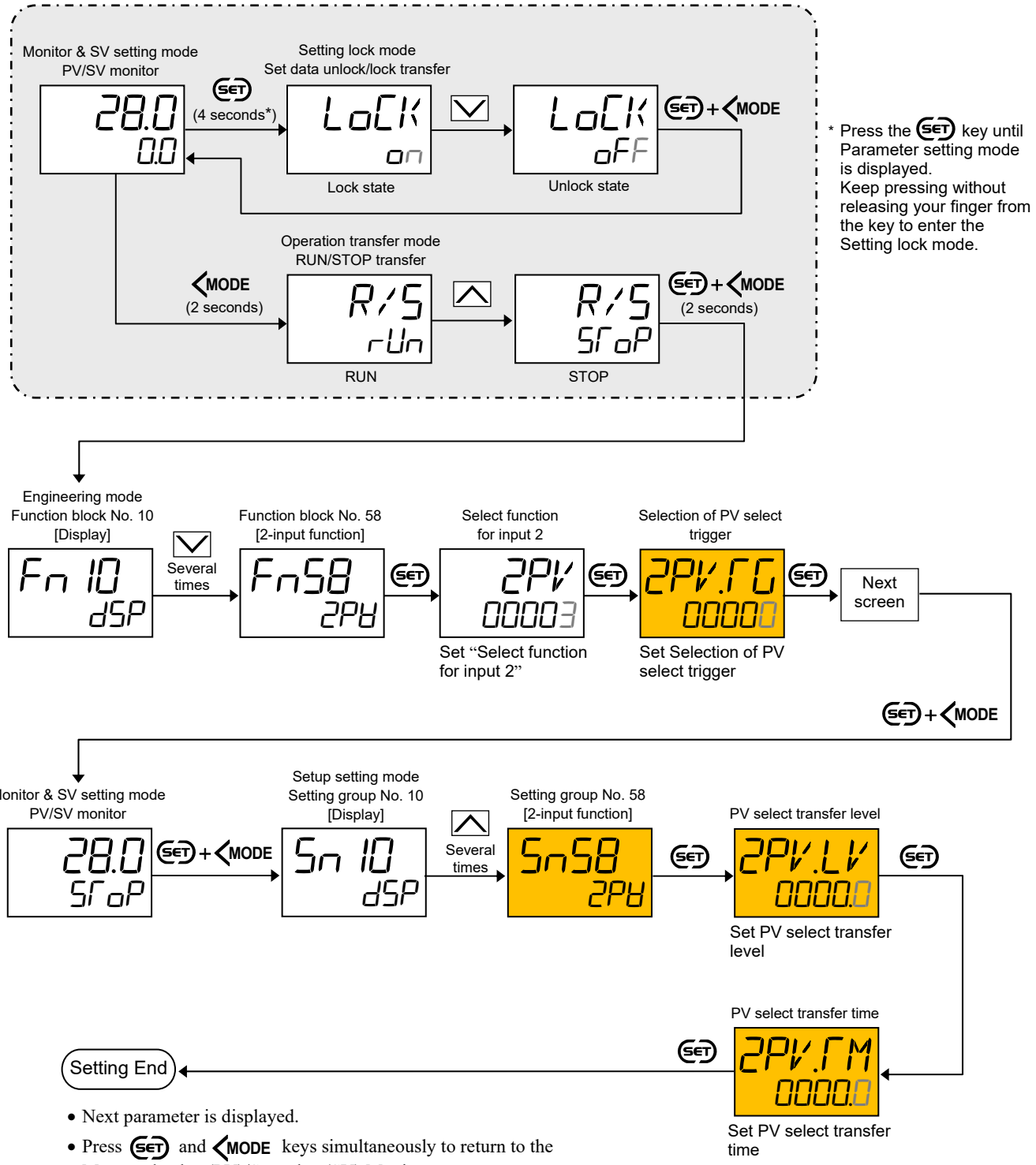
● Selection of PV select trigger [Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV.TG	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0

To display "Selection of PV select trigger," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Control with PV select.

■ Setting procedure

To enter the Engineering mode



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

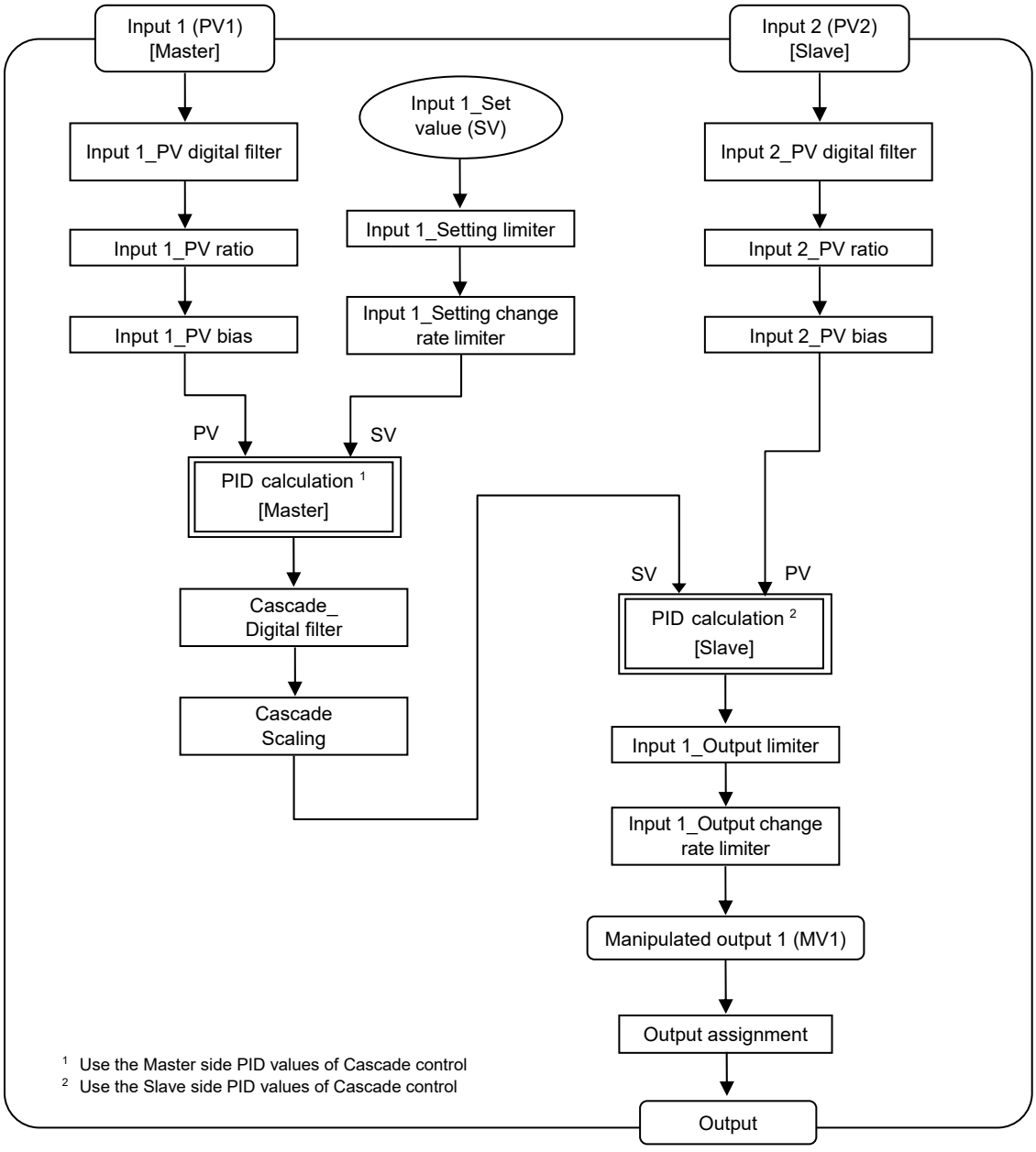
8.14 Executing Cascade Control [FZ400/900]

During the Cascade control, the temperature of the controlled object is monitored by the Master, and depending on the deviation between the target value (set value) and the actual temperature, the set value of the Slave is adjusted. The controlled object is controlled by the Slave to bring the temperature of the controlled object to the target value.
On the FZ400/900, Input 1 can be assigned to the Master and Input 2 to the Slave respectively to conduct Cascade control on a single instrument. The use of Autotuning (AT) exclusively designed for the Cascade control allows the PID values of both the Master and the Slave to be calculated.

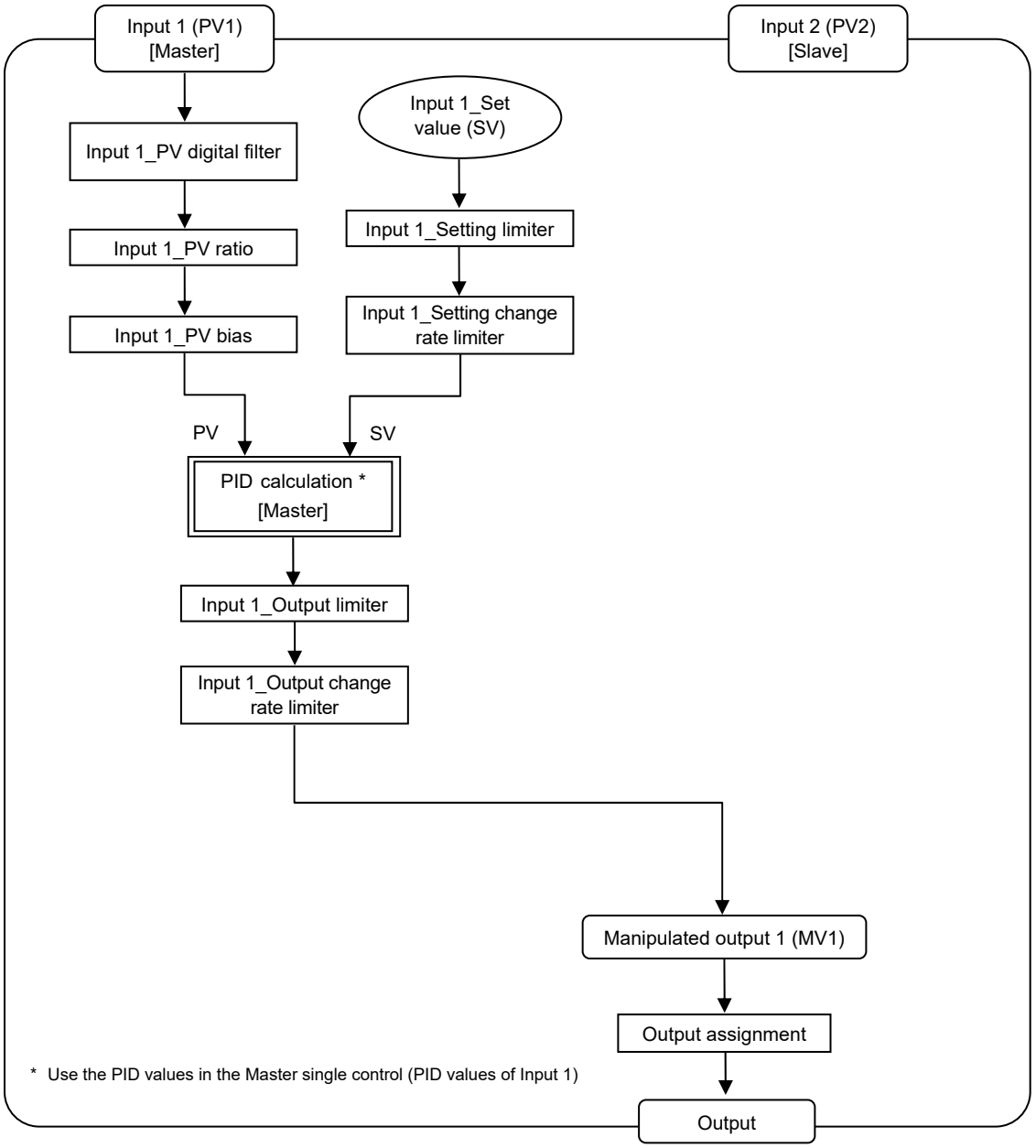
■ Description of function

The Cascade control has two types; One is to switch between “Cascade control” and “Master single control” and the other is to switch between “Cascade control” and “Slave single control.”
The internal processing of the control is described below.

[Description of Cascade control]

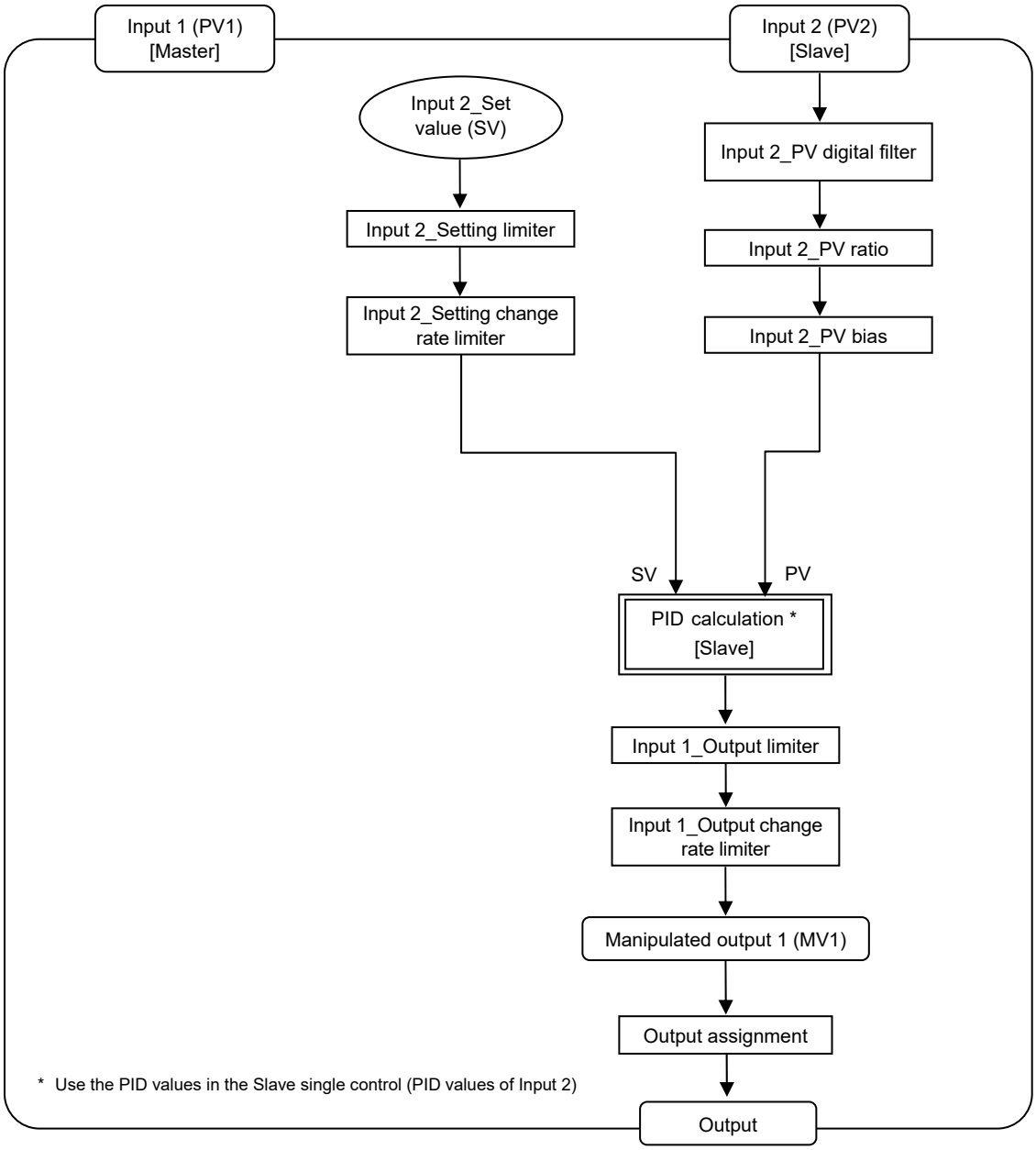


[Description of Master single control]



To switch between “Cascade control” and “Master single control,” you need to set the Cascade control (Master single ↔ Cascade) at “Select function for input 2” in Function block No. 58 in the Engineering mode.

[Description of Slave single control]



To switch between “Cascade control” and “Slave single control,” you need to set the Cascade control (Slave single ↔ Cascade) at “Select function for input 2” in Function block No. 58 in the Engineering mode.

● Autotuning (AT) at Cascade control

During the Cascade control, four types of PID values can be calculated with the use of the Autotuning (AT) exclusively developed for the Cascade control.

● Types of PID values

Types of PID values	Calculated values
Master side PID values of Cascade control	Cascade_Proportional band (master-side), Cascade_Integral time (master-side), Cascade_Derivative time (master-side)
Slave side PID values of Cascade control	Cascade_Proportional band (slave-side), Cascade_Integral time (slave-side), Cascade_Derivative time (slave-side)
PID values in Master single cantrol (PID values of Input 1)	Input 1_Proportional band, Input 1_Integral time, Input 1_Derivative time
PID values in Slave single cantrol (PID values of Input 2)	Input 2_Proportional band, Input 2_Integral time, Input 2_Derivative time

● Cascade_AT mode

There are two types of Autotuning (AT) for the Cascade control; Easy adjustment and Load factor adjustment.

Easy adjustment: Autotuning (AT) is executed once. Control reference level* is not calculated.

Load factor adjustment: Autotuning (AT) is executed twice. Control reference level* is calculated.

* Control reference level is the data used for PID value calculation for Cascad control.
In the case of TC input/RTD input, there is no need of calculating the Control reference level and the Autotuning (AT) in the Easy adjustment can be used.
In the case of Voltage/Current inputs, the Control reference level must be calculated and the Autotuning (AT) in the Load factor adjustment must be used.

● PID values calculated by AT in different control modes

Control	Cascade AT mode		Types of PID values				Control reference level	
	Master-side	Salve-side	Master-side PID values of Cascade control	Slave-side PID values of Cascade control	PID values in Master single cantrol	PID values in Slave single cantrol	Master-side	Salve-side
Cascade control	Easy adjustment (AT once)	Easy adjustment (AT once)	×	×	×	×	—	—
	Easy adjustment (AT once)	Load factor adjustment (AT twice)	×	×	×	×	—	×
	Load factor adjustment (AT twice)	Easy adjustment (AT once)	×	×	×	×	×	—
	Load factor adjustment (AT twice)	Load factor adjustment (AT twice)	×	×	×	×	×	×
Master single control	Easy adjustment (AT once)	Note	×	—	×	—	—	—
	Load factor adjustment (AT twice)	Note	×	—	×	—	×	—
Salve single control	Note	Easy adjustment (AT once)	—	×	—	×	—	—
	Note	Load factor adjustment (AT twice)	—	×	—	×	—	×

Note: Setting is ignored. ×: Calculated —: Not calculated

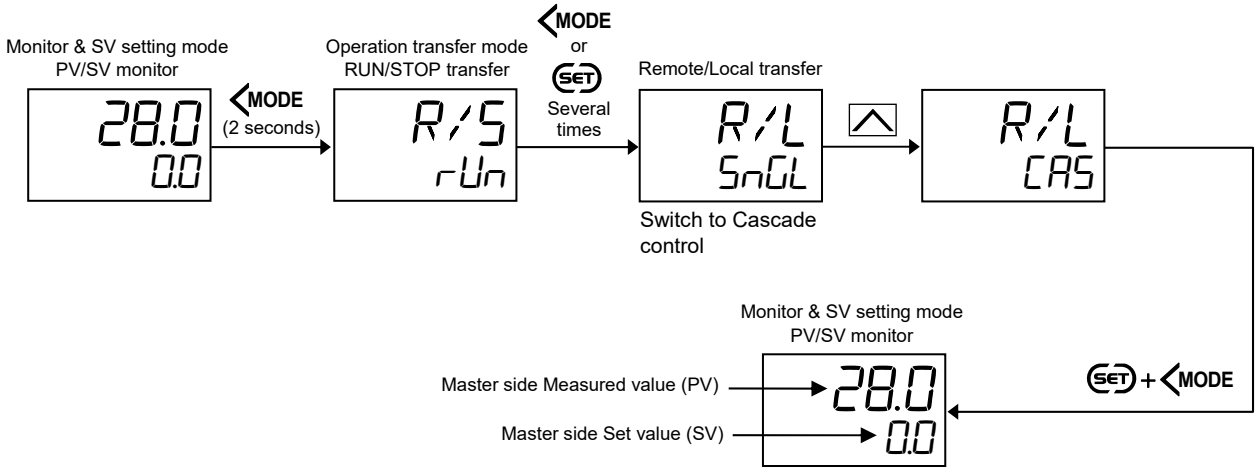
When executing the Autotuning (AT) of the Cascade control, always use “Input 1_Autotuning (AT)” in the Operation transfer mode.

When executing the Autotuning (AT) for the Cascade control, make sure that the set values (SV) of the Master and the Slave are properly set.

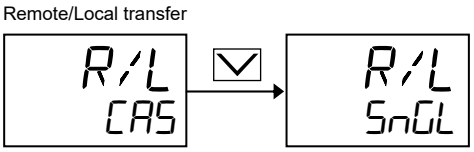
■ Switching between Cascade and Single

● Selection by front key operation

Single control (Master single or Slave single) → Cascade control

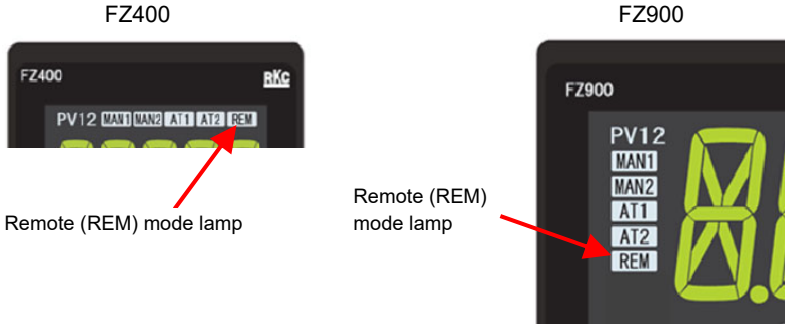


Cascade control → Single control (Master single or Slave single)



During the Cascade control mode, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]



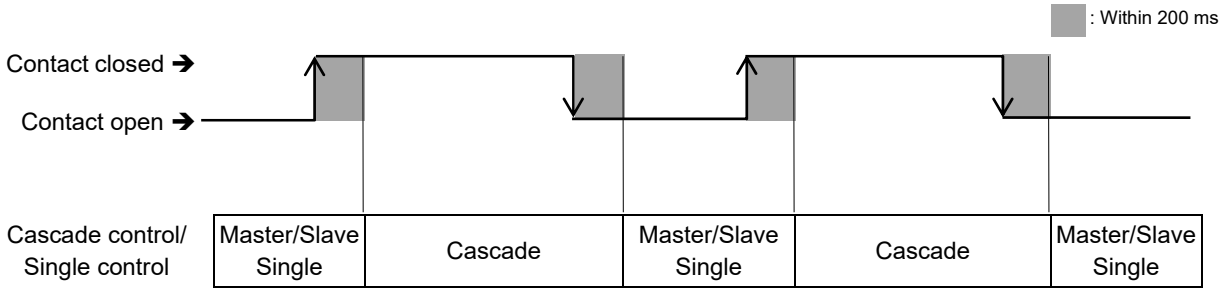
For FZ400/900, the FUNC key may be configured to switch between Cascade control and Single control. For details, refer to **10.8 Accessing Some Functions Directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Remote/Local (Cascade control) using the Digital Input (DI), use "DI function selection" (Function block No. 23 in the Engineering mode).

☞ For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Remote/Local (Cascade control/Single control)



NOTE

After the contact is transferred, it takes "Within 200 ms" until the action of this instrument is actually selected.

The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at "DI logic invert." For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Remote/Local transfer (Cascade control) state

The table below shows the actual Cascade control/Single control status and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Cascade control	Cascade control	Cascade control	
	Single control (Master/Slave)	Single control (Master/Slave)	Priority to Single control
Single control (Master/Slave)	Cascade control		
	Single control (Master/Slave)		

■ Parameter setting

● Remote/Local transfer (Cascade control) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "Cascade control" is selected at Select function for input 2 SnGL: Single control (Master single or Slave single) CAS: Cascade control	SnGL

To display "Remote/Local transfer" (Cascade control), specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Input 1_Proportional band [heat-side] [Parameter Setting Mode: Parameter group No. 51 (PnS 1)]

Parameter symbol	Data range	Factory set value
1. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 1_Integral time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (PnS 1)]

Parameter symbol	Data range	Factory set value
1. I	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 1_Integral time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [heat-side] [Parameter Setting Mode: Parameter group No. 51 (PnS 1)]

Parameter symbol	Data range	Factory set value
1. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 1_Derivative time [heat-side]," you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Proportional band
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Input 2_Proportional band," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 2_Integral time
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. I	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Input 2_Integral time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 2_Derivative time
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Input 2_Derivative time," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Cascade_Proportional band (master-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
MAS.P	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Cascade_Proportional band (master-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Integral time (master-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
MAS.I	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Cascade_Integral time (master-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Derivative time (master-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
MAS.d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Cascade_Derivative time (master-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Proportional band (slave-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
SLV.P	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0

To display "Cascade_Proportional band (slave-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Integral time (slaver-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
SLV.I	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

To display "Cascade_Integral time (slave-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Derivative time (slave-side) [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
SLV.d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

To display "Cascade_Derivative time (slave-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Digital filter [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
C.dF	0.0 to 100.0 seconds 0.0: Filter OFF	10.0

To display "Cascade_Digital filter," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Scale high [Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
C.SCH	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter high

To display "Cascade_Scale high," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Scale low
[Setup Setting Mode: Setting group No. 58 (5n58)]

Parameter symbol	Data range	Factory set value
C.SCL	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter low

To display "Cascade_Scale low," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Select function for input 2
[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	·FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 ·FZ110: 1

To display "Select function for input 2," "Remote setting input" or "Measured input 2" must be specified at the time of order.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are initialized or changed when the Select function for input 2 is changed.

● Cascade _AT mode (master-side)
[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
MAS.AT	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1

To display "Cascade_AT mode (master-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade _AT mode (slave-side)
[Engineering mode: Function block No. 58 (Fn58)]

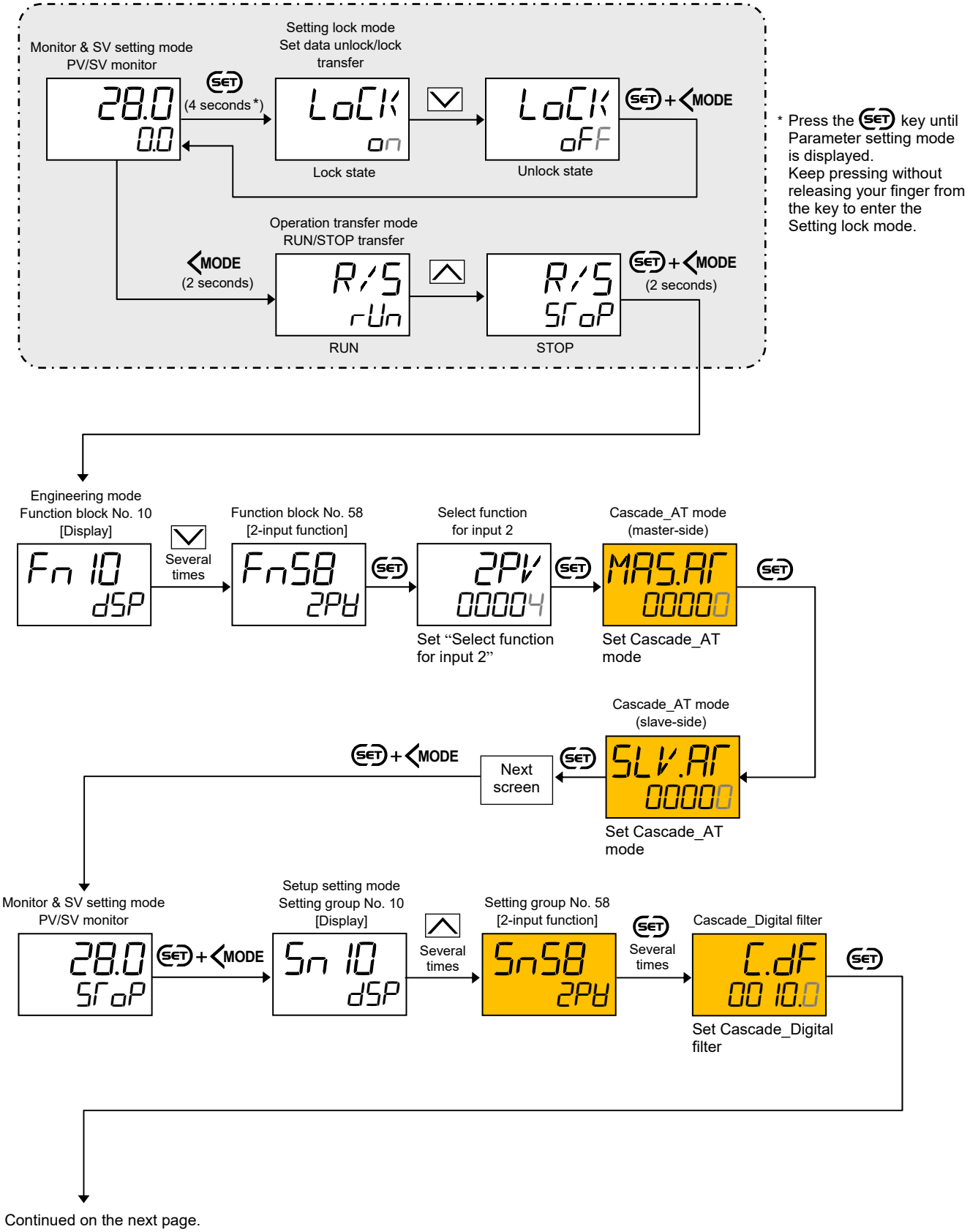
Parameter symbol	Data range	Factory set value
SLV.AT	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1

To display "Cascade_AT mode (slave-side)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control.

■ Setting procedure

Calculating the PID values for Cascade control (Slave single ↔ Cascade) using AT

● Cascade control related setting



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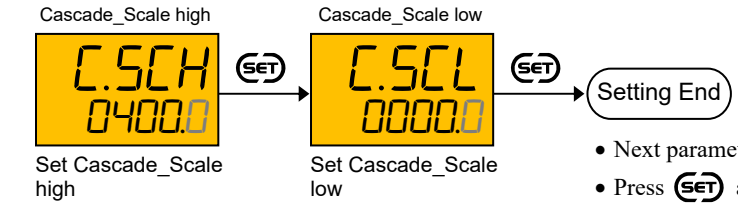
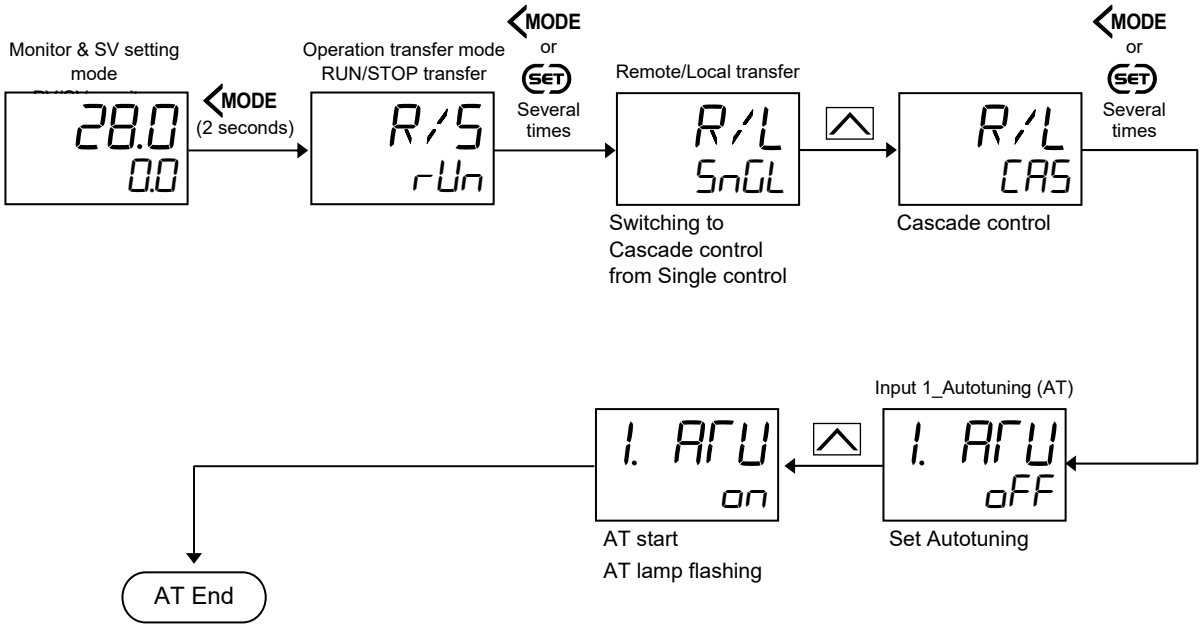


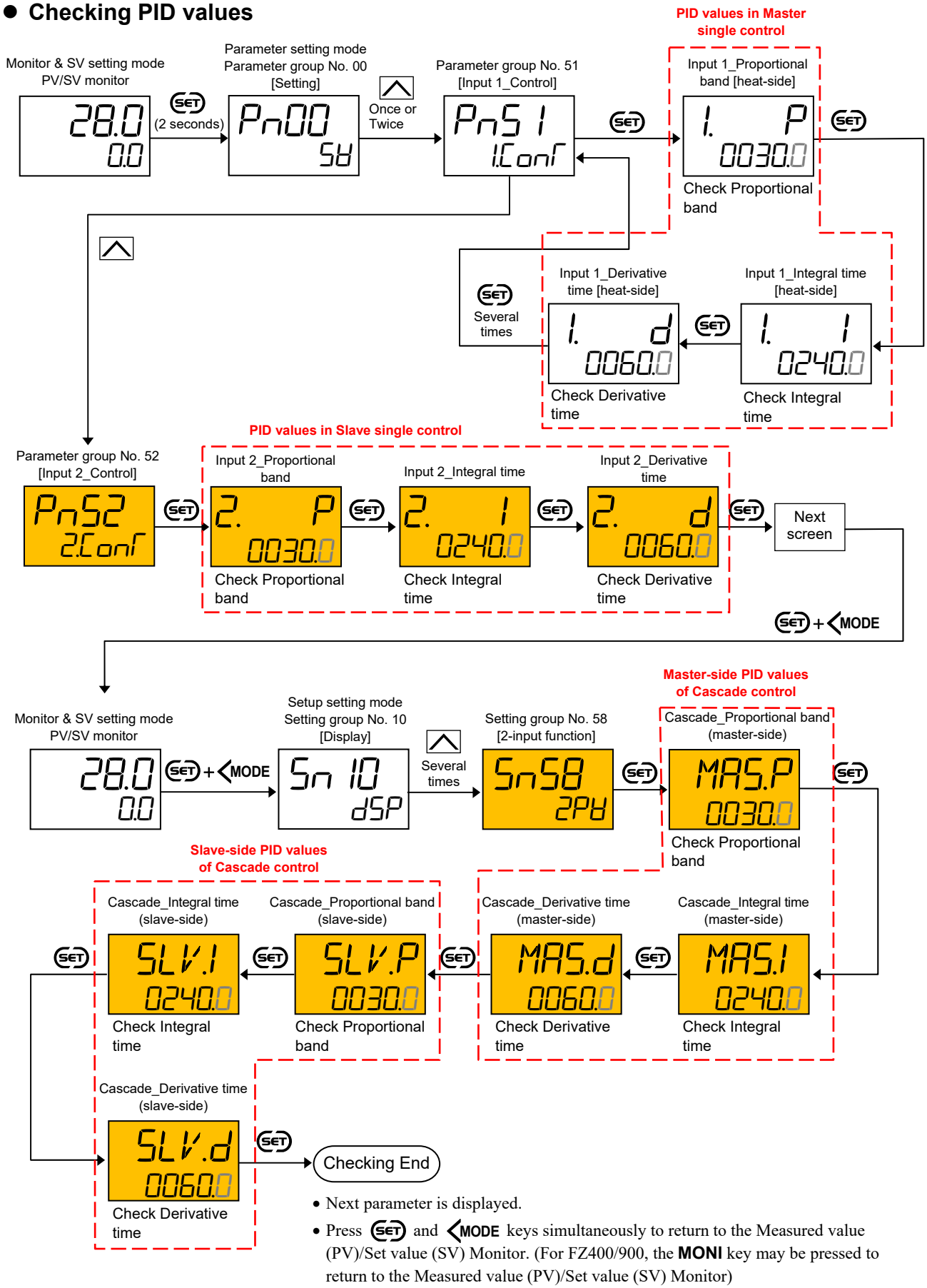
- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

● Switching to Cascade control and executing AT



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

● Checking PID values



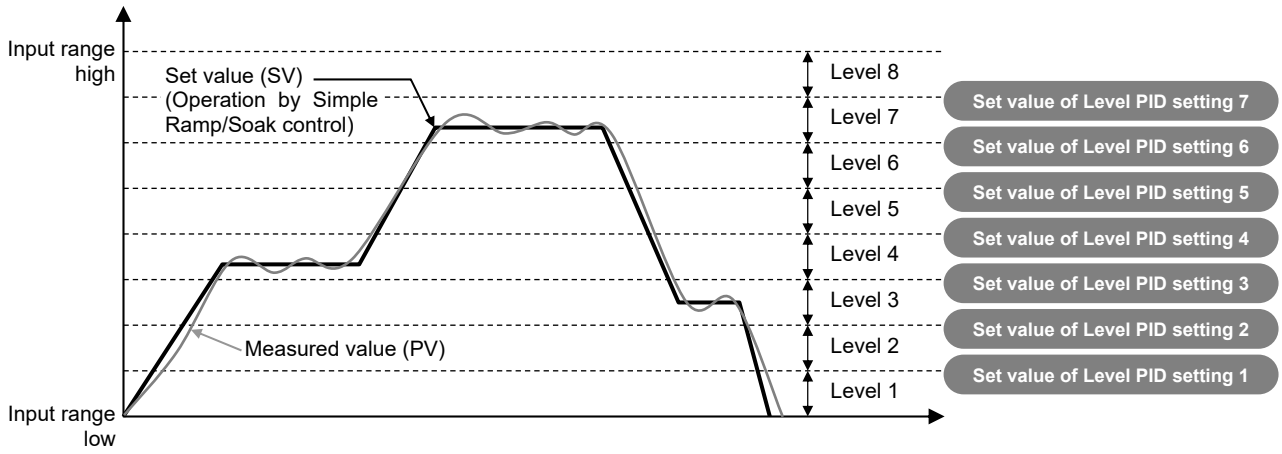
- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

8.15 Controlling with Level PID

Level PID function is used to set the following parameters for control to each divided level of the input range (up to 8 levels): PID values, Control response parameters, Output limiter high/low, Control loop break alarm (LBA) time and LBA deadband.

■ Description of function

- Set the values such as PID values of each level to the Memory area 1 to 8 (PID memory group 1 to 8).
- The input range can be divided based on the setting for the parameters of Level PID setting 1 to Level PID setting 7.
- The value selected in the Level PID action selection [SV or PV] is checked and determined in which level of the PID it is, and the control is done using the PID values from the Memory area appropriate to the level.
- Different levels can be set at Input 1 and Input 2.



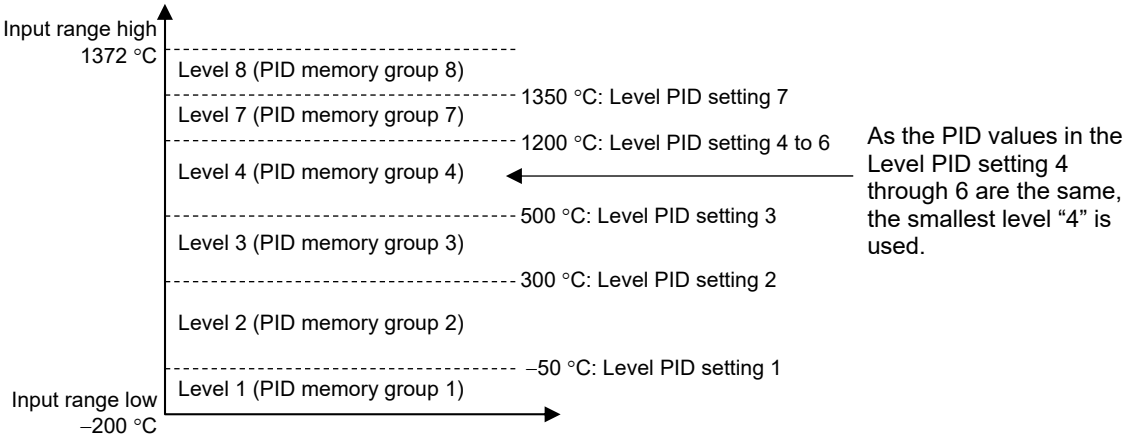
● Memory area to be used for level

The memory area used at each level will be selected after comparison between the Level PID setting and the value [Set value (SV) or Measured value (PV)] selected in the Level PID action selection

Level	PID memory group	Description	Memory area
Level 8	PID memory group 8	Level PIDsetting 7 < Set value (SV) or Measured value (PV) ≤ Input rang high	Memory area 8
Level 7	PID memory group 7	Level PIDsetting 6 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 7	Memory area 7
Level 6	PID memory group 6	Level PIDsetting 5 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 6	Memory area 6
Level 5	PID memory group 5	Level PIDsetting 4 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 5	Memory area 5
Level 4	PID memory group 4	Level PIDsetting 3 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 4	Memory area 4
Level 3	PID memory group 3	Level PIDsetting 2 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 3	Memory area 3
Level 2	PID memory group 2	Level PIDsetting 1 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 2	Memory area 2
Level 1	PID memory group 1	Input range low ≤ Set value (SV) or Measured value (PV) ≤ Level PIDsetting 1	Memory area 1

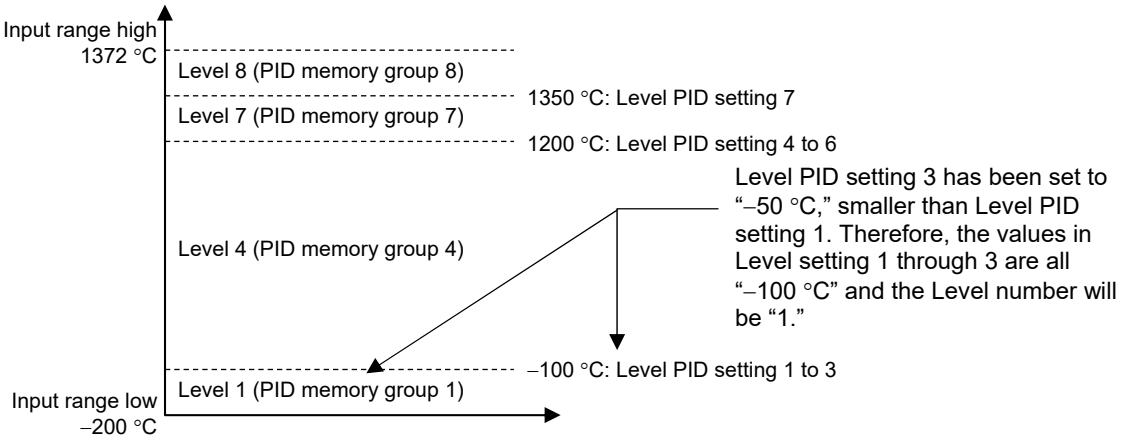
- When two or more levels have the same setting, the values with a smaller level number will be valid and used.

[Example 1] Values in Level PID setting 4 through 6 are the same.



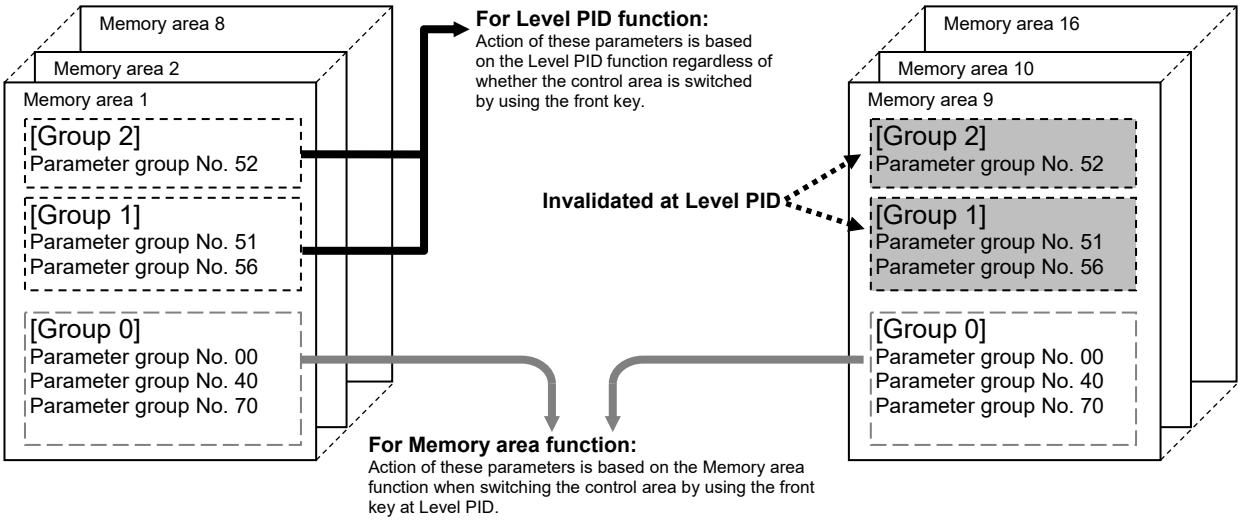
- If the Level PID setting is set ignoring the order of the level Nos., the Level PID values in the set range will be the same and the smallest level number is used. (See Example 2)

[Example 2] Level PID setting 3 in Example 1 has been changed to –100 ºC.



● Parameters of Memory area in Level PID

When using Level PID, parameters of Memory area are separated to be used for the Level PID function and the regular Memory area function.



Parameters of Memory area (at Level PID)

Parameters in each group

Parameters for Memory area function (Memory area 1 to 16)

[Group 0]

Parameter group No. 00

- Input 1_Set value (SV)
- Input 2_Set value (SV)
- Set value (SV) of differential temperature input

Parameter group No. 40

- Event 1 set value (EV1)
  Event 1 set value (EV1) [high]
- Event 1 set value (EV1') [low]
- Event 2 set value (EV2)
  Event 2 set value (EV2) [high]
- Event 2 set value (EV2') [low]
- Event 3 set value (EV3)
  Event 3 set value (EV3) [high]
- Event 3 set value (EV3') [low]
- Event 4 set value (EV4)
  Event 4 set value (EV4) [high]
- Event 4 set value (EV4') [low]

Parameter group No. 70

- Select Trigger type for Memory area transfer
- Area soak time
- Link area number
- Input 1_Setting change rate limiter (up)
- Input 1_Setting change rate limiter (down)
- Input 1_Auto/Manual transfer selection (Area)
- Input 1_Manipulated output value (Area)
- Input 2_Setting change rate limiter (up)
- Input 2_Setting change rate limiter (down)
- Input 2_Auto/Manual transfer selection (Area))
- Input 2_Manipulated output value (Area)
- Remote/Local transfer selection (Area)

Parameters for Level PID function (Memory area 1 to 8)

[Group 1]

Parameter group No. 51

- Input 1_Proportional band [heat-side]
- Input 1_Integral time [heat-side]
- Input 1_Derivative time [heat-side]
- Input 1_Control response parameter
- Input 1_Proactive intensity
- Input 1_Manual reset
- Input 1_FF amount
- Input 1_Output limiter high [heat-side]
- Input 1_Output limiter low [heat-side]
- Input 1_Control loop break alarm (LBA) time
- Input 1_LBA deadband (LBD)

Parameter group No. 56

- Input 1_Proportional band [cool-side]
- Input 1_Integral time [cool-side]
- Input 1_Derivative time [cool-side]
- Input 1_Overlap/Deadband
- Input 1_Output limiter high [cool-side]
- Input 1_Output limiter low [cool-side]

[Group 2]

Parameter group No. 52

- Input 2_Proportional band
- Input 2_Integral time
- Input 2_Derivative time
- Input 2_Control response parameter
- Input 2_Proactive intensity
- Input 2_Manual reset
- Input 2_FF amount
- Input 2_Output limiter high
- Input 2_Output limiter low
- Input 2_Control loop break alarm (LBA) time
- Input 2_LBA deadband (LBD)

During the Level PID, Memory areas 9 through 16 are not used (invalid).

These parameters are all in the Parameter setting mode, However, "ON/OFF action differential gap (upper)" and "ON/OFF action differential gap (lower)" are excluded.

●Parameters for Level PID function

In Memory areas 1 through 8, the parameters in [Group 1] and [Group 2] are used as parameters for Level PID. Setting in Memory areas 9 through 16 will be ignored.

Memory area number for the control area can be changed by the front key, communication, Digital input (DI), Simple ramp/soak function or Simple sequence function; however, the parameters for Level PID function of the changed Memory area are invalidated.
The value selected in the Level PID action selection [SV or PV] is checked and determined in which level of the PID it is, and the control is done using the PID values from the Memory area appropriate to the level.

☞ Refer to P. 8-100 for parameters in each group.

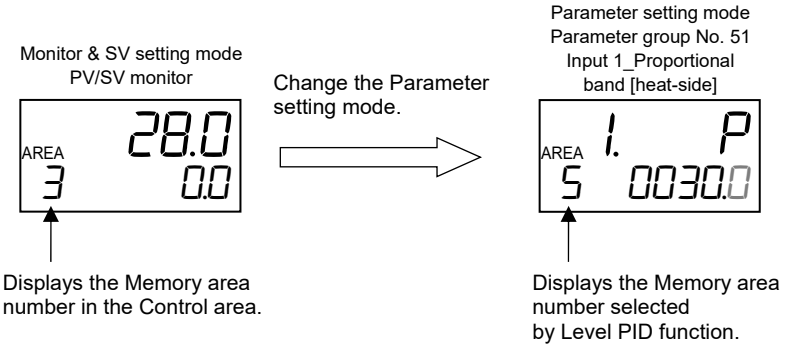
To use regular Memory area function

Input 1_Level PID action selection (Function block No. 51 in the Engineering mode) and Input 2_Level PID action selection (Function block No. 52 in the Engineering mode) can be used as a regular Memory area function in the case of “Switching by Memory area number” (Factory set value).

Memory area display at Level PID

PID values used for control are changed by the Level PID, but the control area is not influenced. This means that the Memory area No. on the PV/SV monitor screen in the Monitor & SV setting mode remains unchanged.
To check the Memory area No. actually used by the Level PID, locate the parameter used in the Level PID in the Parameter setting mode. Then, the actual Memory No. will be displayed. (See the example below)

[Example] In this example, Area 3 is displayed on the instrument (as a control area). Parameter “P” is displayed to show the Memory area No. actually used by the Level PID.

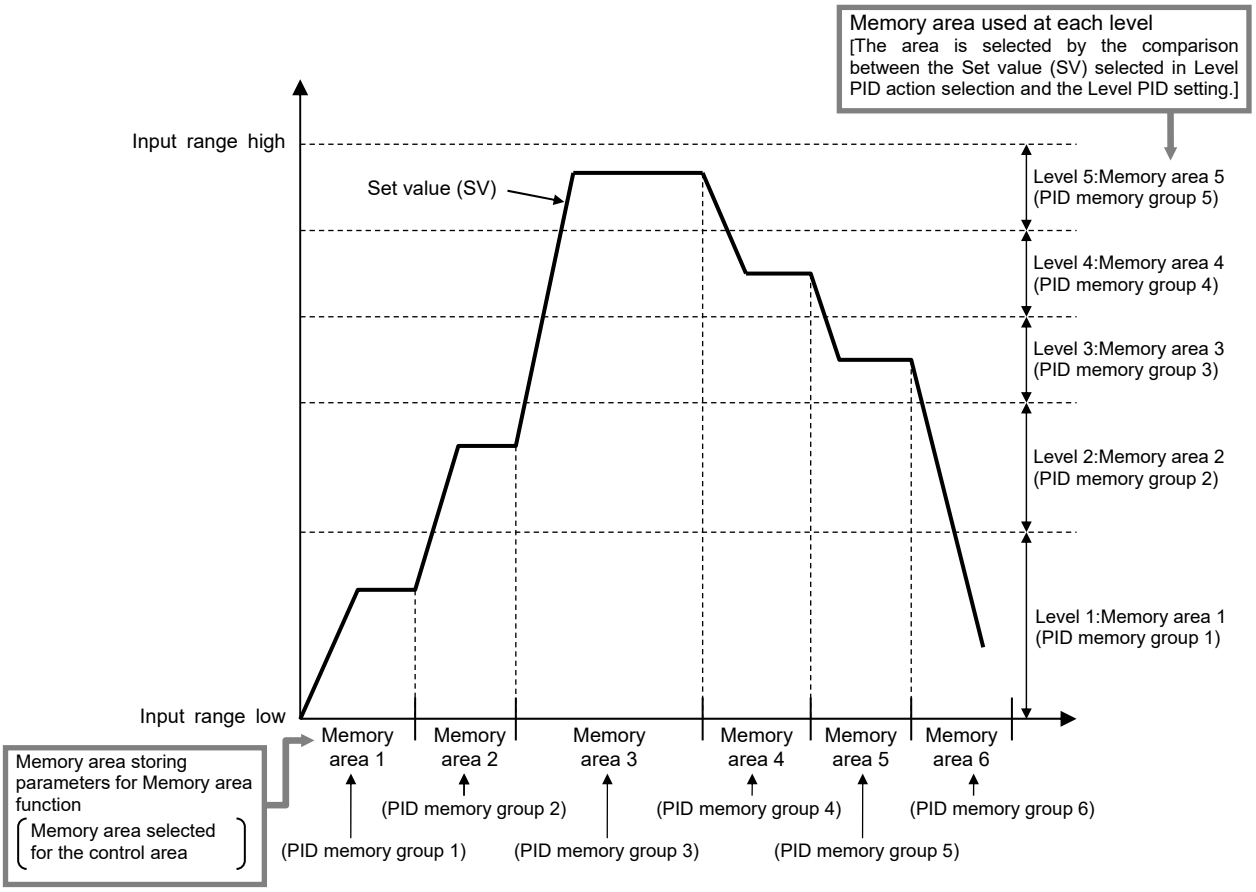


●Parameters for Memory area function

In Memory areas 1 through 16, parameters in [Group 0] can be used for the regular Memory area function. The parameters for the changed Memory area are validated by switching the Memory areas of the control area by the front key, communication, Digital input (DI), Simple ramp/soak function or Simple sequence function.

☞ For details of the parameters in Group 0, refer to P. 8-100.

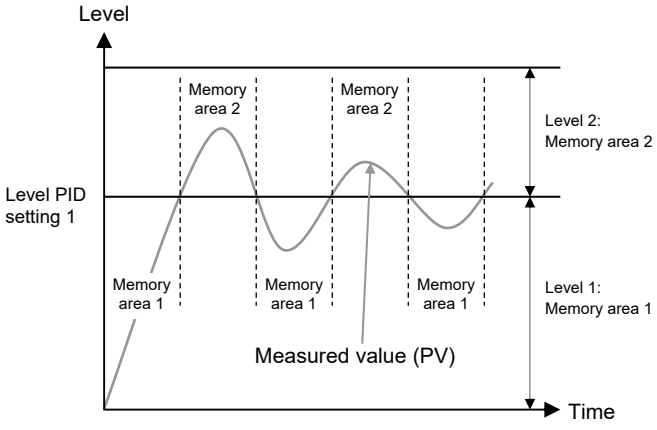
●Example of action of the Memory area when setting simple ramp/soak program at Level PID
[When “1: Switching by Set value (SV) (Level PID action)” is selected in Level PID action selection]



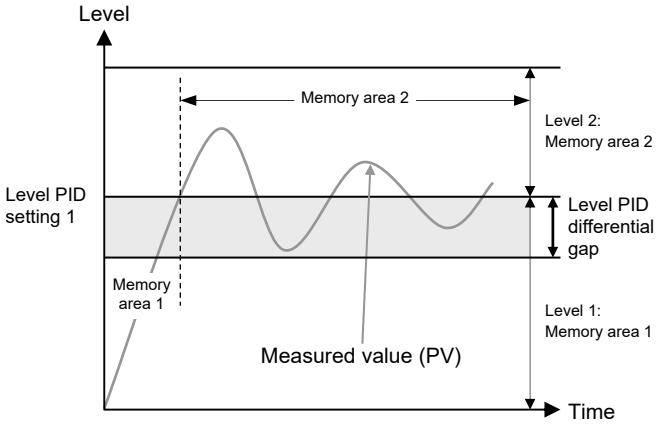
● Level PID differential gap

When setting “Switch by Measured value (PV)” to Level PID action:
The Memory areas storing the parameters for Level PID function may switch frequently by the fluctuation of the input when the Measured value (PV) is close to the Level PID set value.
Setting Level PID differential gap prevents memory areas from switching too frequently.

When Level PID differential gap is not set



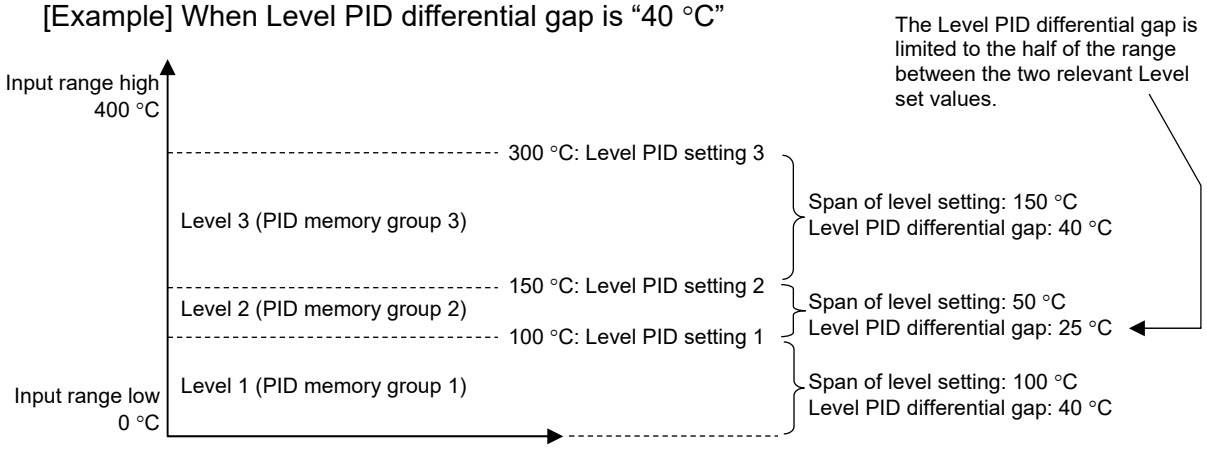
When Level PID differential gap is set



When setting “Switch by Set value (SV)” to Level PID action:
The setting of Level PID differential gap is validated; however, it is recommended to set “0.0” to Level PID differential gap.

When the setting of the Level PID differential gap is set larger than the half of the range between two continuous Level set values, the Level PID differential gap is forcedly limited to the half of the range between the two relevant Level set values.

[Example] When Level PID differential gap is “40 °C”

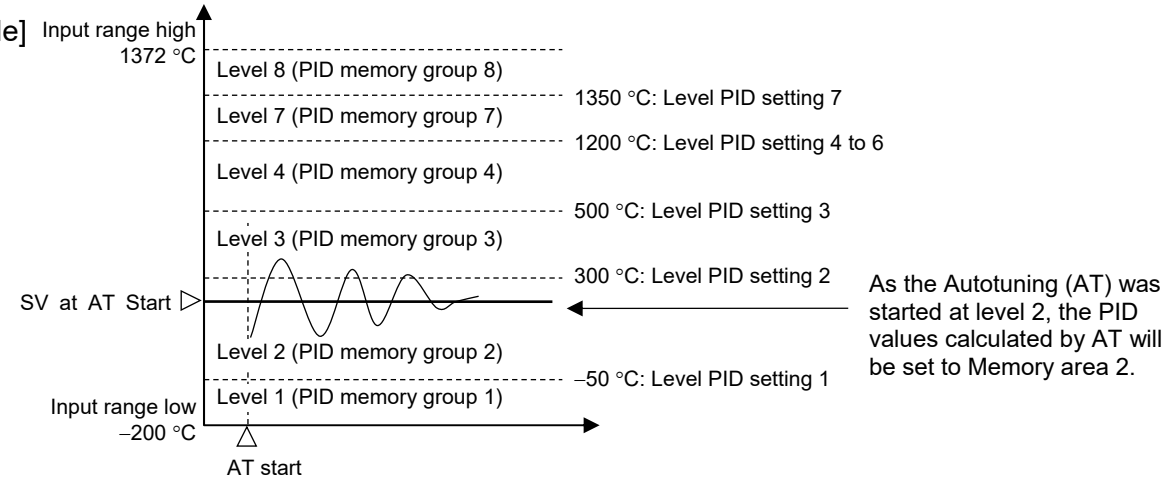


● Autotuning (AT) at Level PID

Autotuning (AT) can be started even while Level PID function is used whether or not the Level PID action selection is “Switching by SV” or “Switching by PV”. Autotuning (AT) will be executed at the Set value (SV) when it is initiated.

The calculated PID values are stored in the memory area which has the Set value (SV) at the time of the Autotuning (AT) start.

[Example]



● Level PID at Differential temperature control

When the Level PID action selection is “Switching by Set value (SV)”:

Level PID is done at the Input 1_Monitor Set value (SV)*.

* Input 1_Monitor Set value (SV) = Input 2_Measured value (PV) + Set value of Differential temperature input

When the Level PID action selection is “Switching by Measured value (PV)”:

Level PID is done at the Measured value (PV) Input 1.

The Level PID will not work at the Set value (SV) or Measured value (PV) of the Differential temperature input.

■ Parameter setting

● Input 1_Level PID setting 1 to Input 1_Level PID setting 7 [Setup Setting Mode: Setting group No. 51 (Sns 1)]

Parameter symbol	Data range	Factory set value
1.LEV 1 1.LEV2 1.LEV3 1.LEV4 1.LEV5 1.LEV6 1.LEV7	Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Level PID settings 1 to 7 always maintain the following relation. (Input 1_Level PID setting 1) ≤ (Input 1_Level PID setting 2) ≤ (Input 1_Level PID setting 3) ≤ (Input 1_Level PID setting 4) ≤ (Input 1_Level PID setting 5) ≤ (Input 1_Level PID setting 6) ≤ (Input 1_Level PID setting 7)	Input 1_Input range high (Control with PV select: PV select input range high)

To display the "Input 1_Level PID setting 1 through 7," set switchover by the Set value (SV) or the Measured value (PV) at "Input 1_Level PID action selection" in Function block No. 51 in the Engineering mode AND set an item other than Cascade control at "Select function for input 2" in Function block No. 58 in the Engineering mode.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Level PID setting is changed.

● Input 2_Level PID setting 1 to Input 2_Level PID setting 7 [Setup Setting Mode: Setting group No. 52 (Sns2)]

Parameter symbol	Data range	Factory set value
2.LEV 1 2.LEV2 2.LEV3 2.LEV4 2.LEV5 2.LEV6 2.LEV7	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Level PID settings 1 to 7 always maintain the following relation. (Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)	Input 2_Input range high

To display "Input 2_Level PID setting 1 to 7," specify "Measured input 2" at the time of order, AND "Input 2_Level PID action selection" (Function block No. 58 in Engineering mode) select to "Switching by Set value (SV)" or "Switching by Measured value (PV)," AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Level PID setting is changed.

● Input 1_Level PID action selection [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.LPId	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0

To display "Input 1_Level PID action selection," set an item other than Cascade control at "Select function for input 2" in Function block No. 58 in the Engineering mode.

● Input 2_Level PID action selection [Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2.LPId	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0

To display "Input 2_Level PID action selection," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_Level PID differential gap [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. LHS	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 1_input span (Control with PV select: 0.2 % of PV select input span)

To display "Input 1_Level PID differential gap," set an item other than Cascade control at "Select function for input 2" in Function block No. 58 in the Engineering mode.

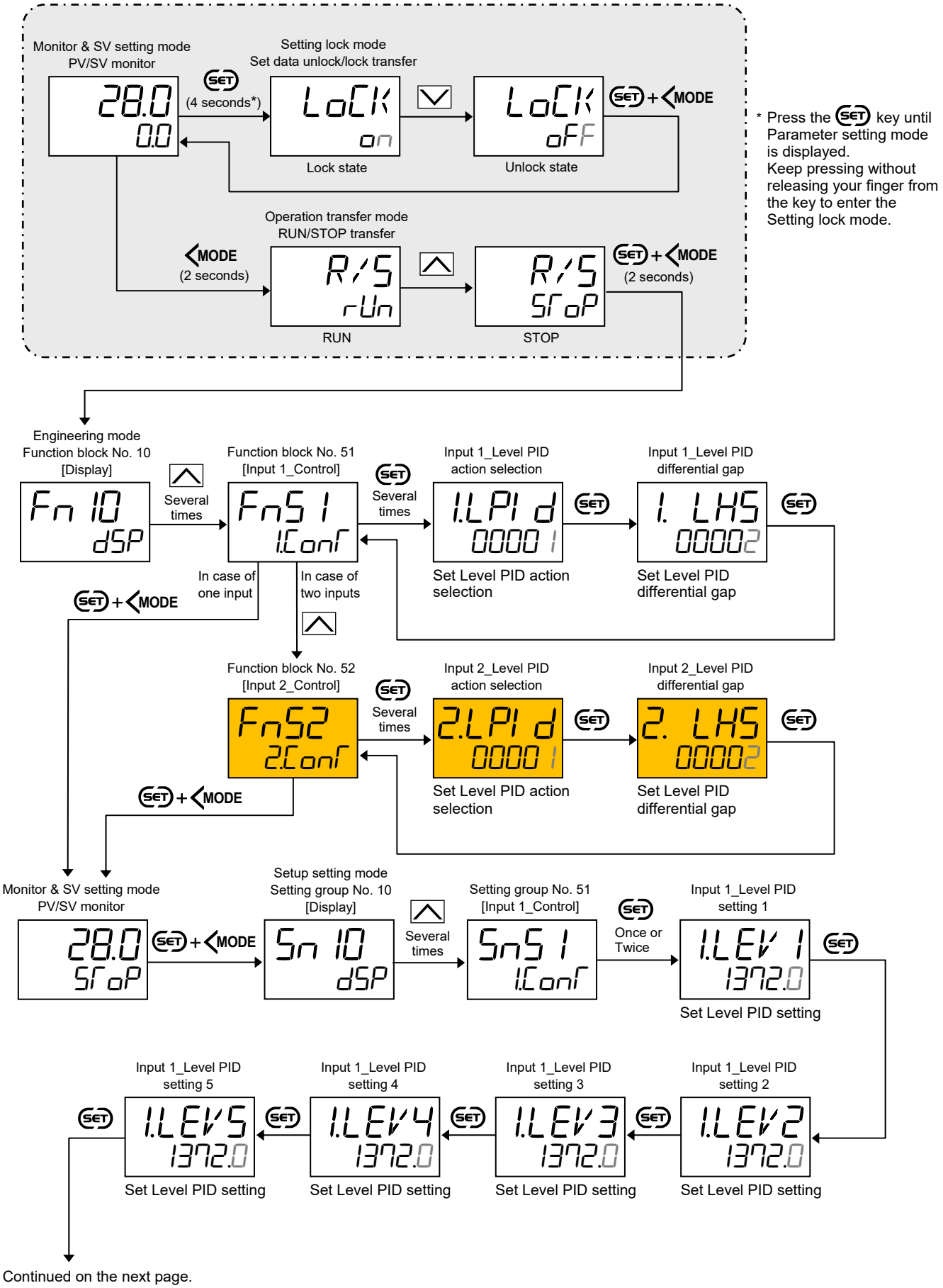
● Input 2_Level PID differential gap [Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. LHS	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2 % of Input 2_input span

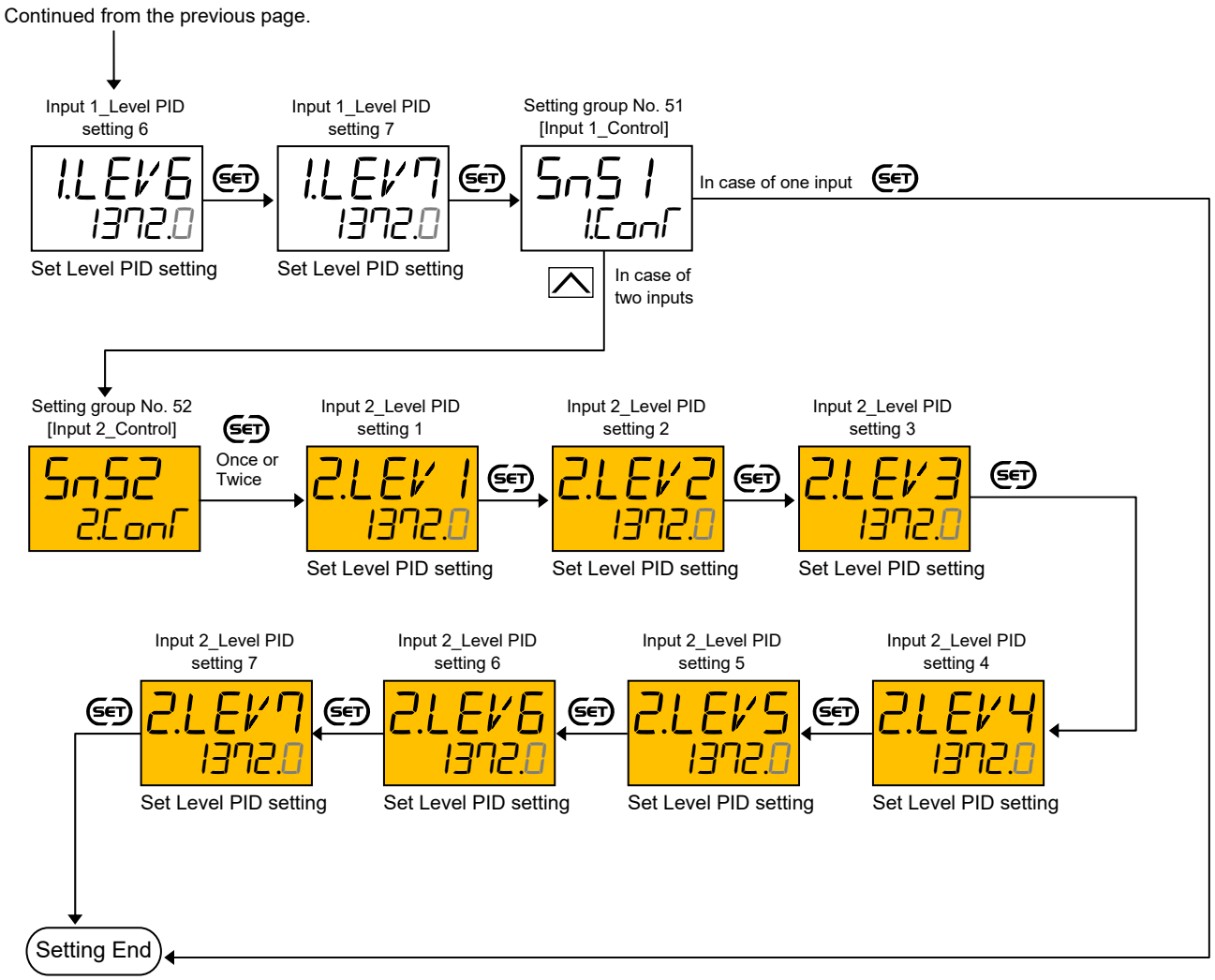
To display "Input 2_Level PID differential gap," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

■ Setting procedure

To enter the Engineering mode



Continued on the next page.



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

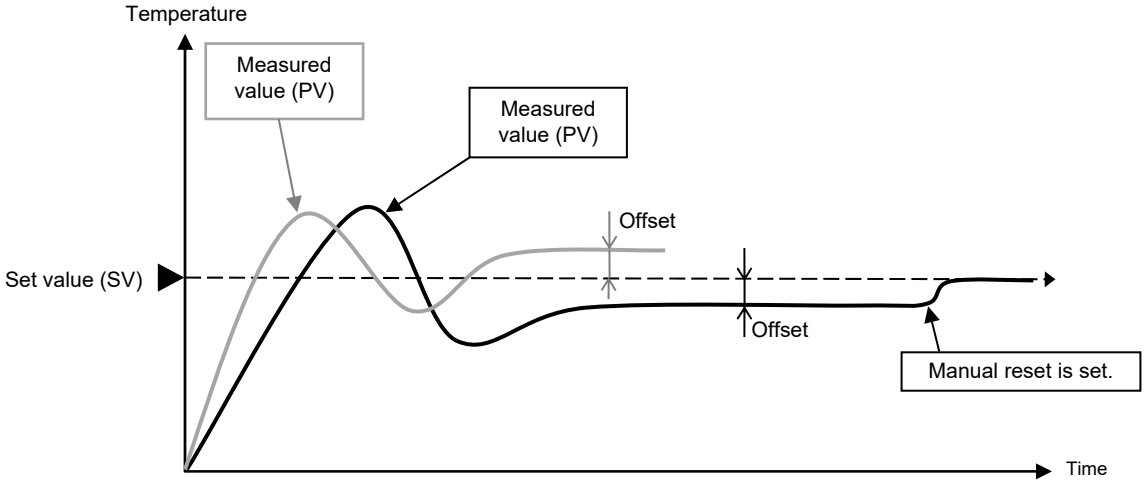
8.16 Eliminating Offset Inherent to Proportioning Control (Manual Reset)

In order to eliminate the offset occurring in Proportional (P) control, the Manipulated output value is manually corrected.

■ Description of function

This is the function used to manually correct the offset when in Proportional (P) control or PD control. If the Manual reset value varies, the Manipulated output value also changes.
Offset means the deviation of the actual when the Manipulated output value becomes stabilized (stable state).

- When the Manual reset is set to the plus (+) side
  The Manipulated output value under the stable condition increases by the Manual reset value.
- When the Manual reset is set to the minus (–) side
  The Manipulated output value * under the stable condition decreases by the Manual reset value.



Manual reset is available when the Integral time is 0 (0.0, 0.00).

■ Parameter setting

● Input 1_Manual reset [Parameter Setting Mode: Parameter group No. 51 (Pn5 1)]

Parameter symbol	Data range	Factory set value
1. MR	–100.0 to +100.0 %	0.0

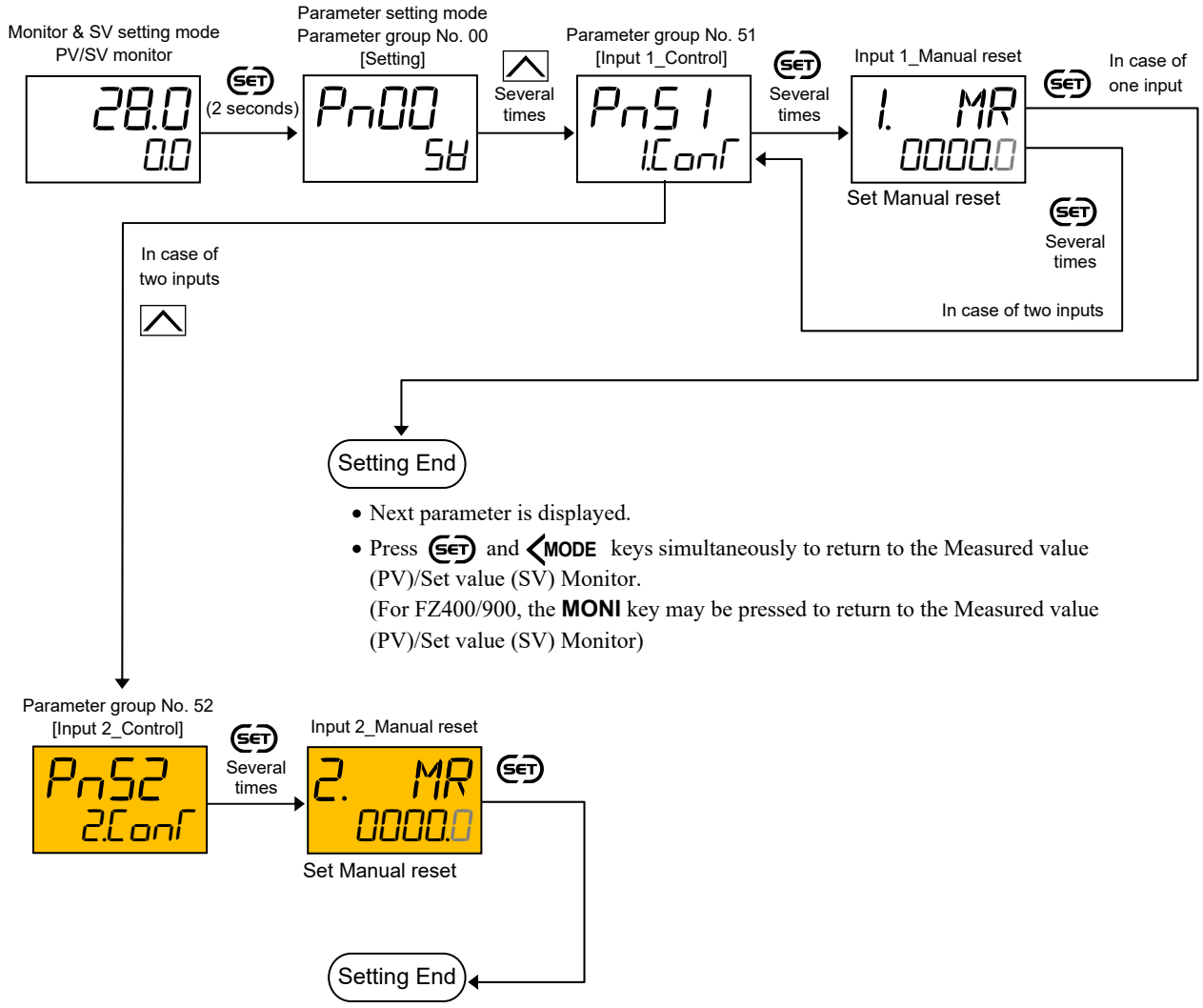
To display “Input 1_Manual reset,” set “0” (zero) to the “Input 1_Integral time [heat-side].”

● Input 2_Manual reset
[Parameter Setting Mode: Parameter group No. 52 (PnS2)]

Parameter symbol	Data range	Factory set value
2. MR	–100.0 to +100.0 %	0.0

To display "Input 2_Manual reset," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control. Additionally, you also need to set "0" (zero) to the "Input 1_Integral time."

■ Setting procedure



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

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

8.17 Continuing Stable Control after the Operation Transfer (SV Tracking)

This function is used to follow (keep tracking of) the other set value in another mode (control) that was used before the change of the set value. This is useful to suppress a sudden change of the set value when the operation mode is changed.

■ Description of function

The SV tracking can be selected at the time of switching between Remote/Local and Auto/Manual. The functions can be selected independently or together.

● SV tracking at the time of Remote/Local transfer

The SV tracking at the time of Remote/Local transfer may be effective in such switching actions.

- Switching between Remote and Local mode
- Switching between 2-loop control and Differential temperature control
- Switching between Cascade control and Slave single control

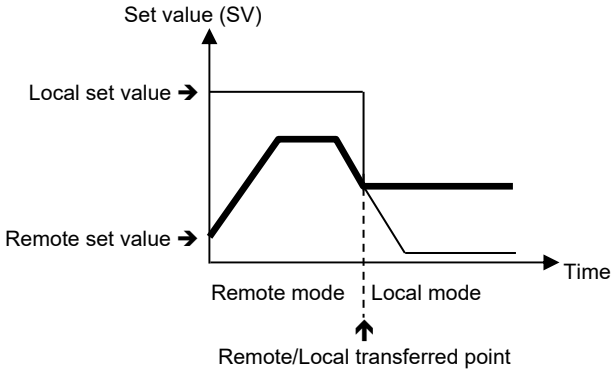
Switching between Remote and Local mode

When the operation mode is switched from Remote to Local mode, the Local set value follows the Remote set value just before the switching (tracking).

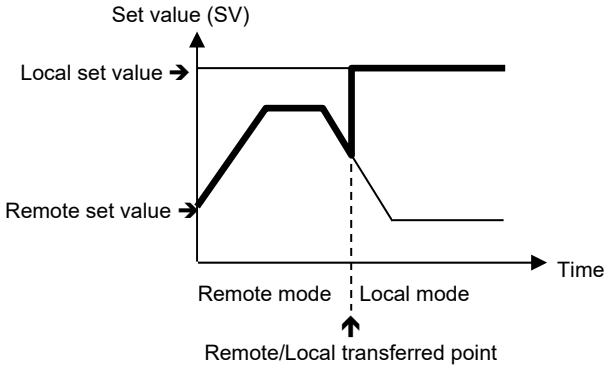
[Change of set values when switched from Remote to Local mode]

Operation mode:	Remote mode ⟶	Local mode
Set value used	Set value (SV) = Remote set value	Set value (SV) = Local set value
SV tracking used	Local set value ≠ Remote set value	Local set value = Remote set value
SV tracking unused	Local set value ≠ Remote set value	Local set value ≠ Remote set value

< SV tracking used >



< SV tracking unused >



The SV tracking does not function at the time of switching from Local mode to Remote mode.

Switching between 2-loop control and Differential temperature control

When the Differential temperature control is switched to 2-loop control, the Input 1_Set value (SV) follows the Input 1_set value monitor [PV just before the switching + Set value of Differential temperature control]

In case of Differential temperature control, the Input 1_Set value (SV) is not used for control. The Input 1_Monitor Set value (SV)* of is used in actual control.

* Input 1_Monitor Set value (SV) = Controlled temperature
= Input 2_Measured value (PV) [Reference temperature] + Set value of Differential temperature input

[Change of set values when switched from Differential temperature control to 2-loop control]

Control:	Differential temperature control ⟶	2-loop control
Set value used (Input 1)	Input 1_Set value monitor	Input 1_Set value (SV)
SV tracking used	Input 1_Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input	Input 1_Set value (SV) = Input 2_PV just before the switching + Set value of Differential temperature input Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input
SV tracking unused	Input 1_ Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input	Input 1_Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 1_Set value (SV)

The SV tracking does not function at the time of switching from 2-loop control to Differential temperature control.

Switching between Cascade control and Slave single control

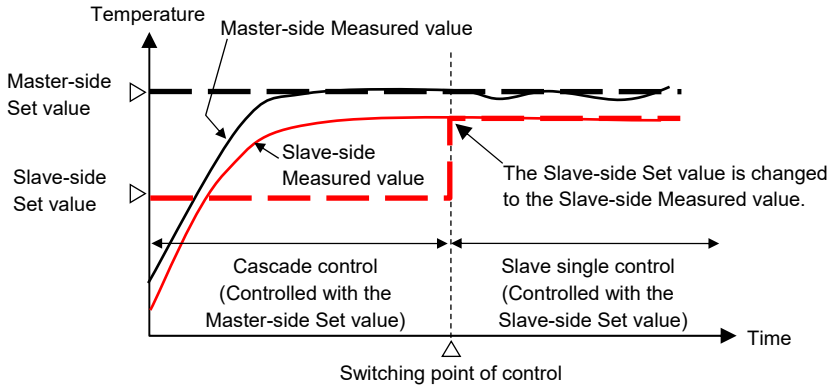
- When the Cascade control is switched to the Slave single control, the set value of Input 2 (slave-side) follows the Input 2_Measured value (PV) just before the switching
- When the Slave single control is switched to the Cascade control, the set value of Input 1 (master-side) follows the Input 1_Measured value (PV) just before the switching

[Change of set values when switched from Cascade control to Slave single control]

Control:	Cascade control ⟶	Slave single control
SV tracking used	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)	Input 1_Set value (master-side) = Input_1 Set value (master-side) Input 2_Set value (slave-side) = Measured value of Input 2 (slave-side) just before the switching
SV tracking unused	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)

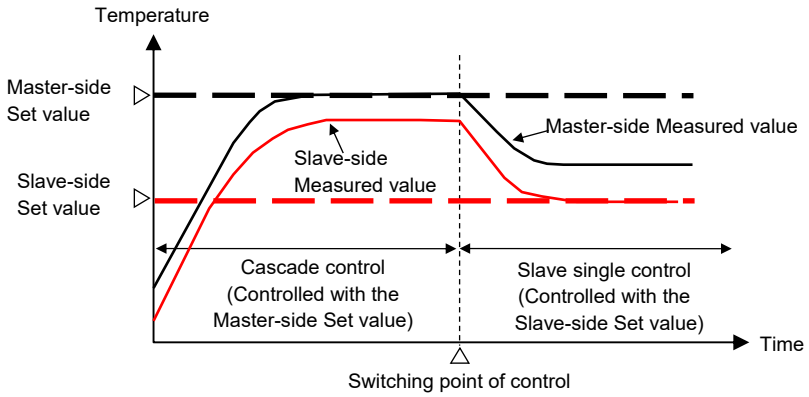
< SV tracking used >

When the Cascade control is switched to the Slave single control, the Slave-side set value tracks the Slave-side measured value, switching without fluctuation can be achieved.



< SV tracking unused >

When the Cascade control is switched to the Slave-single control, if the Slave-side measured value and the Slave side set value are not the same, fluctuation of the PV is caused.

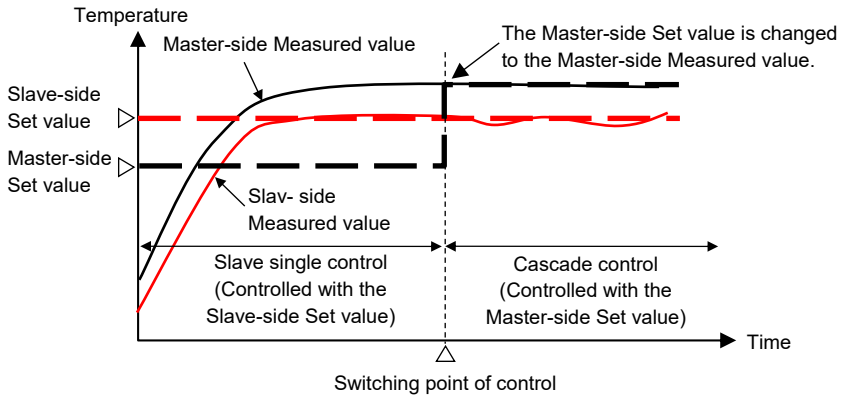


[Change of set values when switched from Slave single control to Cascade control]

Control:	Slave single control →	Cascade control
SV tracking used	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)	Input 1_Set value (master-side) = Measured value of Input 1 (master-side) just before the switching Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)
SV tracking unused	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)	Input 1_ Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)

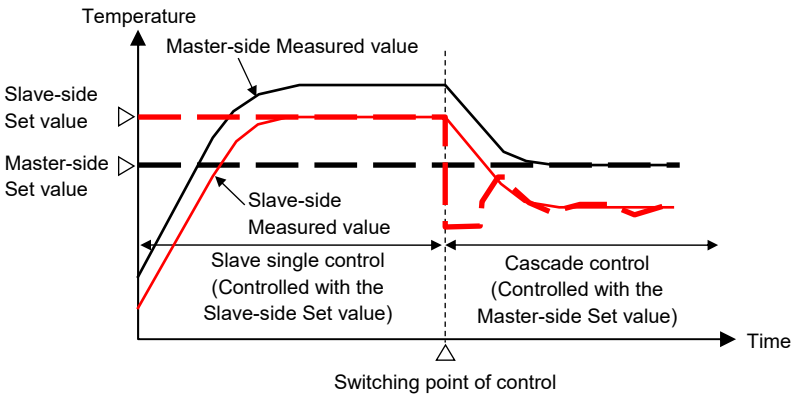
< SV tracking used >

When the Slave single control is switched to the Cascade control, the Master-side set value tracks the Master-side measured value, switching without fluctuation can be achieved.



< SV tracking unused >

When the Slave single control is switched to the Cascade control, if the Master-side set value and the Master-side measured value are not the same, fluctuation of the PV is caused.



● SV tracking at the time of Auto/Manual transfer

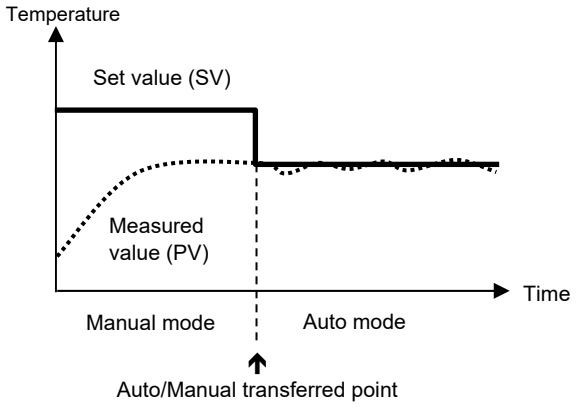
When the Manual mode is switched to the Auto mode, the Set value (SV) follows the Measured value (PV) just before the switching.

[Change of set values when switched from Manual mode to Auto mode]

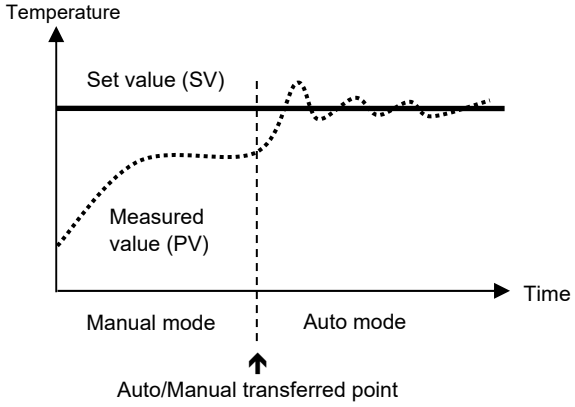
Operation mode:	Manual mode ⟶	Auto mode
SV tracking used	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)	Set value (SV) = Measured value (PV) just before the switching Measured value (PV) = Measured value (PV)
SV tracking unused	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)

Input 1 and Input 2 is the same action.

< SV tracking used >



< SV tracking unused >



The SV tracking does not function at the time of switching from Auto mode to Manual mode.

SV tracking does not function at the time of Auto/Manual switching at the Differential temperature control.

■ Parameter setting

● Input 1_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. A/M	AUTo: Auto mode MAn: Manual mode	AUTo

● Input 2_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. A/M	AUTo: Auto mode MAn: Manual mode	AUTo

To display “Input 2_Auto/Manual transfer,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Remote/Local transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When "Remote setting input" is selected at Select function for input 2 LoC: Local mode rEm: Remote mode	LoC
	When "Cascade control" is selected at Select function for input 2 SnGL: Single control (Master single or Slave single) CAS: Cascade control	SnGL
	When "2-loop control/Differential temperature control" is selected at Select function for input 2 2LooP: 2-loop control dIFF: Differential temperature control	2LooP

To display "Remote/Local transfer" (on FZ400/900), you need to specify the "Remote setting input" at the time of order, or configure the "Measured input 2" (that must be also specified at the time order) to the Remote setting input at "Select function for input 2" in Function block No. 58 in the Engineering mode.
Concerning FZ110, "Remote settingt input" must be specified at the time of order.

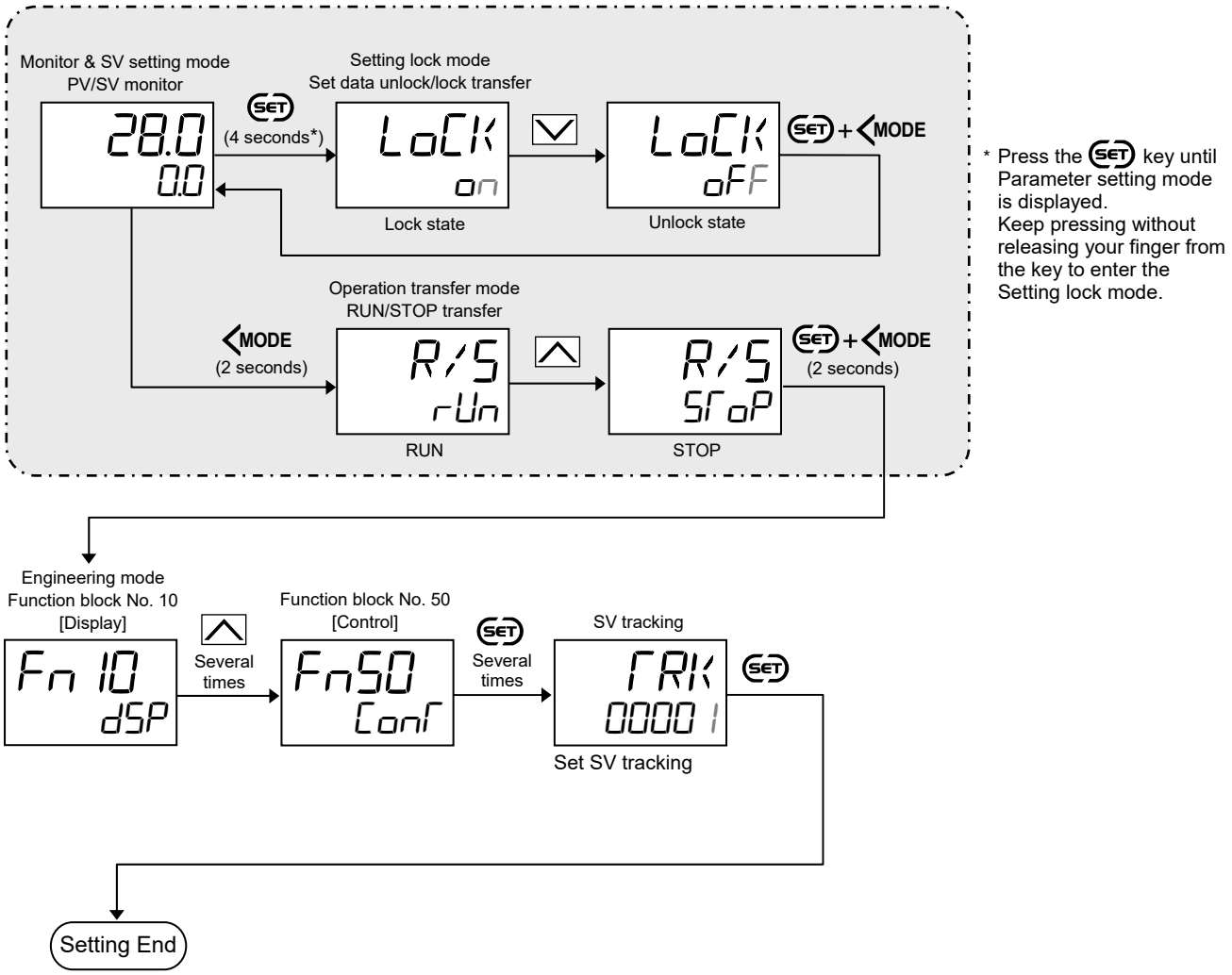
● SV tracking [Engineering Mode: Function block No. 50 (Fn50)]

Parameter symbol	Data range	Factory set value
TRK	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/ Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1

■ Setting procedure

● SV tracking setting

To enter the Engineering mode



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

☞ For detailed operation of Auto/Manual switching, refer to **8.9 Controlling with Manual Control (P.8-56)**.

☞ For detailed operation of Remote/Local switching, refer to **8.10 Using Remote Setting Input (P.8-61)**.

8.18 Suppressing Overshoot

Overshoot can be suppressed on this instrument at the time of startup (power on, control stop to start), Set value (SV) change, and external disturbances.
Overshoot during the transition from Ramp to Soak can be prevented, when the Setting change rate limiter is used.

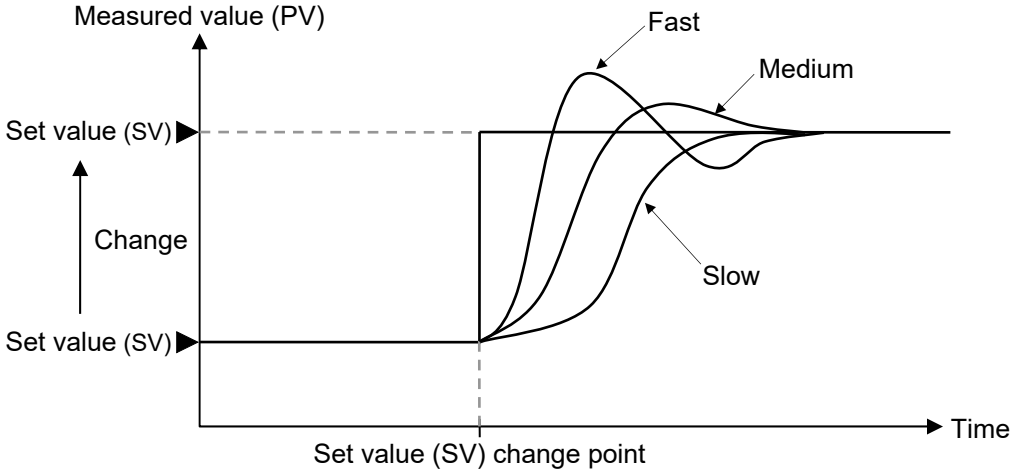
■ Description of function

Overshoot suppressing function may include Control response parameter, Proactive intensity, Determination point of external disturbance and Bottom suppression function.

● Control response parameter

A response speed level at changing Set value (SV) at PID control can be selected from three levels (Slow, Medium and Fast) in the Control response parameter.
Select “Fast” to quicken the response of the controlled object to the change in segment level and Set value (SV). When the response speed level is “Fast,” overshoot will occur. To avoid overshoot, select “Slow.”

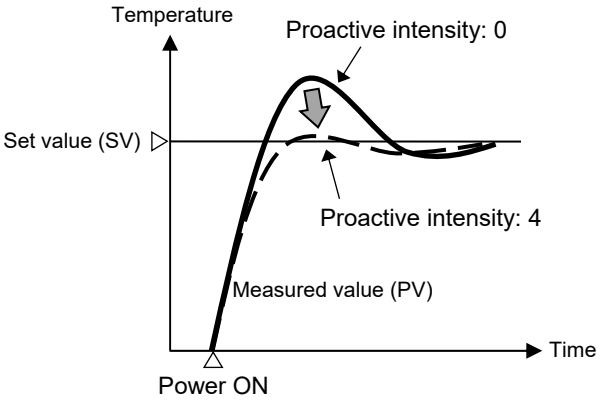
Fast	Selected when rise time needs to be shortened (operation needs to started fast). However in this case, slight overshooting may not be avoided.
Medium	Middle between “Fast” and “Slow.” Overshooting when set to “Medium” becomes less than that when set to “Fast.”
Slow	Selected when no overshooting is allowed. Used when material may be deteriorated if the temperature becomes higher that the set value.

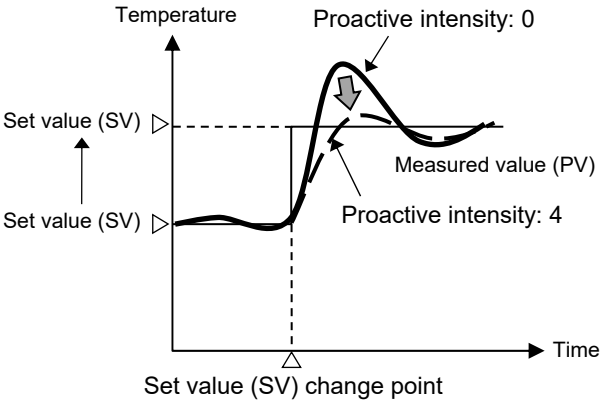


● Proactive intensity, Determination point of external disturbance

Overshoot can be suppressed at startup (power on, control stop to start), Set value (SV) change, and external disturbances. Overshoot during the transition from Ramp to Soak can be prevented. The intensity ranges from 0 to 4 (5 scales).

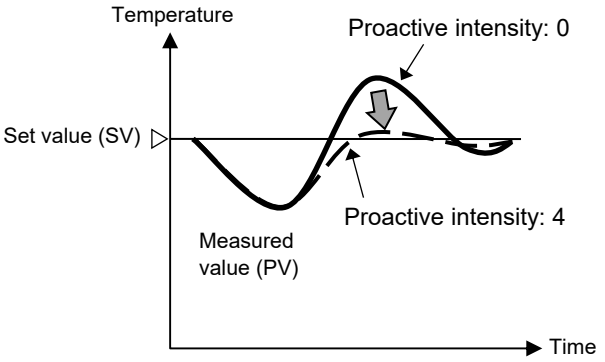
Startup (power on, control stop to start), Set value (SV) change

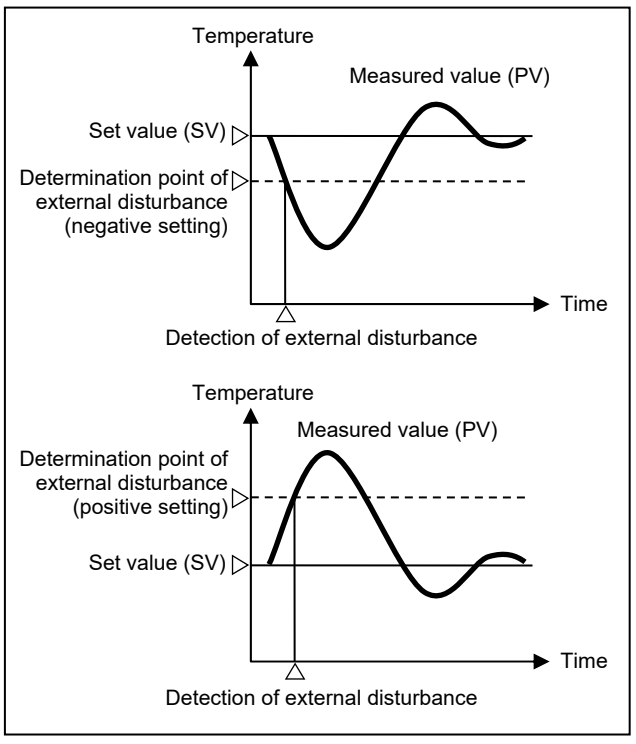




When external disturbance occurs

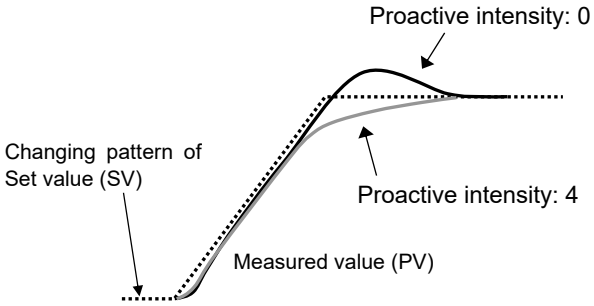
Overshoot can be suppressed when external disturbance occurs.
External disturbances are determined by the fluctuation between the stable state and Measured value (PV) of the external disturbance determination point or more which is then used as a trigger.





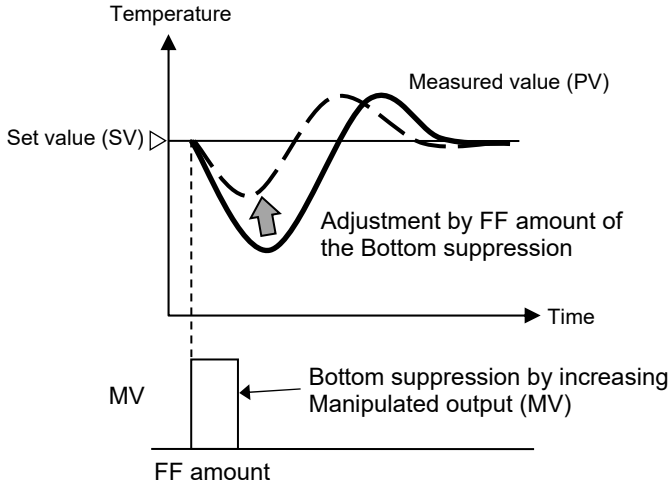
During Ramp control (Change of SV by Setting change rate limiter)

Overshoot can be suppressed when the temperature is in transition from theRramp state to the Soak state.



● Bottom suppression function

When the input fluctuation by external disturbance is detected, the amount of FF (Feedforward) is added to the output value to suppress the Bottom.



[Setting items]

- FF amount: This can also be obtained automatically by Amount of FF which is added to detect external disturbance and Learning function
- FF amount learning:
  FF amount can be calculated from external disturbance when detection of external disturbance is executed after selection of “Learn.” When setting is completed, the value will automatically return to “0: No learning.”
- Bottom suppression function:
  Used to activate/deactivate the Bottom suppression function as well as a trigger function. There are two types of triggers; when the Determination point of external disturbance (FF amount is added by the level) is exceeded and Forced addition off FF amount. Trigger signal can be input through communication in the case of Forced addition of FF amount.

■ Parameter setting

● Input 1_Control response parameter [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. RPT	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

● Input 2_Control response parameter [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. RPT	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0

To display "Input 2_Control response parameter," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Proactive intensity [Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1.PACT	0 to 4 0: No function	2

To display "Input 1_Proactive intensity," the Input 1_Proportional band [heat-side] and the Input 1_Integral time [heat-side] in the same memory area must be set to a value other than zero.

● Input 2_Proactive intensity [Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2.PACT	0 to 4 0: No function	2

To display "Input 2_Proactive intensity," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band and the Input 2_Integral time in the same memory area.

● Input 1_FF amount
[Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. FF	–100.0 to +100.0 %	0.0

To display "Input 1_FF amount," 1 or 2 must be set at "Bottom suppression function" at Function block No. 57 in the Engineering mode, and the Input 1_Proportional band [heat-side] and the Input 1_Integral time [heat-side] in the same memory area must be set to a value other than zero.

Not displayed when the control action is Position proportioning PID control.

● Input 2_FF amount
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. FF	–100.0 to +100.0 %	0.0

To display "Input 1_FF amount," 1 or 2 must be set at "Bottom suppression function" at Function block No. 57 in the Engineering mode, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band and the Input 2_Integral time in the same memory area.

● FF amount learning
[Setup Setting Mode: Setting group No. 57 (Sn57)]

Parameter symbol	Data range	Factory set value
FFST	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0

To display "FF amount learning," 1 or 2 must be set at "Bottom suppression function" at Function block No. 57 in the Engineering mode

● Input 1_Determination point of external disturbance
[Setup Setting Mode: Setting group No. 57 (Sn57)]

Parameter symbol	Data range	Factory set value
1.ExdJ	–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	–1

● Input 2_Determination point of external disturbance [Setup Setting Mode: Setting group No. 57 (SnS7)]

Parameter symbol	Data range	Factory set value
2.ExdU	–(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	–1

To display "Input 2_Determination point of external disturbance," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

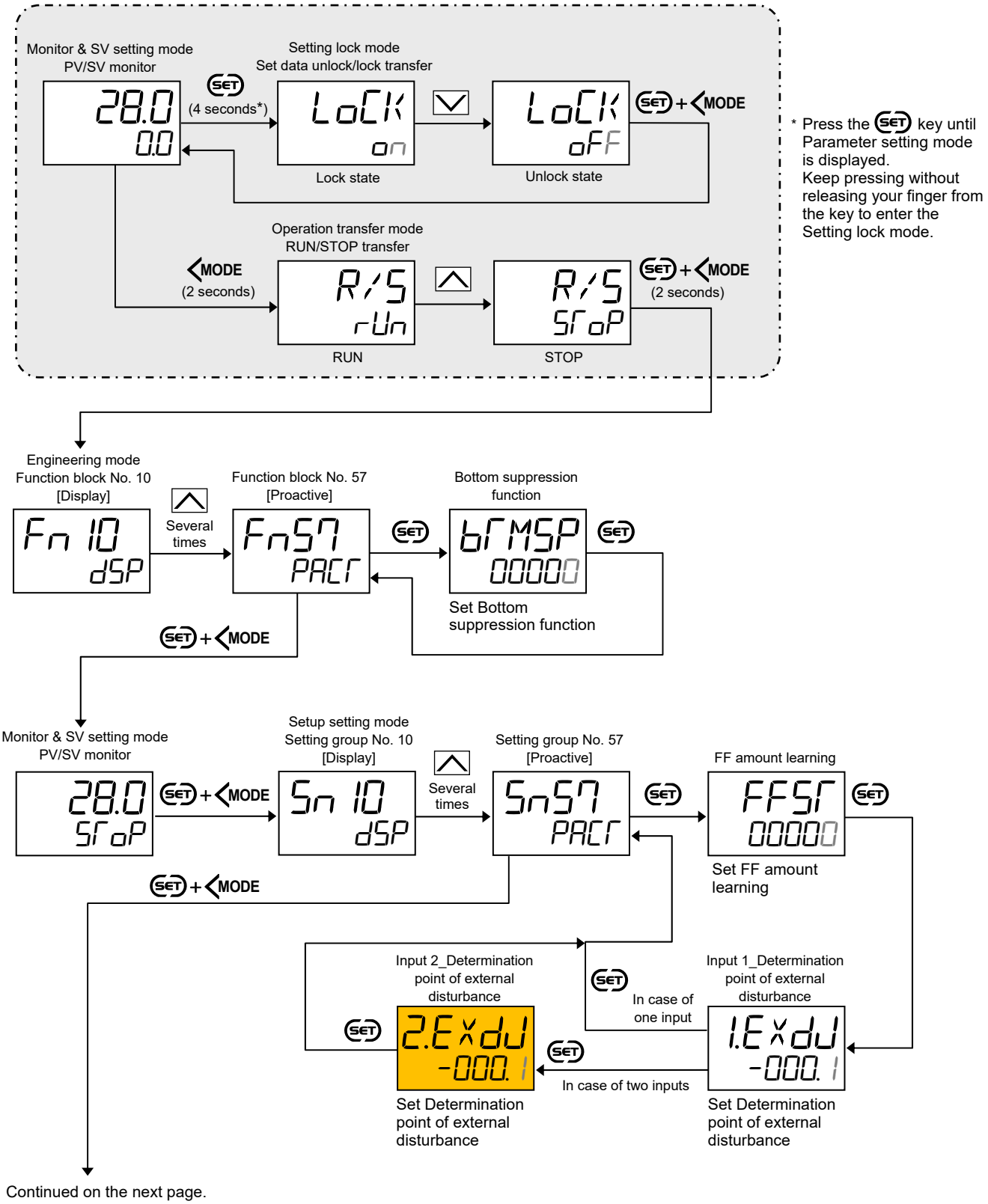
● Bottom suppression function [Engineering Mode: Function block No. 57 (FnS7)]

Parameter symbol	Data range	Factory set value
bTMSP	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0

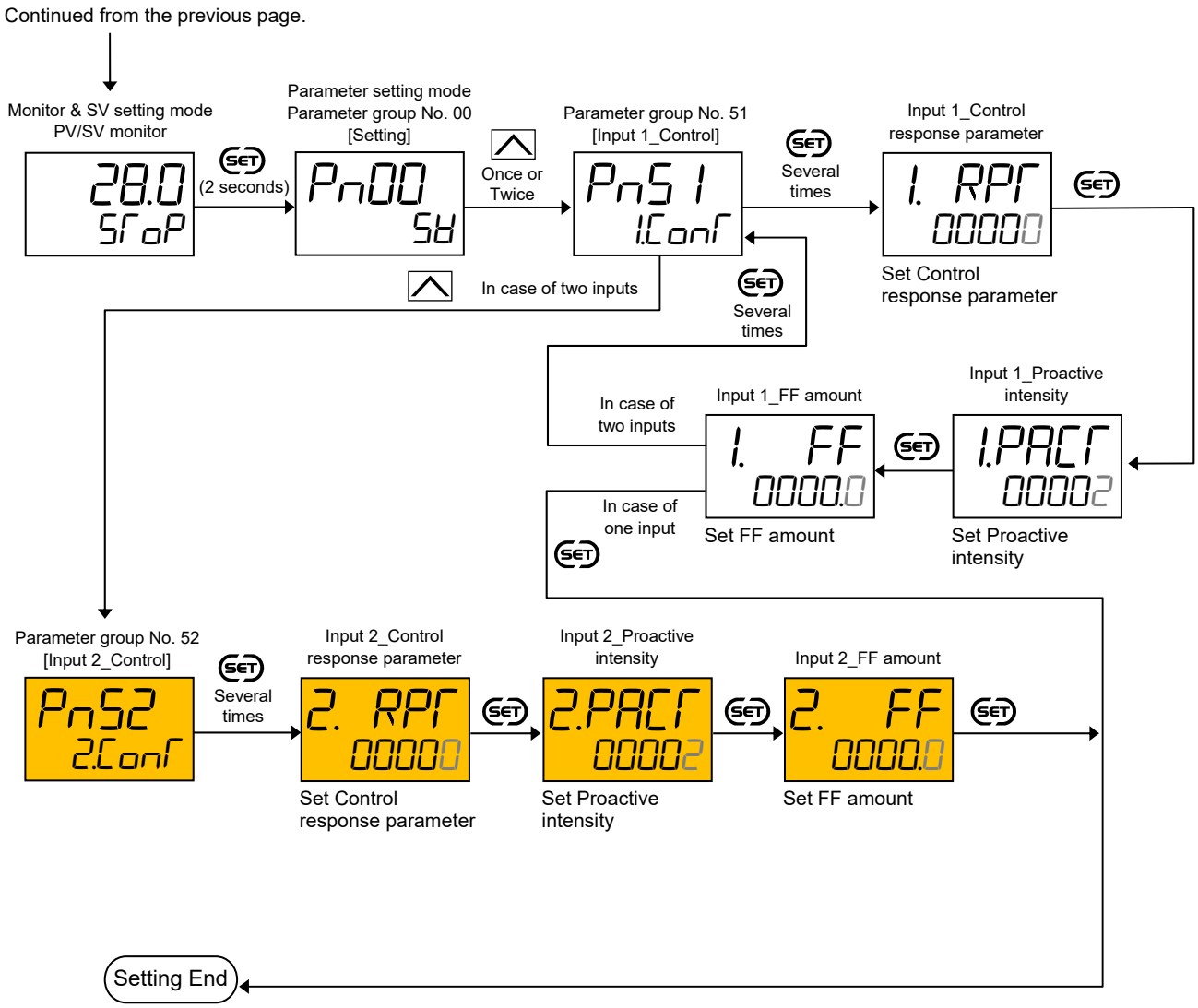
Not displayed when the control action is Position proportioning PID control.

■ Setting procedure

To enter the Engineering mode



Continued on the next page.



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

8.19 Changing the Action at Power ON (Hot/Cold Start)

When restarting following a power failure (power OFF from ON), the start action can be selected by the following parameters:

– Hot/Cold start
– Start determination point

■ Description of function

● Hot/Cold start

Recovery action from power failure can be selected from the following.

For PID control or Heat/Cool PID control

Action when power failure recovers	Operation mode when power failure recovers	Output value when power failure recovers	
Hot start 1	Same as that before power failure	Near the output value before power failure occurs	
Hot start 2	Same as that before power failure	Auto mode	Computed control output value [2]
		Manual mode	Output limiter low
Cold start	Manual control mode	Output limiter low	
STOP start	Started in the Reset mode regardless of the Operation mode before power failure. [1]	Manipulated output value (MV) at STOP	

Factory set value: Hot start 1

[1] If changed to RUN from STOP by RUN/STOP transfer after start, set to the operation mode before power failure occurs.
[2] The result of control computation varies with the control response parameter.

If the Startup tuning (ST) function is executed or an automatic temperature rise is made just when the power is turned on or selection is made from STOP to RUN as one of the startup conditions, control starts at Hot start 2 even if set to Hot start 1 (factory set value).
(It is unavailable at Cold start and STOP start.)

For Position Proportioning PID control

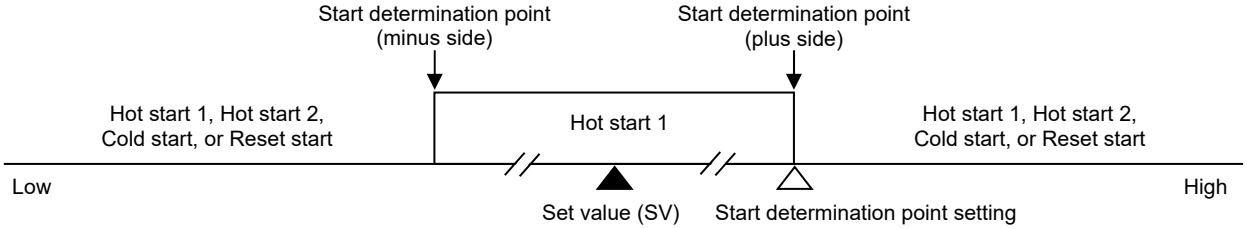
<table>
<tr><th rowspan="4">Action when power failure recovers</th><th rowspan="4">Operation mode before power failure</th><th colspan="4">Operation mode and Output value when power failure recovers</th></tr>
<tr><th rowspan="3">Without Feedback resistance (FBR) input</th><th colspan="3">With Feedback resistance (FBR) input</th></tr>
<tr><th rowspan="2">Feedback resistance (FBR) connected</th><th colspan="2">Feedback resistance (FBR) disconnected</th></tr>
<tr><th>Action at FBR disconnected: 0 *</th><th>Action at FBR disconnected: 1 *</th></tr>
<tr><td rowspan="4">Hot start 1</td><td>Auto mode</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td><td rowspan="4">Operation mode:
Same as that before power failure
Output:
In accordance with the setting of valve action at STOP</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td></tr>
<tr><td>Manual mode</td><td>Operation mode:
Same as that before power failure
Output: No output</td><td>Operation mode:
Same as that before power failure
Output:
According to the result of control computation of Manipulated output value</td><td>Operation mode:
Same as that before power failure
Output: No output</td></tr>
<tr><td rowspan="2">Hot start 2</td><td>Auto mode</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td><td>Operation mode:
Same as that before power failure
Output:
Computed control output value</td></tr>
<tr><td>Manual mode</td><td>Operation mode:
Same as that before power failure
Output: No output</td><td>Operation mode:
Same as that before power failure
Output:
According to the result of control computation of Manipulated output value</td><td>Operation mode:
Same as that before power failure
Output: No output</td></tr>
<tr><td>Cold start</td><td></td><td>Operation mode: Monual mode
Output: No output</td><td>Operation mode: Monual mode
Output:
According to the result of control computation of Output limiter low</td><td>Operation mode: Monual mode
Output:
In accordance with the setting of valve action at STOP</td><td>Operation mode: Monual mode
Output: No output</td></tr>
<tr><td>STOP start</td><td></td><td>Operation mode: STOP
Output:
In accordance with the setting of valve action at STOP</td><td>Operation mode: STOP
Output:
According to the result of control computation of Manipulated output value at STOP</td><td colspan="2">Operation mode: STOP
Output: In accordance with the setting of valve action at STOP</td></tr>
</table>

* Action at FBR disconnected
0: In accordance with the setting of valve action at STOP
1: Control action is continued

● Start determination point

Separately from Hot start and Cold start, users can set the start range (Start determination point) of Hot start 1 after power recovery. Determination point of start is a deviation setting from the Set value (SV).

- The start state is determined according to the Measured value (PV) level [deviation from set value] at power recovery.
- When a Measured value (PV) is between the determination points on the + (plus) and − (minus) sides, always starts from Hot start 1 when recovered.
- When a Measured value (PV) is out of the determination points or the Start determination point is set at "0," operation starts from any start state selected by Hot/Cold start.



During Cascade control: Determined for Master side (Input 1) only.
In the case of Master single control and Slave single control, according to the setting of each input.

Action at power failure for 2-loop control is as follows:

- Hot start 1, Hot start 2, and Cold start
  Control is started in a mode according to the determination point of start.
- STOP start
  Starts in Hot start 1 when Input 1 or Input 2 stays within the determination point of start.
  Starts in STOP start when both of Input 1 and Input 2 are outside the determination point of start.

■ Parameter setting

● Hot/Cold start
[Engineering Mode: Function block No. 50 (FnS0)]

Parameter symbol	Data range	Factory set value
Pd	0: Hot start 1 1: Hot start 2 2: Cold start 3: STOP start	0

● Input 1_Start determination point
[Engineering Mode: Function block No. 51 (FnS1)]

Parameter symbol	Data range	Factory set value
1. PdA	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 1_Input span (Control with PV select: 3 % of PV select input span)

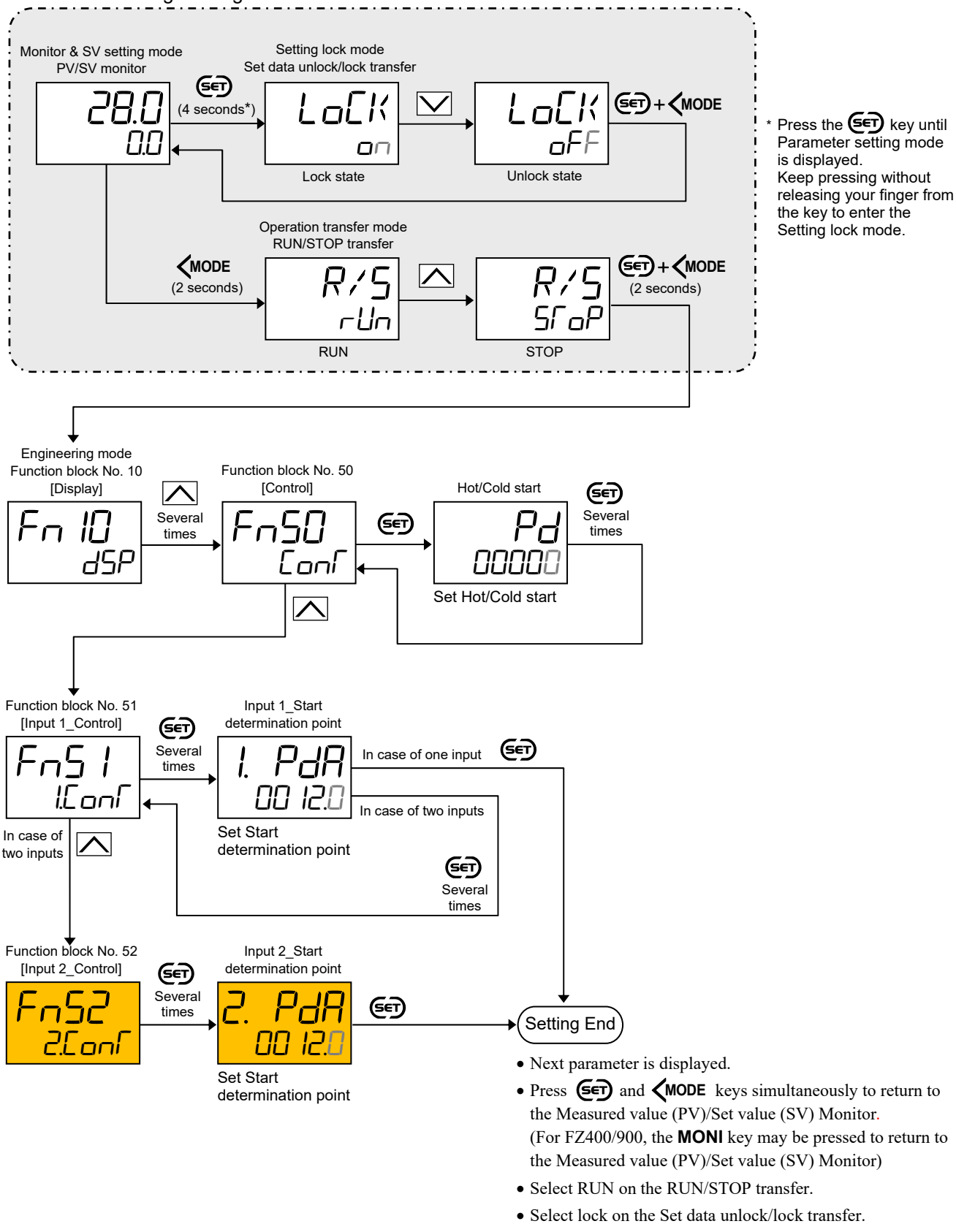
● Input 2_Start determination point
[Engineering Mode: Function block No. 52 (FnS2)]

Parameter symbol	Data range	Factory set value
2. PdA	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 2_Input span

To display “Input 2_Start determination point,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

■ Setting procedure

To enter the Engineering mode



* Press the (SET) key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

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

MEMO

DISPLAY RELATED FUNCTIONS

9

This chapter describes display related functions, setting contents and setting procedure based on the key words related to Display.

9.1 Grouping Necessary Screens (Parameter Select Function) 9-2
9.2 Hiding Unnecessary Screens..... 9-12
9.3 Hiding the Display of the Set Value (SV) 9-18
9.4 Changing the Display Position of STOP during the Control Stop.. 9-20
9.5 Changing the ALM Lamp Lighting Condition 9-22
9.6 Changing the Display Contents of the MV Display [FZ400/900] ... 9-24
9.7 Checking Input Peak Value/Bottom Value 9-26
9.8 Suppressing the Display Flickering..... 9-30
9.9 Checking the Instrument Information 9-32

9.1 Grouping Necessary Screens (Parameter Select Function)

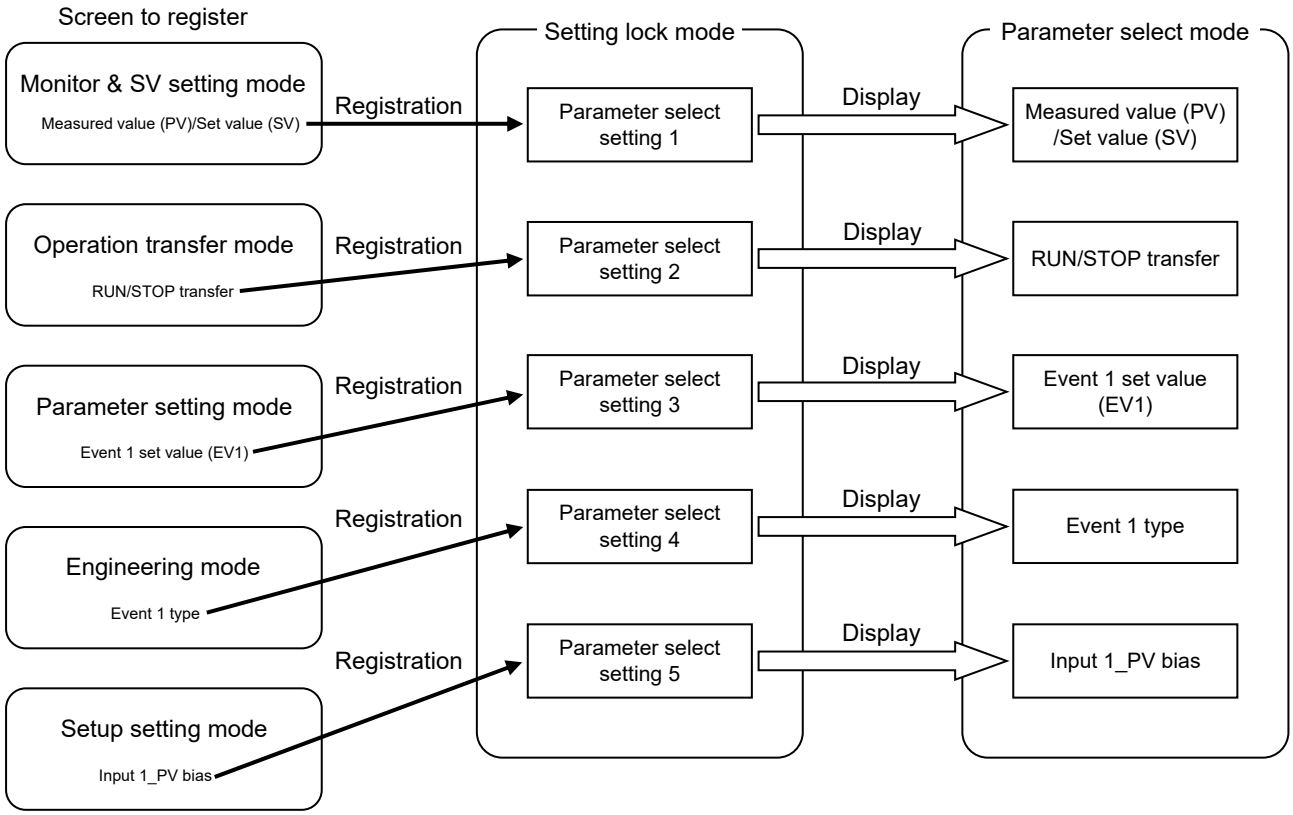
This instrument has a function that allows a user to specify desired screens to be displayed. This function is called “Parameter select function.” Up to 16 screens can be grouped together.

■ Description of function

The Parameter select function allows grouping necessary screens into a single mode for display. Screens registered in the Setting lock mode are displayed in the Parameter select mode.
The screens displayed in this mode can be operated in the same manner as they are in the original mode.

With the Parameter select function, the Setting lock mode screen and the Function block No. 91 in the Engineering mode cannot be registered.

[How does Parameter select function work?]



[Example] When “Event 1 set value (EV1)” screen in the Parameter setting mode is registered in the Parameter select setting screen, this screen can be viewed in both the Parameter select mode and the Parameter setting mode.

- **Set data lock**

  This function can be independently activated in each operation mode.
  For example, when the parameters in the Parameter setting mode are locked, the same parameters in the Parameter select mode are settable.

There are two ways to register screens.
- Screen number entry: Enter the screen No. on the Parameter select setting screen.
- Direct registration: Display the desired screen and register it through key operations.

● Screen number entry

Enter the predefined screen number on the Parameter select setting screen in the Setting lock mode. The registered screens in the Parameter select mode will be displayed.

☞ Refer to the **List of screen numbers (P. 9-9)** for details.

[To register screens]

Check the screen number.	Find the desired screen No. by referring to the List of screen numbers
↓	
Enter the screen number on the Parameter select setting screen.	Display the "Parameter select setting screen" in the Setting lock mode and enter the desired screen number to register. (A maximum of 16 screens can be registered)
↓	
Check the registered screen.	Switch the mode to the Parameter select mode to see that the registered screen is properly displayed.

[Registering screens and display (1)]

There are 16 Parameter select setting screens and these are freely settable. Unregistered screens, if any, will be skipped and screens are displayed in series in the Parameter select mode.

Setting lock mode: Parameter select setting screen (for registration)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C					D	E						F	

: Registered screens : Unregistered screens (Set value = 0)

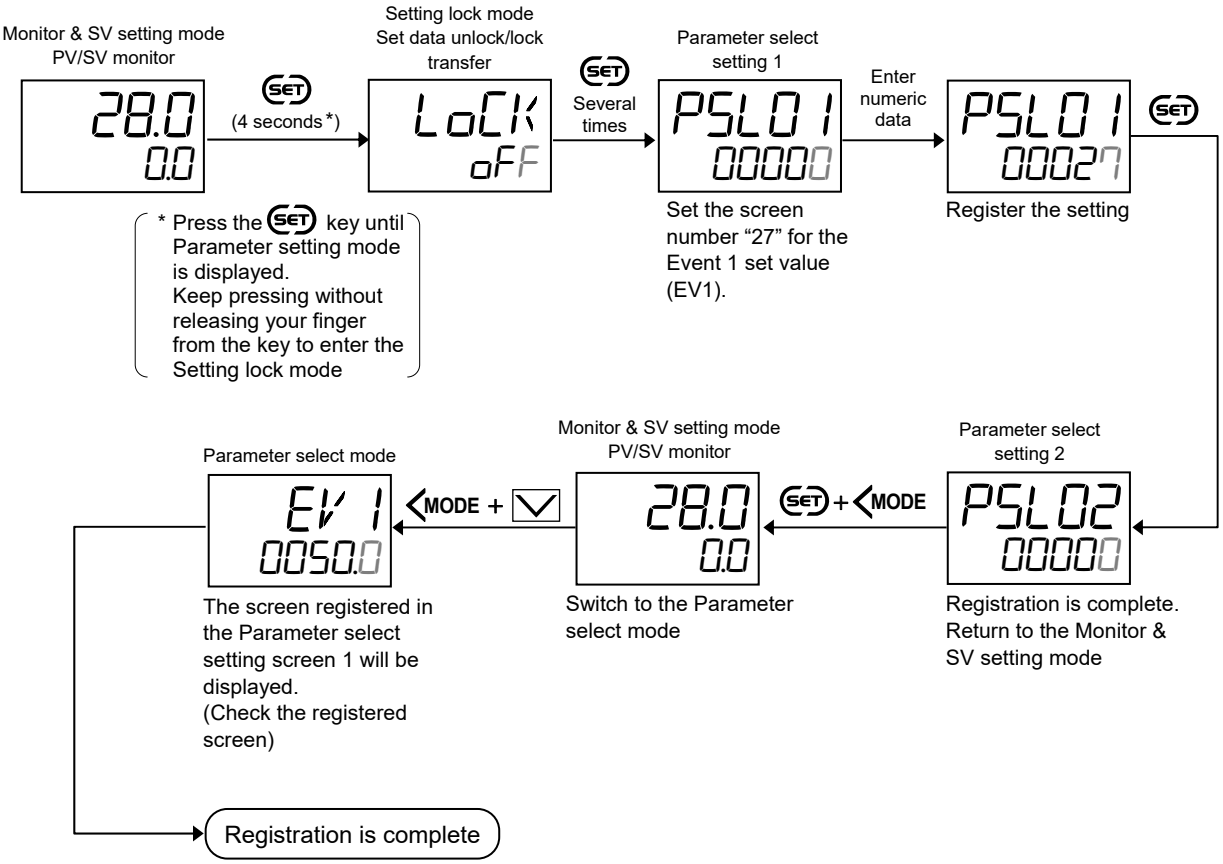
Parameter select mode: Displayed screens

A	B	C	D	E	F

Only registered screens are grouped for display.

[Entering screen No.]

In this example we will register “Event 1 set value (EV1)” in the Parameter setting mode.

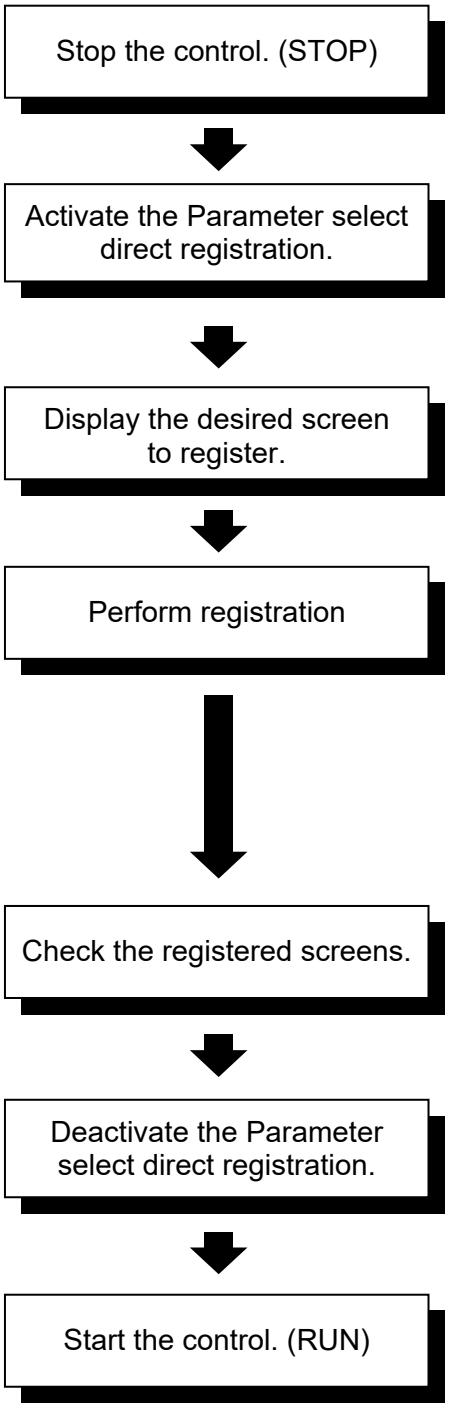


● Direct registration

Activate the direct registration on the Parameter select direct registration screen in the Setting lock mode. Display the screen to register and press the ▽ and △ keys simultaneously.
The screen will be registered on the Parameter select setting screen.

- Control must be stopped before attempting the direct registration.
- When the direct registration is activated on the Parameter select direct registration screen, all modes except for the Setting lock mode will be locked.

[To register screens]



Stop the control to make a direct registration.

Call the "Parameter select direct registration" screen and enable the direct registration.

- When the direct registration is set to ON, modes are forced to be data lock state except the Setting lock mode.

Display the desired screen to register.

Press the ▽ and △ keys simultaneously, then the displayed screen will be registered in the Parameter select setting screen.

- When the registration is accepted, the Parameter select setting screen No. will be displayed about one second on the SV display.
  When the data is registered into the Parameter select setting screen 2, "PSL02" will be displayed.

Change the mode to the Parameter select mode to check the registered screen.

To release the Set data lock state, call the "Parameter select direct registration" screen and disable the direct registration.

Start the control.

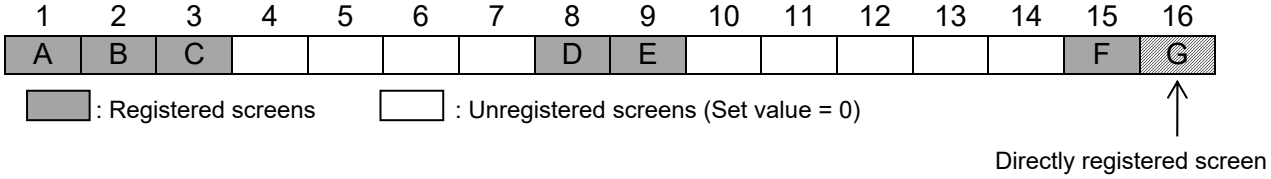
[Registering screens and display (2)]

This example shows the case of the direct registration under the state of the "**[Registering screens and display (1)]" (P. 9-3)**.

• When directly registered

When attempting a direct registration, in case there is a registered screen in the Parameter select setting screen, the new screen will be added to after the registered screen. Even if there are unregistered screens, the new screen will be added to after the screen with the largest screen number of the Parameter select setting screen.

Setting lock mode: Parameter select setting screen (for registration)

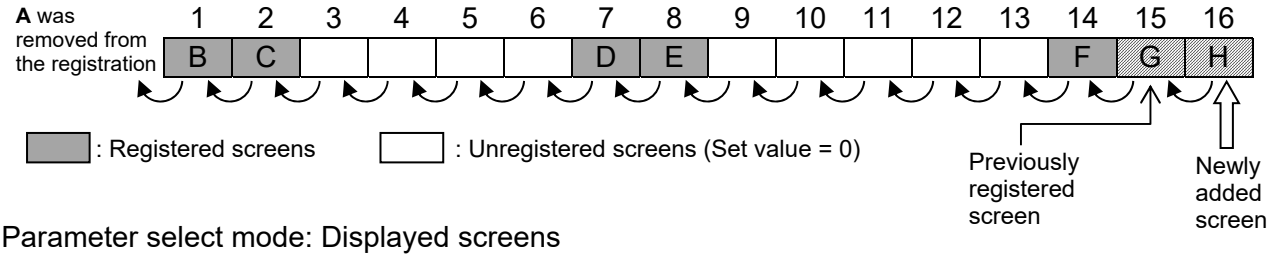


Parameter select mode: Displayed screens

• Registering further screens

When the Parameter select setting 16 screens are registered, the latest direct registration is added to the position of No.16, and the data before that will be moved ahead to toward the direction of the smaller numbers. Consequently, the screen registered at the Parameter select setting 1 will be moved out and removed from the registration.

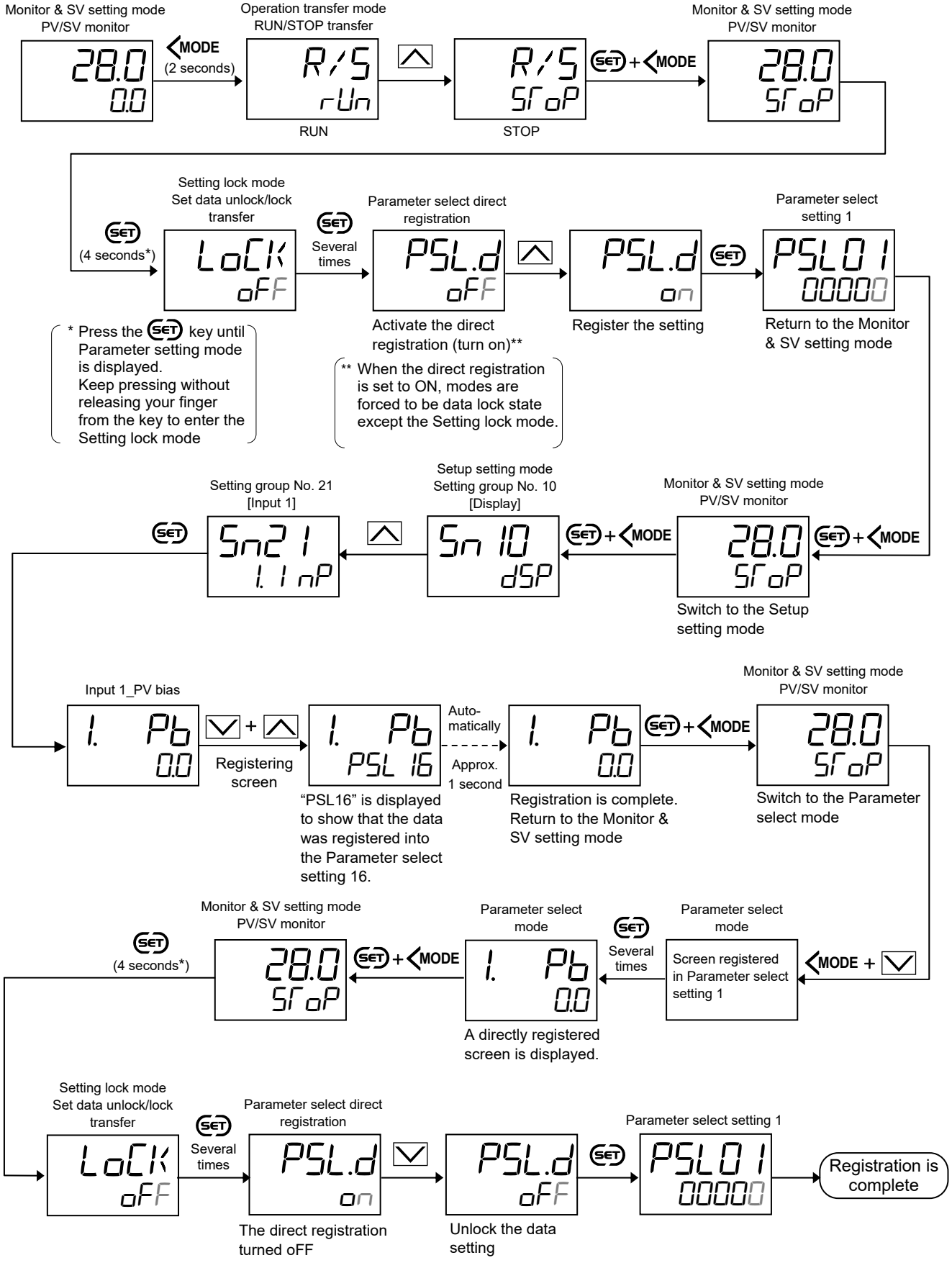
Setting lock mode: Parameter select setting screen (for registration)



Parameter select mode: Displayed screens

[Example of Direct registration]

This is an example to make a direct registration of "Input 1_PV bias" in the Setting group 21 in the Setup setting mode under the state of the "**[Registering screens and display (1)]" (P. 9-3)**.



■ Parameter setting

● Parameter select direct registration [Setting Lock Mode]

Parameter symbol	Data range	Factory set value
PSL.d	oFF: Direct registration: OFF on: Direct registration: ON	oFF

To allow "Parameter select direct registration," Control must be stopped (STOP).

Set "on: Direct registration ON" to ON. All except Setting lock mode will be forced to data locked. After the registration process is over, return the setting to oFF.

This setting returns to oFF when the power is turned off.

● Parameter select setting 1 to 16 [Setting Lock Mode]

Parameter symbol	Data range	Factory set value
PSL01 ⋮ PSL16	0: No registration 1 to 303 (Screen No.) For details, refer to **List of screen numbers (P. 9-9)**.	0

● List of screen numbers

No.	Name	Mode
1	Input 1_Measured value (PV) monitor [1] Input 1_Set value (SV) monitor [2]	Monitor & SV setting mode
2	Input 2_Measured value (PV) monitor Input 2_Set value (SV) monitor [3, 4]	
3	Measured value (PV) of differential temperature input monitor Set value (SV) of differential temperature input (SV) monitor [2]	
4	Input 1_Measured value (PV) Input 2_Measured value (PV)	
5	Remote setting input value monitor	
6	Input 1_Manipulated output value monitor [heat-side]	
7	Input 1_Manipulated output value monitor [cool-side] 7	
8	Input 2_Manipulated output value monitor	
9	Current transformer 1 (CT1) input value monitor	
10	Current transformer 2 (CT2) input value monitor	
11	Comprehensive event state	
12	Memory area soak time monitor	
13	Interlock release	
14	Memory area transfer	
15	RUN/STOP transfer	Operation transfer mode
16	Input 1_Autotuning (AT)	
17	Input 2_Autotuning (AT)	
18	Input 1_Startup tuning (ST)	
19	Input 2_Startup tuning (ST)	
20	Input 1_Auto/Manual transfer	
21	Input 2_Auto/Manual transfer	
22	Remote/Local transfer Cascade mode transfer PV select transfer 2-loop control/Differential temperature control transfer	
23	Control area Local/External transfer	
24	Input 1_Set value (SV)	Parameter setting mode Parameter group No. 00 (Pn00)
25	Input 2_Set value (SV)	
26	Set value (SV) of differential temperature input (SV)	
27	Event 1 set value (EV1) Event 1 set value (EV1) [high]	Parameter setting mode Parameter group No. 40 (Pn40)
28	Event 1 set value (EV1') [low]	
29	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
30	Event 2 set value (EV2') [low]	
31	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
32	Event 3 set value (EV3') [low]	
33	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
34	Event 4 set value (EV4') [low]	
35	Input 1_Proportional band [heat-side]	Parameter setting mode Parameter group No. 51 (Pn51)
36	Input 1_Integral time [heat-side]	
37	Input 1_Derivative time [heat-side]	
38	Input 1_ON/OFF action differential gap (upper)	
39	Input 1_ON/OFF action differential gap (lower)	
40	Input 1_Control response parameter	
41	Input 1_Proactive intensity	

No.	Name	Mode
42	Input 1_Manual reset	Parameter setting mode Parameter group No. 51 (Pn51)
43	Input 1_FF amount	
44	Input 1_Output limiter high [heat-side]	
45	Input 1_Output limiter low [heat-side]	
46	Input 1_Control loop break alarm (LBA) time	
47	Input 1_LBA deadband (LBD)	
48	Input 2_Proportional band	Parameter setting mode Parameter group No. 52 (Pn52)
49	Input 2_Integral time	
50	Input 2_Derivative time	
51	Input 2_ON/OFF action differential gap (upper)	
52	Input 2_ON/OFF action differential gap (lower)	
53	Input 2_Control response parameter	
54	Input 2_Proactive intensity	
55	Input 2_Manual reset	
56	Input 2_FF amount	
57	Input 2_Output limiter high	
58	Input 2_Output limiter low	
59	Input 2_Control loop break alarm (LBA) time	
60	Input 2_LBA deadband (LBD)	
61	Input 1_Proportional band [cool-side]	Parameter setting mode Parameter group No. 56 (Pn56)
62	Input 1_Integral time [cool-side]	
63	Input 1_Derivative time [cool-side]	
64	Input 1_Overlap/Deadband	
65	Input 1_Output limiter high [cool-side]	
66	Input 1_Output limiter low [cool-side]	
67	Select Trigger type for Memory area transfer	Parameter setting mode Parameter group No. 70 (Pn70)
68	Area soak time	
69	Link area number	
70	Input 1_Setting change rate limiter (up)	
71	Input 1_Setting change rate limiter (down)	
72	Input 1_Auto/Manual transfer selection (Area)	
73	Input 1_Manipulated output value (Area)	
74	Input 2_Setting change rate limiter (up)	
75	Input 2_Setting change rate limiter (down)	
76	Input 2_Auto/Manual transfer selection (Area)	
77	Input 2_Manipulated output value (Area)	
78	Remote/Local transfer selection (Area)	
79	Display update cycle	Setup setting mode Setting group No. 10 (Sn10)
80	Input 1_PV bias	Setup setting mode Setting group No. 21 (Sn21)
81	Input 1_PV digital filter	
82	Input 1_PV ratio	
83	Input 1_PV low input cut-off	
84	Input 2_PV bias (RS bias)	Setup setting mode Setting group No. 22 (Sn22)
85	Input 2_PV digital filter (RS digital filter)	
86	Input 2_PV ratio (RS ratio)	
87	Input 2_PV low input cut-off	
88	OUT1 proportional cycle time	Setup setting mode Setting group No. 30 (Sn30)
89	OUT2 proportional cycle time	
90	OUT3 proportional cycle time	

[1] Measured value (PV) of the PV select under the Control with PV select.

[2] Input 1_Manual manipulated output value when Input 1 is in Manual mode.

[3] Input 1_Manual manipulated output value when the control is Cascade control in the Manual mode.

[4] Input 2_Manual manipulated output value when the control is 2-loop control and when Input 2 is in Manual mode.

No.	Name	Mode
91	OUT1 minimum ON/OFF time of proportional cycle	Setup setting mode Setting group No. 30 (5n30)
92	OUT2 minimum ON/OFF time of proportional cycle	
93	OUT3 minimum ON/OFF time of proportional cycle	
94	Heater break alarm 1 (HBA1) set value	Setup setting mode Setting group No. 45 (5n45)
95	Number of heater break alarm 1 (HBA1) delay times	
96	Heater break alarm 2 (HBA2) set value	Setup setting mode Setting group No. 46 (5n46)
97	Number of heater break alarm 2 (HBA2) delay times	
98	Input 1_Manual manipulated output value	Setup setting mode Setting group No. 51 (5n51)
99	Input 1_Level PID setting 1	
100	Input 1_Level PID setting 2	
101	Input 1_Level PID setting 3	
102	Input 1_Level PID setting 4	
103	Input 1_Level PID setting 5	
104	Input 1_Level PID setting 6	
105	Input 1_Level PID setting 7	
106	Input 2_Manual manipulated output value	Setup setting mode Setting group No. 52 (5n52)
107	Input 2_Level PID setting 1	
108	Input 2_Level PID setting 2	
109	Input 2_Level PID setting 3	
110	Input 2_Level PID setting 4	
111	Input 2_Level PID setting 5	
112	Input 2_Level PID setting 6	
113	Input 2_Level PID setting 7	
114	Input 1_AT bias	Setup setting mode Setting group No. 53 (5n53)
115	Input 1_AT remaining time monitor	
116	Input 1_AT/ST status monitor	
117	Input 2_AT bias	Setup setting mode Setting group No. 54 (5n54)
118	Input 2_AT remaining time monitor	
119	Input 2_AT/ST status monitor	
120	Open/Close output neutral zone	Setup setting mode Setting group No. 55 (5n55)
121	Open/Close output differential gap	
122	FF amount learning	Setup setting mode Setting group No. 57 (5n57)
123	Input 1_Determination point of external disturbance	
124	Input 2_Determination point of external disturbance	
125	Cascade_Proportional band (master-side)	Setup setting mode Setting group No. 58 (5n58)
126	Cascade_Integral time (master-side)	
127	Cascade_Derivative time (master-side)	
128	Cascade_Proportional band (slave-side)	
129	Cascade_Integral time (slave-side)	
130	Cascade_Derivative time (slave-side)	
131	Cascade_Digital filter	
132	Cascade_Scale high	
133	Cascade_Scale low	
134	PV select transfer level	
135	PV select transfer time	
136	Input 1_Peak hold monitor	Setup setting mode Setting group No. 91 (5n91)
137	Input 1_Bottom hold monitor	
138	Input 1_Hold reset	
139	Input 2_Peak hold monitor	
140	Input 2_Bottom hold monitor	
141	Input 2_Hold reset	
142	STOP display selection	Engineering mode Function block No. 10 (Fn10)
143	ALM lamp lighting condition	
144	PV flashing display at input error	

No.	Name	Mode
145	Show/Hide Input 1_SV	Engineering mode Function block No. 10 (Fn10)
146	Show/Hide Input 2_SV	
147	Show/Hide Input 1_MV	
148	Show/Hide Input 2_MV	
149	Select hide items in Monitor mode	
150	Select hide items in Operation transfer mode	
151	Data registration	Engineering mode Function block No. 11 (Fn11)
152	FUNC key assignment	
153	FUNC key operation selection	
154	Input 1_Input type	Engineering mode Function block No. 21 (Fn21)
155	Input 1_Display unit	
156	Input 1_Decimal point position	
157	Input 1_Input range high	
158	Input 1_Input range low	
159	Input 1_Input error determination point (high)	
160	Input 1_Input error determination point (low)	
161	Input 1_Temperature compensation calculation	
162	Input 1_Burnout direction	
163	Input 1_Square root extraction	
164	Input 1_Inverting input	
165	Input data type	
166	Input 2_Input type	Engineering mode Function block No. 22 (Fn22)
167	Input 2_Display unit	
168	Input 2_Decimal point position	
169	Input 2_Input range high	
170	Input 2_Input range low	
171	Input 2_Input error determination point (high)	
172	Input 2_Input error determination point (low)	
173	Input 2_Temperature compensation calculation	
174	Input 2_Burnout direction	
175	Input 2_Square root extraction	
176	Input 2_Inverting input	
177	DI1 function selection	Engineering mode Function block No. 23 (Fn23)
178	DI2 function selection	
179	DI3 function selection	
180	DI4 function selection	
181	DI5 function selection	
182	DI6 function selection	
183	DI logic invert	
184	Area switching time (without area set signal)	
185	OUT1 function selection	Engineering mode Function block No. 30 (Fn30)
186	OUT2 function selection	
187	OUT3 function selection	
188	OUT1 logic calculation selection	
189	OUT2 logic calculation selection	
190	OUT3 logic calculation selection	
191	Energized/De-energized selection	
192	Interlock selection	
193	Output action at control stop	
194	Universal output type selection (OUT3)	
195	Retransmission output 1 type	Engineering mode Function block No. 31 (Fn31)
196	Retransmission output 1 scale high	
197	Retransmission output 1 scale low	
198	Retransmission output 2 type	Engineering mode Function block No. 32 (Fn32)
199	Retransmission output 2 scale high	
200	Retransmission output 2 scale low	

No.	Name	Mode
201	Retransmission output 3 type	Engineering mode Function block No. 33 (Fn33)
202	Retransmission output 3 scale high	
203	Retransmission output 3 scale low	
204	DO1 function selection	Engineering mode Function block No. 34 (Fn34)
205	DO2 function selection	
206	DO3 function selection	
207	DO4 function selection	
208	DO1 logic calculation selection	
209	DO2 logic calculation selection	
210	DO3 logic calculation selection	
211	DO4 logic calculation selection	
212	Event 1 assignment	Engineering mode Function block No. 41 (Fn41)
213	Event 1 type	
214	Event 1 hold action	
215	Event 1 differential gap	
216	Event 1 timer	
217	Event 2 assignment	Engineering mode Function block No. 42 (Fn42)
218	Event 2 type	
219	Event 2 hold action	
220	Event 2 differential gap	
221	Event 2 timer	
222	Event 3 assignment	Engineering mode Function block No. 43 (Fn43)
223	Event 3 type	
224	Event 3 hold action	
225	Event 3 differential gap	
226	Event 3 timer	
227	Event 4 assignment	Engineering mode Function block No. 44 (Fn44)
228	Event 4 type	
229	Event 4 hold action	
230	Event 4 differential gap	
231	Event 4 timer	
232	CT1 assignment	Engineering mode Function block No. 45 (Fn45)
233	CT1 type	
234	CT1 ratio	
235	CT1 low input cut-off	
236	CT2 assignment	Engineering mode Function block No. 46 (Fn46)
237	CT2 type	
238	CT2 ratio	
239	CT2 low input cut-off	
240	Hot/Cold start	Engineering mode Function block No. 50 (Fn50)
241	Manual manipulated output value selection	
242	SV tracking	
243	Integral/Derivative time decimal point position	
244	ST start condition	
245	Input 1_Control action	Engineering mode Function block No. 51 (Fn51)
246	Input 1_Output change rate limiter (up) [heat-side]	
247	Input 1_ Output change rate limiter (down) [heat-side]	
248	Input 1_Action (high) input error	
249	Input 1_Action (low) input error	
250	Input 1_Manipulated output value at input error	
251	Input 1_ Manipulated output value at STOP [heat-side]	
252	Input 1_Start determination point	
253	Input 1_Level PID action selection	
254	Input 1_Level PID differential gap	

No.	Name	Mode
255	Input 2_Control action	Engineering mode Function block No. 52 (Fn52)
256	Input 2_Output change rate limiter (up)	
257	Input 2_Output change rate limiter (down)	
258	Input 2_Action (high) input error	
259	Input 2_Action (low) input error	
260	Input 2_Manipulated output value at input error	
261	Input 2_Manipulated output value at STOP	
262	Input 2_Start determination point	
263	Input 2_Level PID action selection	
264	Input 2_Level PID differential gap	
265	Action at feedback resistance (FBR) input error	Engineering mode Function block No. 55 (Fn55)
266	Feedback adjustment	
267	Control motor time	
268	Integrated output limiter	
269	Valve action at STOP	
270	Action at saturated output	
271	Input 1_Output change rate limiter (up) [cool-side]	Engineering mode Function block No. 56 (Fn56)
272	Input 1_Output change rate limiter (down) [cool-side]	
273	Input 1_Manipulated output value at STOP [cool-side]	
274	Undershoot suppression factor	
275	Overlap/Deadband reference point	
276	Bottom suppression function	Engineering mode Function block No. 57 (Fn57)
277	Select function for input 2	Engineering mode Function block No. 58 (Fn58)
278	Cascade_AT mode (master-side)	
279	Cascade_AT mode (slave-side)	
280	Selection of PV select trigger	
281	Input circuit error alarm set value	
282	Communication protocol	Engineering mode Function block No. 60 (Fn60)
283	Device address	
284	Communication speed	
285	Data bit configuration	
286	Interval time	
287	Communication response monitor	
288	Register type	Engineering mode Function block No. 62 (Fn62)
289	Register start number (High-order 4-bit)	
290	Register start number (Low-order 16-bit)	
291	Monitor item register bias	
292	Setting item register bias	
293	Instrument link recognition time	
294	PLC response waiting time	
295	PLC communication start time	
296	Slave register bias	
297	Number of recognizable devices	
298	Setting change rate limiter unit time	Engineering mode Function block No. 70 (Fn70)
299	Soak time unit	
300	Input 1_Setting limiter high	Engineering mode Function block No. 71 (Fn71)
301	Input 1_Setting limiter low	
302	Input 2_Setting limiter high	Engineering mode Function block No. 72 (Fn72)
303	Input 2_Setting limiter low	

9.2 Hiding Unnecessary Screens

On this instrument, a specified range of screens can be hidden.
Below are screens that can be hidden.

- Monitor screen in the Monitor & SV setting mode
- Screens in the Operation transfer mode
- Screens restricted by the Blind function

9.2.1 Hide the monitor screen in the Monitor & SV setting mode

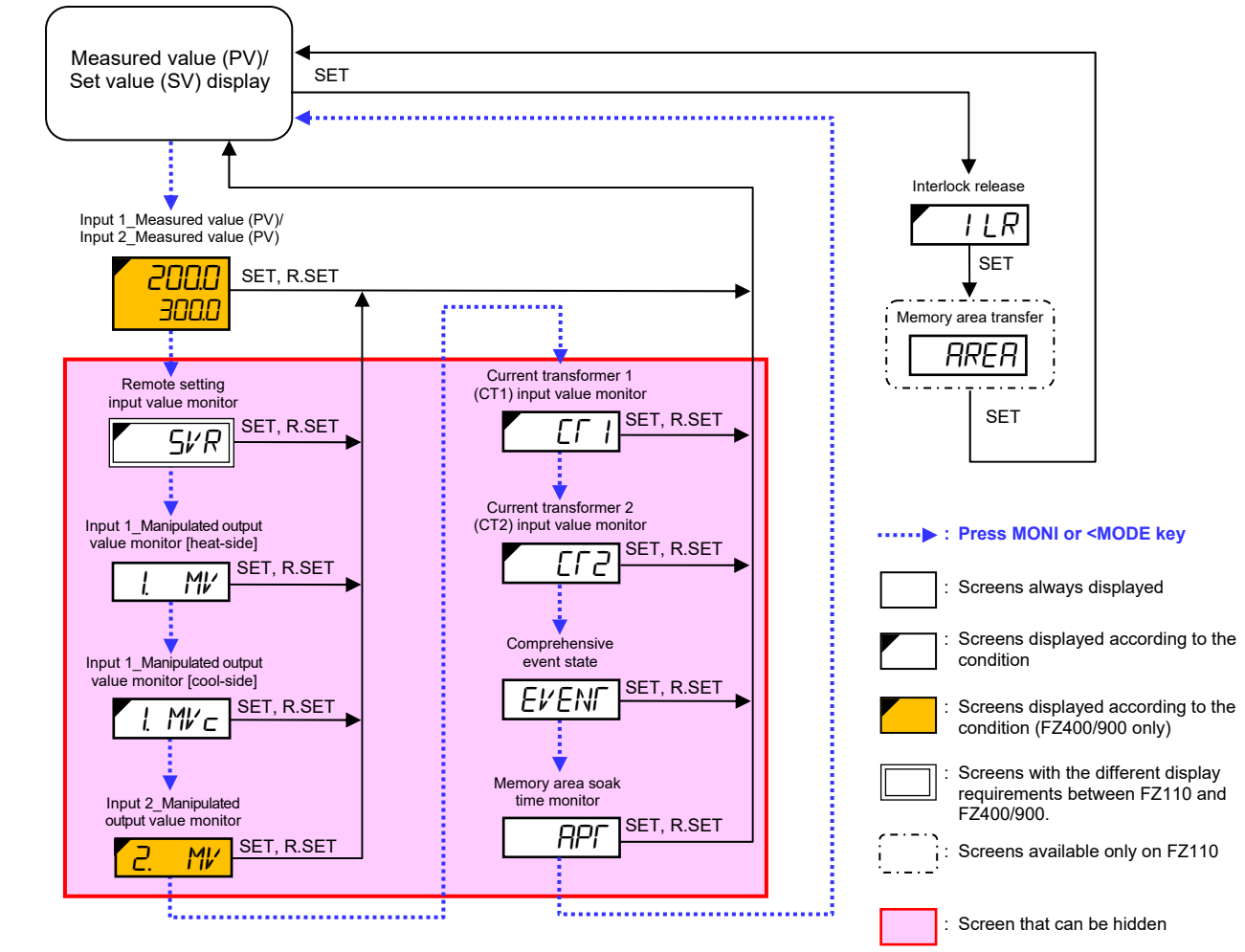
Show/Hide selection of the monitor screens in the Monitor & SV setting mode is available at “Select hide items in Monitor mode” in Function block No. 10 in the Engineering mode.

[Applicable screens]

- Remote setting input value monitor
- Manipulated output value (MV) monitor *:
  Input 1_Manipulated output value monitor [heat-side], Input 1_Manipulated output value monitor [cool-side], Input 2_Manipulated output value monitor
- Current transformer (CT) input value monitor *:
  Current transformer 1 (CT1) input value monitor, Current transformer 2 (CT2) input value monitor
- Comprehensive event state
- Memory area soak time

* Setting is done at “Manipulated output value (MV) monitor” and “Current transformer (CT) input value monitor.”

[Operating navigation in the Monitor & SV setting mode]



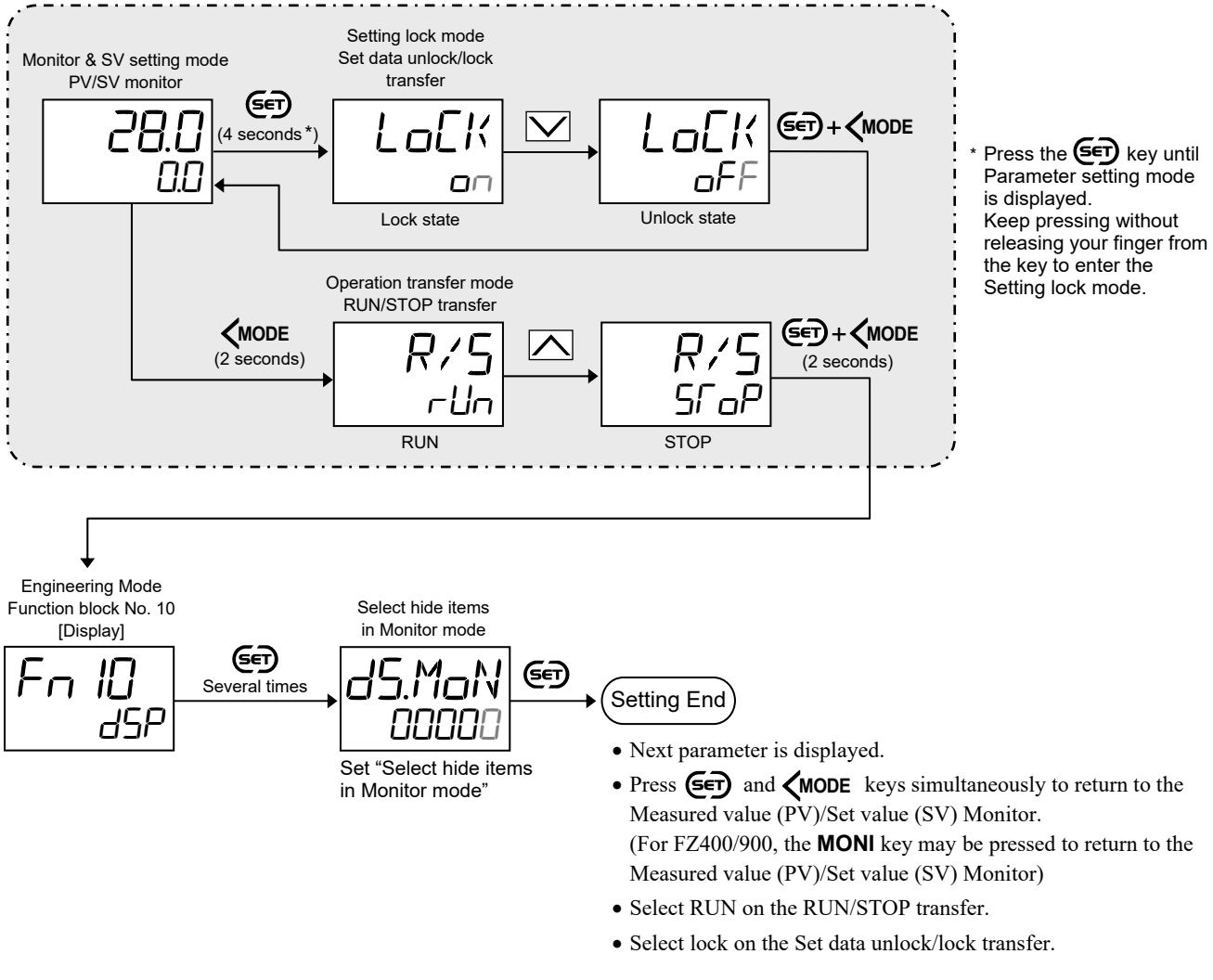
■ Parameter setting

● Select hide items in Monitor mode [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
dS.MoN	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Current transformer (CT) monitor +8: Comprehensive event state +16: Memory area soak time To select two or more functions, sum each value.	0

■ Setting procedure

To enter the Engineering mode



* Press the SET key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

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

9.2.2 Hiding screens in Operation transfer mode

Show/Hide selection of the screens in the Operation transfer mode is available at “Select hide items in Operation transfer mode” in Function block No. 10 in the Engineering mode.

[Applicable screens]

- RUN/STOP transfer
- Autotuning (AT) *: Input 1_Autotuning (AT), Input 2_Autotuning (AT)
- Startup tuning (ST) *: Input 1_Startup tuning (ST), Input 2_Startup tuning (ST)
- Auto/Manual transfer: Input 1_Auto/Manual transfer, Input 2_Auto/Manual transfer
- Remote/Local transfer
  (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control)
- Control area Local/External transfer

* Setting is done at “Autotuning (AT)” and “Startup tuning (ST).”

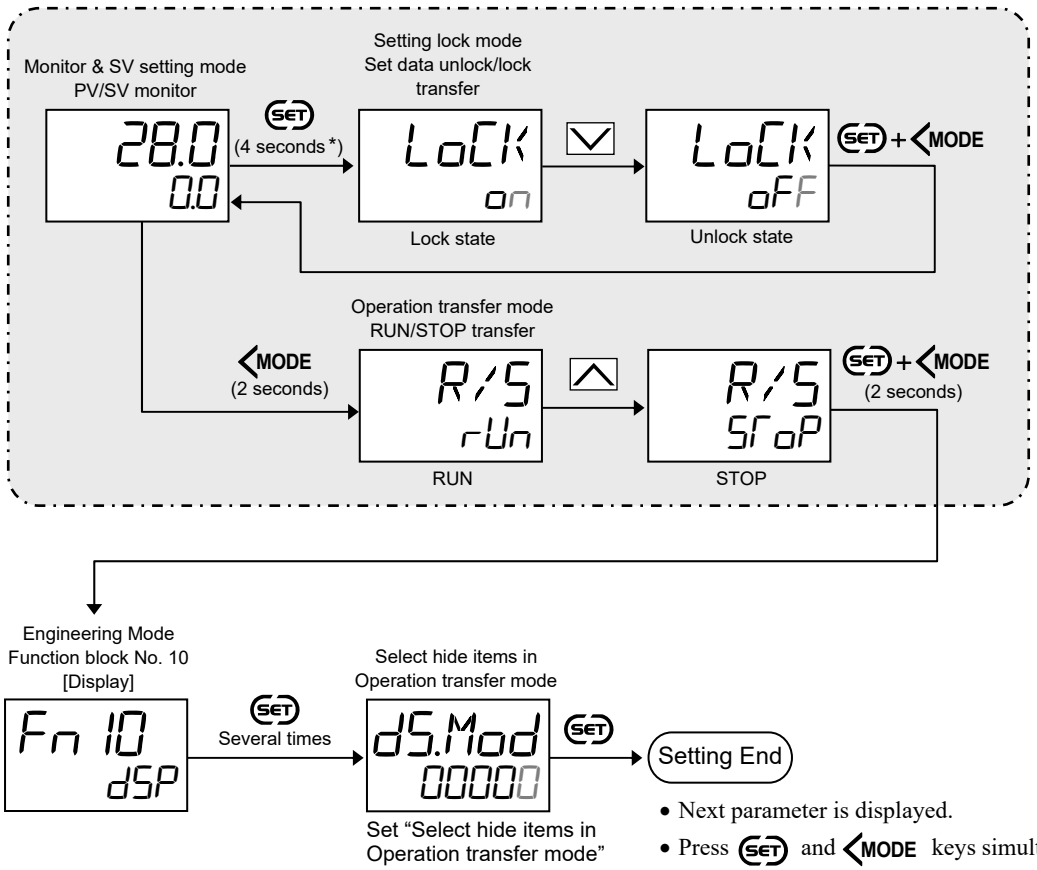
■ Parameter setting

● Select hide items in Operation transfer mode [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
d5.Mod	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0

■ Setting procedure

To enter the Engineering mode



* Press the SET key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

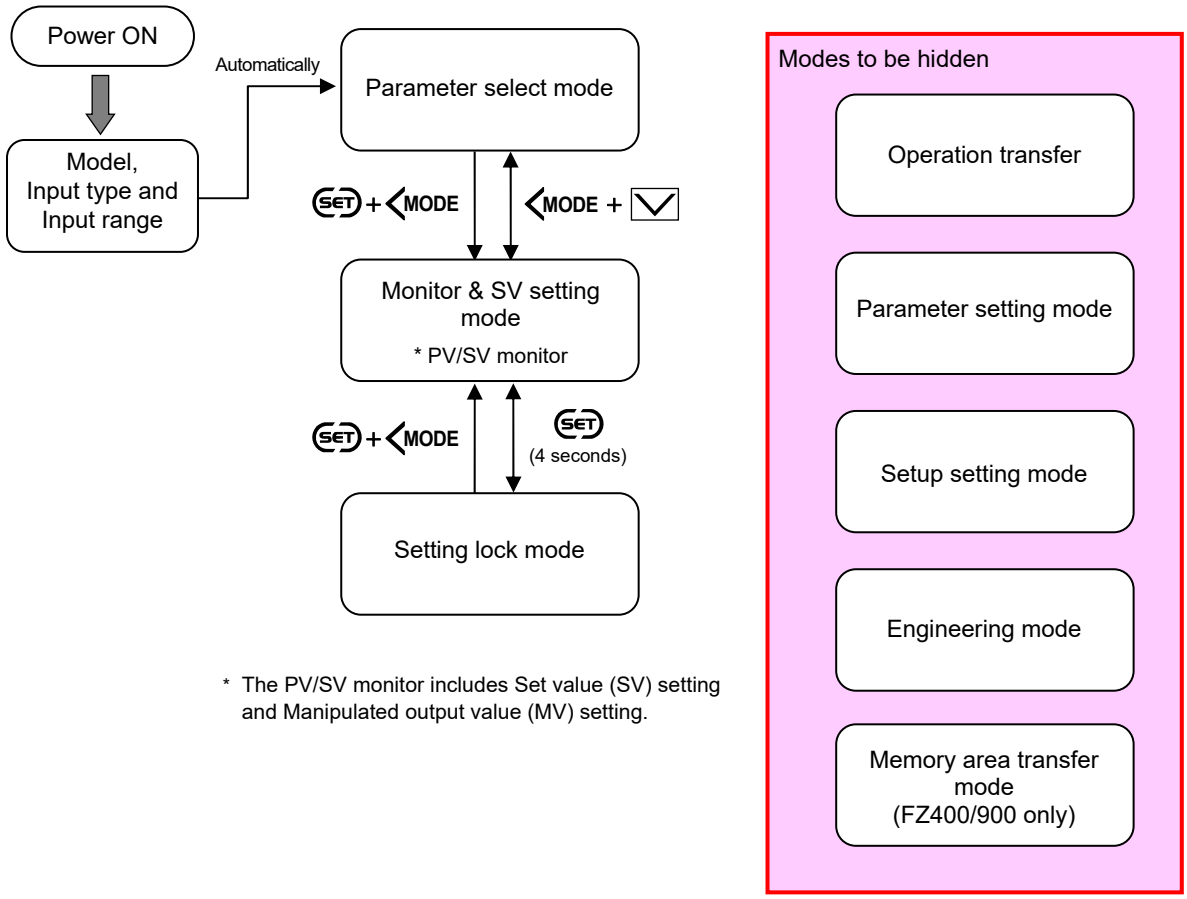
- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

9.2.3 Hiding the screen using the Blind function

The Blind function is used to hide all screens except Parameter select mode, Setting lock mode, and Measured value (PV)/Set value (SV) monitor.
The Blind function can be set in the Setting lock mode.

When the Blind function is activated, the instrument displays the Parameter select mode after displaying the model and the input type/range at the time of power-up.
If all of the necessary screens are placed together in the Parameter select mode, there will be no need of switching screens to other modes.

[Operation flow when the Blind function is activated]



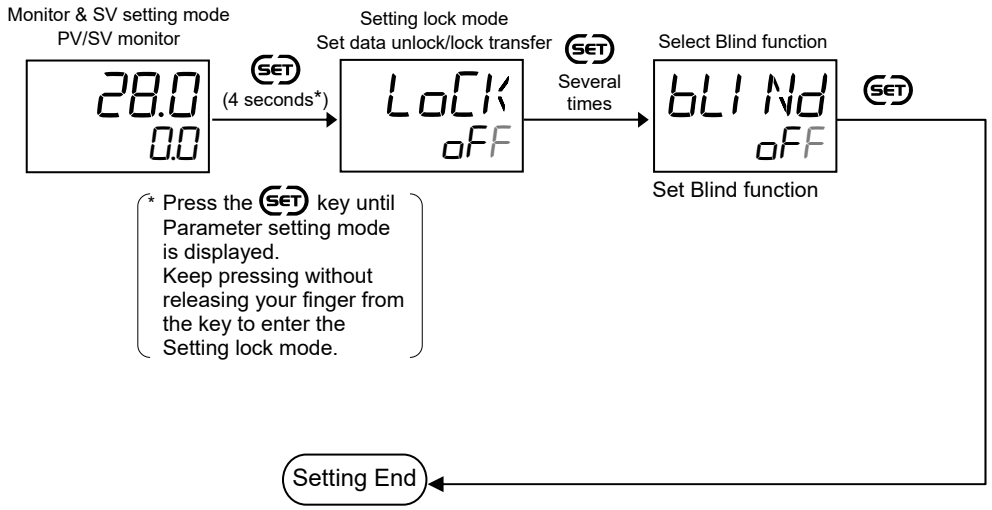
* The PV/SV monitor includes Set value (SV) setting and Manipulated output value (MV) setting.

■ Parameter setting

● Select Blind function [Setting Lock Mode]

Parameter symbol	Data range	Factory set value
bLInd	oFF: Blind function: OFF on: Blind function: ON	oFF

■ Setting procedure



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

9.3 Hiding the Display of the Set Value (SV)

On the normal PV/SV monitor screen, the Set value (SV) is displayed on the set value (SV) display unit. This display can be turned OFF.

■ Description of function

Display of Set value (SV)

With Set value (SV) display

Without Set value (SV) display

Display off

This display can be turned OFF.
(Refer to P. 9-24)

In the above figure FZ400 is used for explanation, but the operation is the same for FZ110/900.

■ Parameter setting

● Show/Hide Input 1_SV [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
1.d5.5V	0: Hide Input 1_SV 1: Show Input 1_SV	1

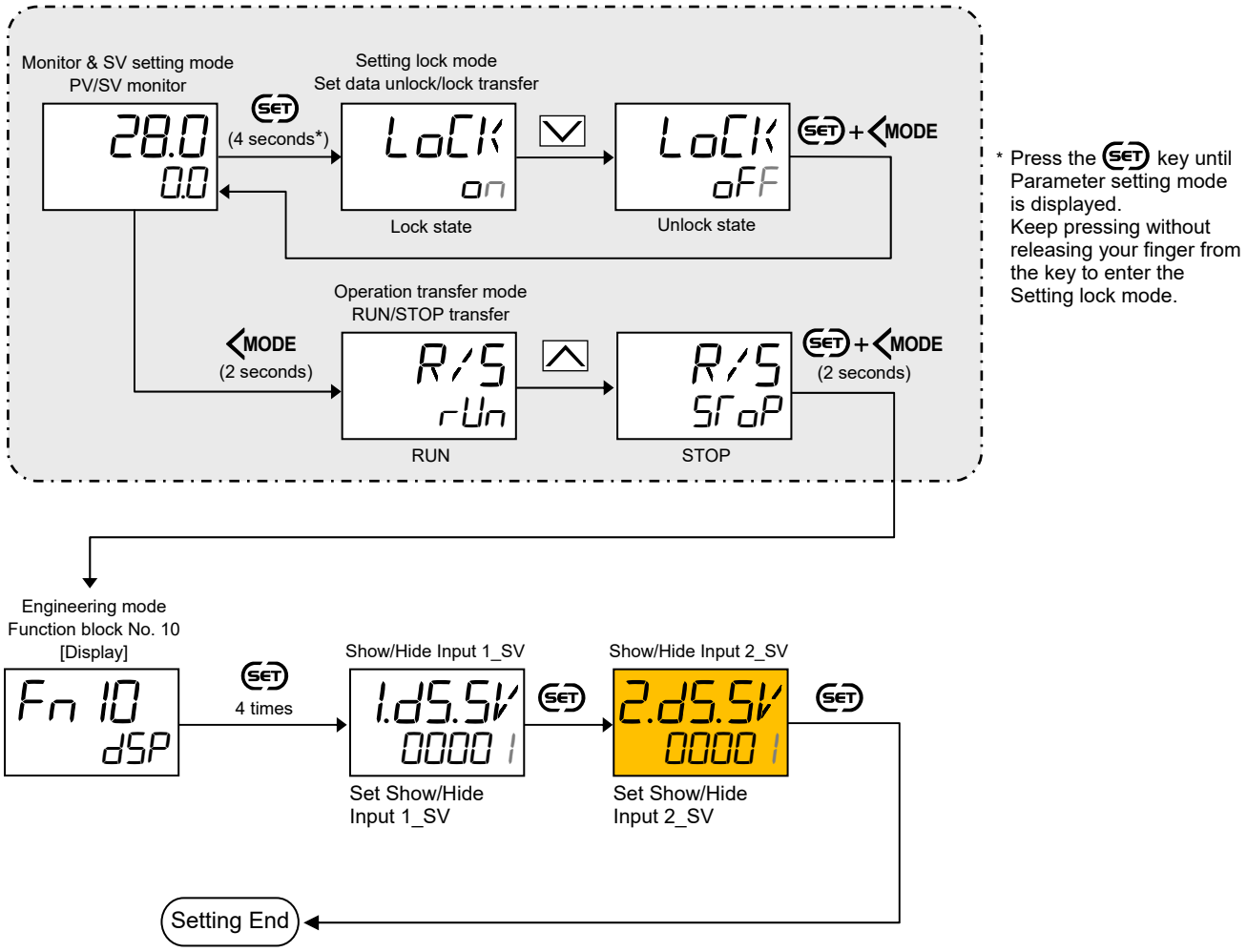
● Show/Hide Input 2_SV [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
2.d5.5V	0: Hide Input 2_SV 1: Show Input 2_SV	1

To display “Show/Hide Input 2_SV,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

■ Setting procedure

To enter the Engineering mode



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

9.4 Changing the Display Position of STOP during the Control Stop

The display position of "StoP" showing the control stop state can be changed.

■ Description of function

The position of the STOP display can be specified; Measured value (PV) display, Set value (SV) display, or Manipulated output value (MV) display.

Displays the STOP on the SV display (Factory set value)

Displays the STOP on the PV display

Displays the STOP on the MV display (FZ400/900 only)

In the above figure FZ400 is used for explanation, but the operation is the same for FZ110/900.

■ Parameter setting

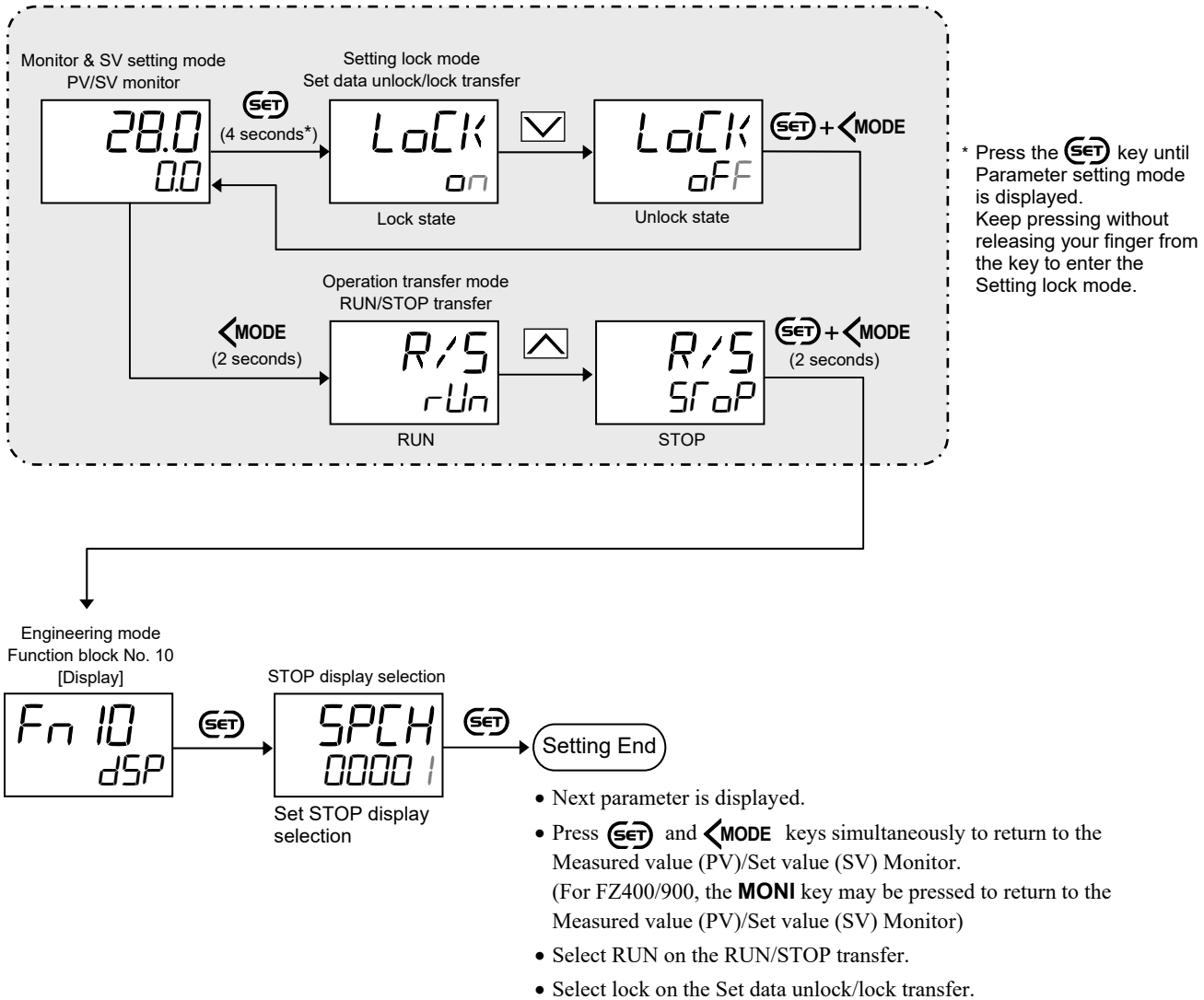
● STOP display selection [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
SPCH	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display *	1

* Selectable only for FZ400/900.

■ Setting procedure

To enter the Engineering mode



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

9.5 Changing the ALM Lamp Lighting Condition

The light condition of the ALM lamp on the front panel can be changed.

■ Description of function

ALM lamps can be configured to light on the occurrence of the following events. These are freely combinable. If any one of selected events or alarms occurs, the ALM lamp will lights on.

- Event 1
- Event 2
- Event 3
- Event 4
- Heater break alarm 1 (HBA1)
- Heater break alarm 2 (HBA2)
- Control loop break alarm 1 (LBA1)
- Control loop break alarm 2 (LBA2)
- Input 1_Input error high
- Input 1_Input error low
- Input 2_Input error high
- Input 2_Input error low

Factory set ranges

Display example

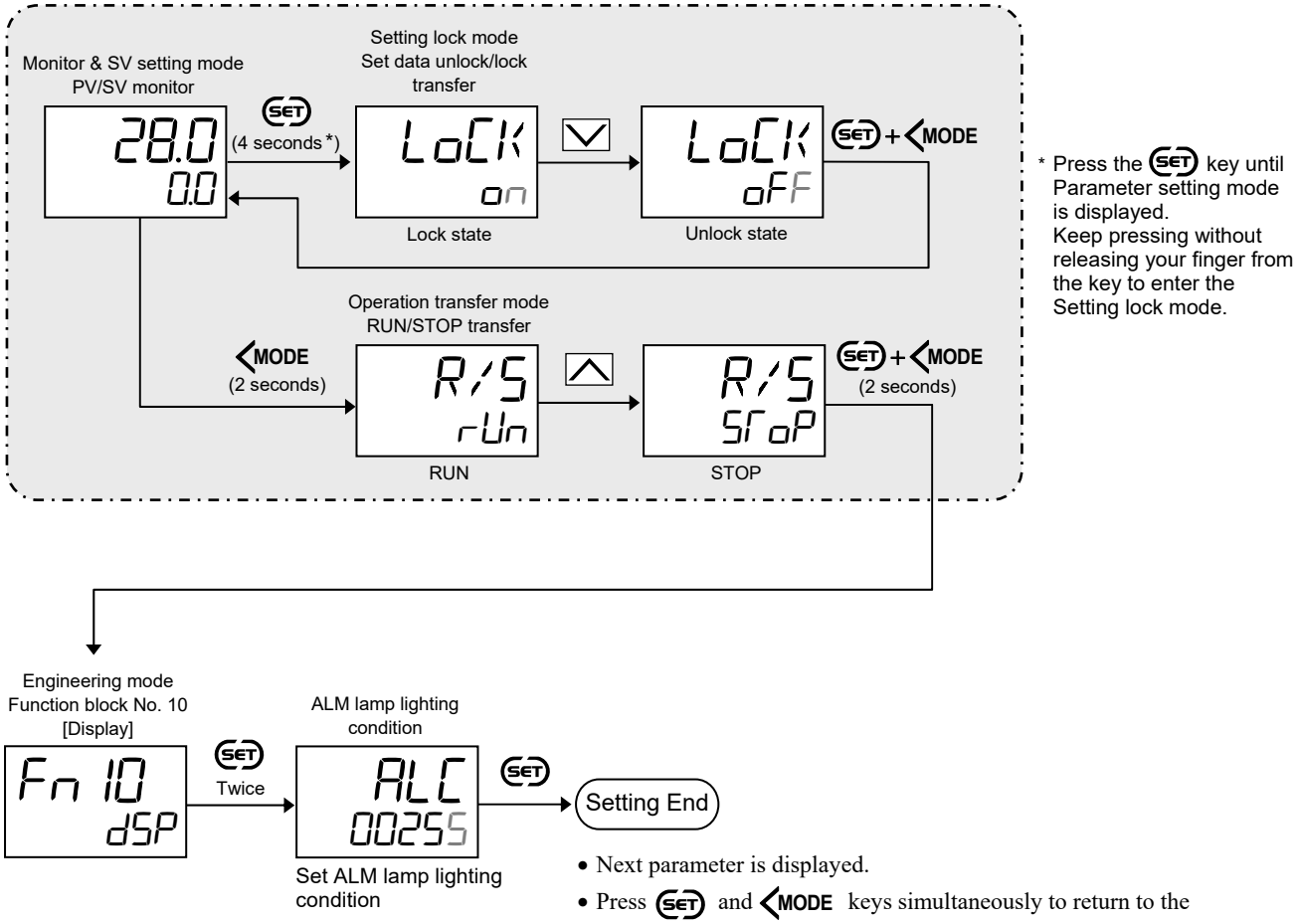
■ Parameter setting

● ALM lamp lighting condition [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
ALC	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255

■ Setting procedure

To enter the Engineering mode



9.6 Changing the Display Contents of the MV Display [FZ400/900]

While the FZ400/900 is monitoring the Measured value (PV) and the Set value (SV), the MV display can be configured to change the display contents.

■ Description of function

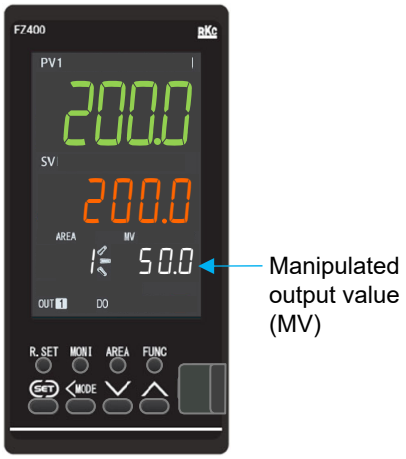
The MV display on the FZ400/900 can display the following data.

- Manipulated output value (MV) [1]
- Memory area soak time
- Current transformer (CT) input value [2]
- Hide

[1] Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input. Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID controller with Feedback resistance (FBR) input. This display goes off at the time of FBR input break.

[2] If the instrument has no current transformer (CT), the value will not be displayed even if this setting is selected.

Display example



Display of Show Memory area soak time

When the Soak time unit is set to "2," the time is displayed as follows depending on the time to be displayed.

Time	Time unit	Lamp	Example (FZ900)
2 hour or more	Hours: Minutes	H:M	H:M 2:06 (2 hours 6 minutes)
1 hour 00 minutes 00 seconds to 1 hour 59 minutes 59 seconds	Hours: Minutes: seconds	H:M:S	H:M:S 1:08:45 (1 hour 8 minutes 45 seconds)
0 minutes 00 seconds to 59 minutes 59 seconds	Minutes: seconds	M:S	M:S 37:09 (37 minutes 9 seconds)

■ Parameter setting

● Show/Hide Input 1_MV [Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
1.d5.MV	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time * 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1

* The time unit depends on the setting of Soak time unit (Function block No. 70 in the Engineering mode).

● Show/Hide Input 2_MV [Engineering Mode: Function block No. 10 (Fn 10)]

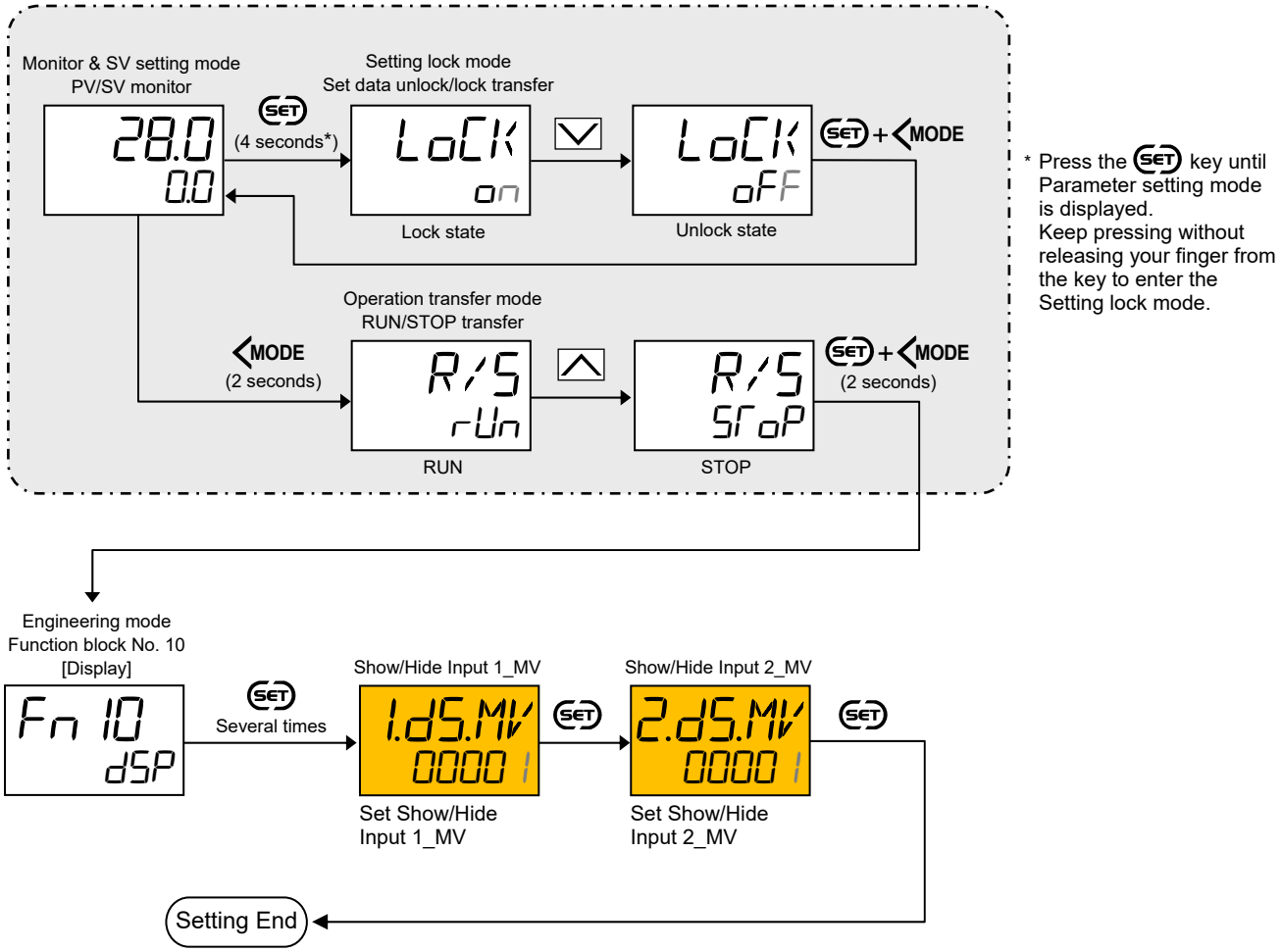
Parameter symbol	Data range	Factory set value
2.d5.MV	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time * 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1

* The time unit depends on the setting of Soak time unit (Function block No. 70 in the Engineering mode).

To display "Show/Hide Input 2_MV," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

■ Setting procedure

To enter the Engineering mode



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

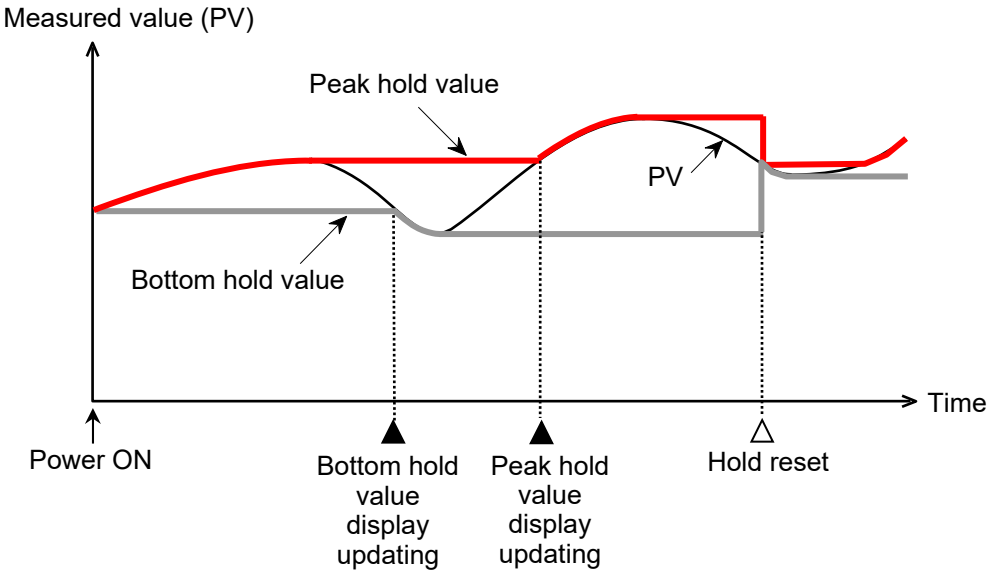
9.7 Checking Input Peak Value/Bottom Value

This instrument incorporates as standard the Peak/Bottom hold function which allows storing the peak (max) and the bottom (min) Measured values (PV).

■ Description of function

The peak hold/bottom hold function is used to store (hold) the peak (max) and the bottom (min) Measured values (PV). Each of these values is updated when the measured temperature becomes more (or less) than the value now being held.

The stored peak (max) and bottom (min) values can be reset on the Hold reset screen.



Peak/Bottom hold action description

■ Parameter setting

● Input 1_Peak hold monitor [Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
I.PHLd	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

● Input 2_Peak hold monitor
[Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
2.PHLd	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—

To display "Input 2_Peak hold monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.

● Input 1_Bottom hold monitor
[Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
1.bHLd	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

● Input 2_Bottom hold monitor
[Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
2.bHLd	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—

To display "Input 2_Bottomk hold monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.

● Input 1_Hold reset
[Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
1.HLdR	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd

Note that the both of the peak and the bottom hold values are reset at a time by the hold reset operation.

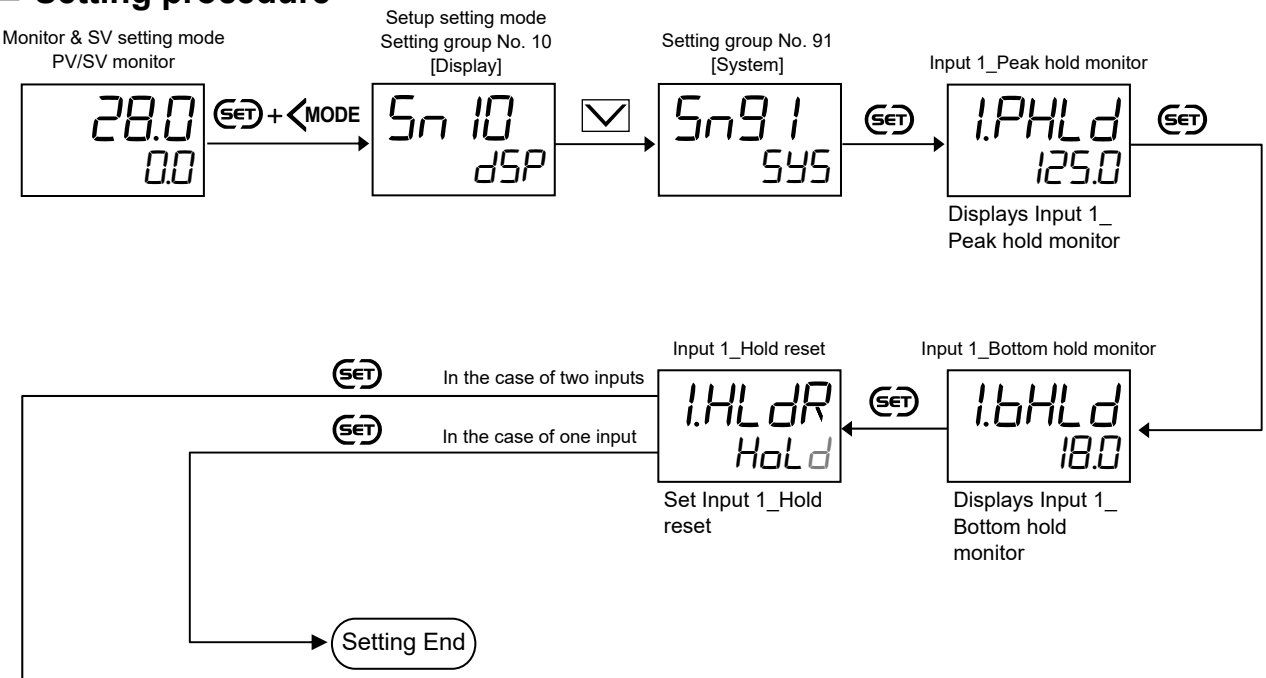
● Input 2_Hold reset
[Setup Setting Mode: Setting group No. 91 (Sng 1)]

Parameter symbol	Data range	Factory set value
2.HLdR	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd

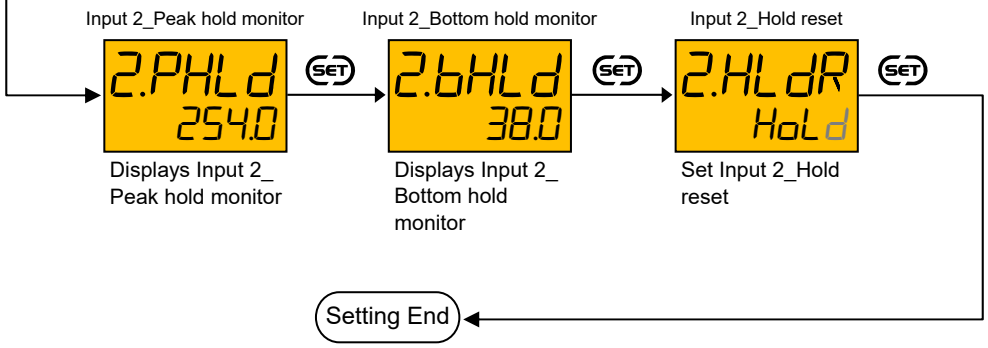
📖 To display “Input 2_Hold reset,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.

📖 Note that the both of the peak and the bottom hold values are reset at a time by the hold reset operation.

■ Setting procedure



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



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

9.8 Suppressing the Display Flickering

The display flickering due to input changes in PV/SV monitor screen can be reduced by extending the display update cycle.

● Applicable screens

The PV/SV monitor screen which comes at the beginning in the Monitor & SV setting mode. When the instrument has two inputs, PV/SV on the Input 2 is also covered.

In the case of FZ400/900, the Manipulated output value (MV) displayed on the Manipulated output value (MV) display is also covered.

[1-loop control]

•Auto mode

Input 1_Measured value (PV)/
Input 1_Set value (SV)

•Manual mode

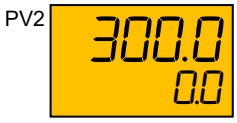
Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)

[2-loop control/Cascade control] (FZ400/900 only)

• Auto mode

Input 1_Measured value (PV)/
Input 1_Set value (SV)

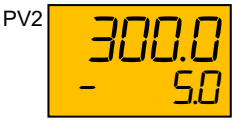
Input 2_Measured value (PV)/
Input 2_Set value (SV)



• Manual mode

Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)

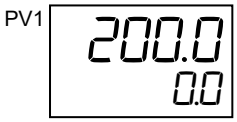
Input 2_Measured value (PV)/
Input 2_Manual manipulated output value (MV)



[Control with PV select] (FZ400/900 only)

• Auto mode

PV select Measured value (PV)/
Input 1_Set value (SV)



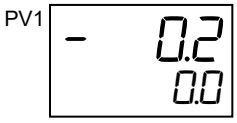
• Manual mode

PV select Measured value (PV)/
Input 1_Manual manipulated output value (MV)

[Differential temperature control] (FZ400/900 only)

• Auto mode

Measured value (PV) of
differential temperature input/
Set value (SV) of differential
temperature input



Input 1_Measured value (PV)/
Input 1_Set value (SV)

Input 2_Measured value (PV)/
Input 2_Set value (SV)

• Manual mode

Measured value (PV) of differential
temperature input/
Input 1_Manual manipulated output
value (MV)

Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)

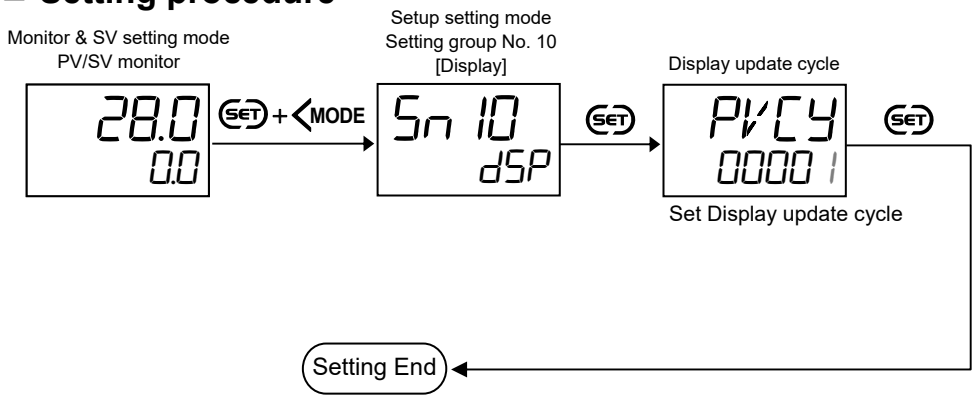
Input 2_Measured value (PV)/
Input 2_Manual manipulated output value (MV)

■ Parameter setting

● Display update cycle
[Setup Setting Mode: Setting group No. 10 (Sn 10)]

Parameter symbol	Data range		Factory set value
PVCY	1: 50 ms	6: 300 ms	1
	2: 100 ms	7: 350 ms	
	3: 150 ms	8: 400 ms	
	4: 200 ms	9: 450 ms	
	5: 250 ms	10:500 ms	

■ Setting procedure



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

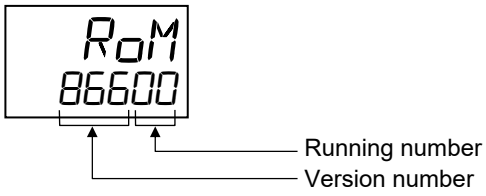
9.9 Checking the Instrument Information

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

■ How to check

● ROM Version

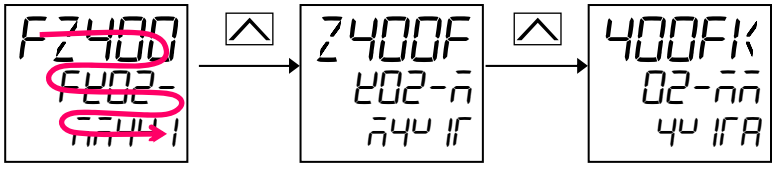
[Example]



● Model code monitor

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

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



FZ400 FK02- MM4∗1	Z400F K02-M M4∗1T	400FK 02-MM 4∗1TA
The model code scrolls from the PV display to the SV display continuously over two displays.	The Up key was pressed once. The model code was scrolled one digit left.	The Up key was pressed once more. The displayed characters were scrolled one more

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

● Instrument number monitor

Displays the serial number of the instrument.

To read the displayed characters, refer to "**Character Symbols**" **(P. i-2)**.

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

● Integrated operating time

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

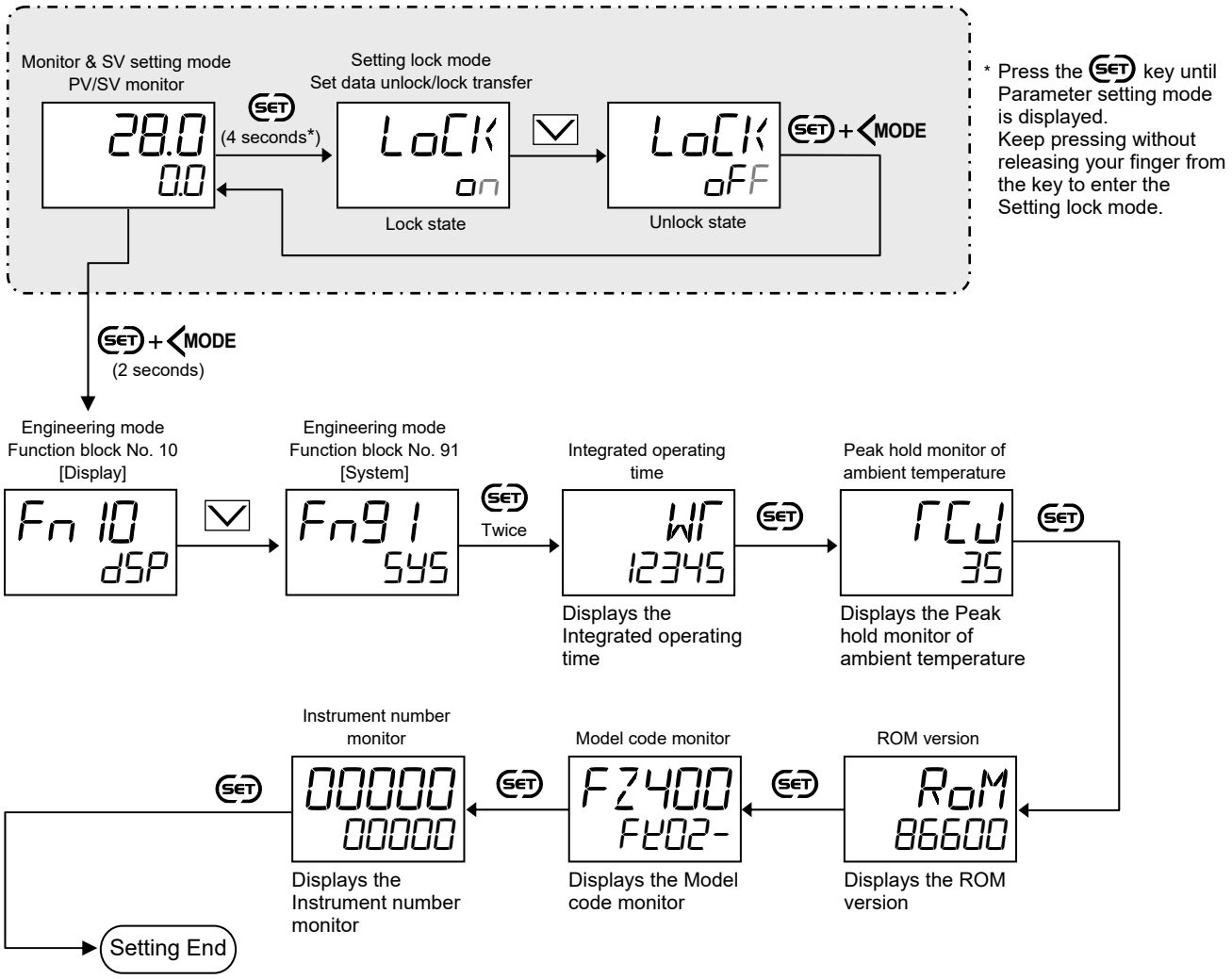
● Peak hold monitor of the ambient temperature

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

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

■ Operating procedure

To enter the Engineering mode



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

MEMO

SETTING AND KEY OPERATION

10

This chapter describes setting and key operation related functions, setting contents and setting procedure based on the keywords related to setting and key operation.

10.1 Limiting the Setting Range of Set Value (SV) 10-2

10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) 10-6

10.3 Storing the Control Related Set Values (Memory Area Function) 10-10

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10.6 Using a Simple Sequence Operation 10-26

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10.10 Initializing the Set Data 10-41

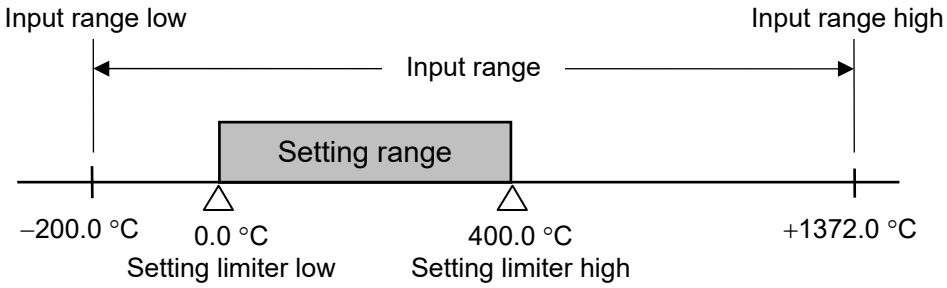
10.1 Limiting the Setting Range of Set Value (SV)

To limit the setting range of the Set value (SV), Setting limiter is used.

■ Description of function

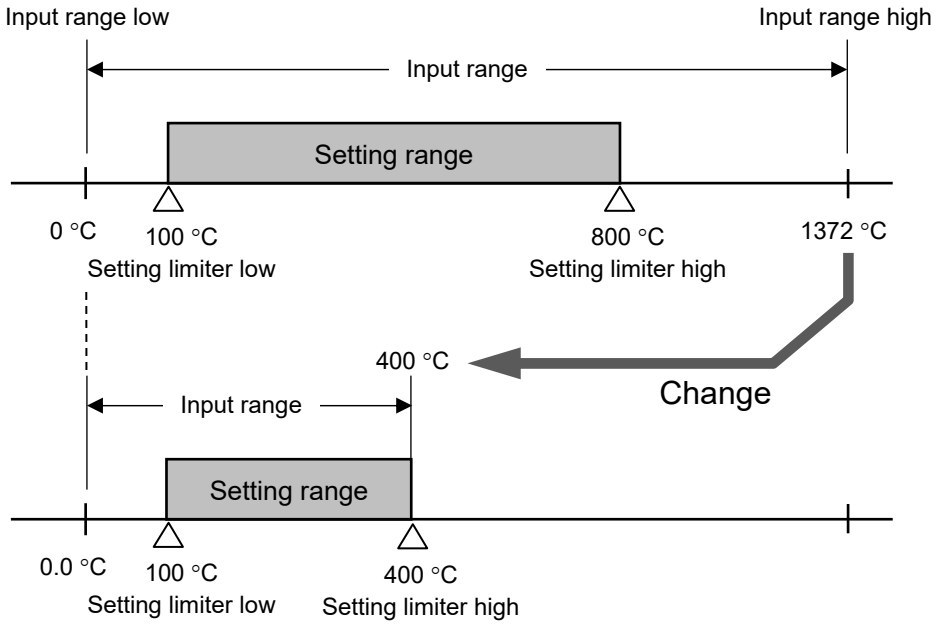
Setting limiter is a function to limit the setting range of the Set value (SV) within the input range.

Example: The input range is from −200.0 to +1372.0 °C, the Setting limiter high is 400.0 °C, and the Setting limiter low is 0.0 °C.

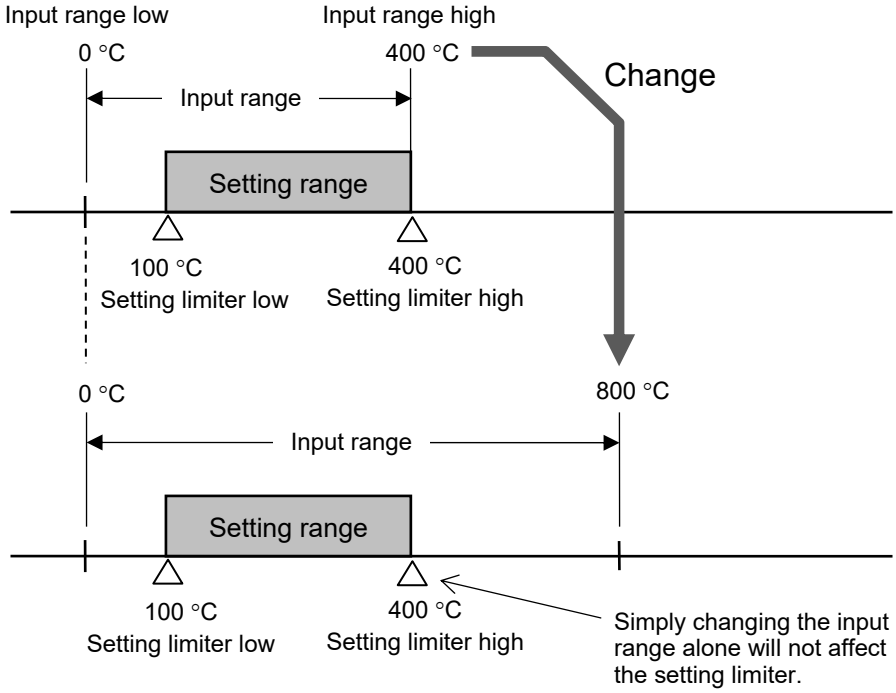


When the input range is changed, the setting limiter may be also changed according to the changed setting.

[Example 1]
Input 1_Input range is 0 to 1372 °C, Input 1_Setting limiter high is 800 °C. Changing the Input 1_ Input range high to 400 °C will change the Setting limiter high to 400 °C accordingly.



[Example 2]
When the Input 1_Input range is 0 to 400 °C and the Input 1_Setting limiter high is 400 °C, changing the Input 1_Input range high to 800 °C will not affect the setting limiter value. In this case the Input 1_Setting limiter high remains 400 °C.
When a wider setting range of the Set value (SV) is required according to the extended input range, change the setting limiter value accordingly.



■ Parameter setting

● Input 1_Setting limiter high [Engineering Mode: Function block No. 71 (Fn71)]

Parameter symbol	Data range	Factory set value
1. SLH	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select: Input 1_Setting limiter low to PV select input range high) Varies with the setting of the Decimal point position.	Input 1_Input range high (Control with PV select: PV select input range high)

☞ Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Setting limiter high is changed.

● Input 2_Setting limiter high [Engineering Mode: Function block No. 72 (Fn72)]

Parameter symbol	Data range	Factory set value
2. SLH	Input 2_Setting limiter low to Input 2_Input range high Varies with the setting of the Decimal point position.	Input 2_Input range high

To display "Input 2_Setting limiter high," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 2_Setting limiter high is changed.

● Input 1_Setting limiter low [Engineering Mode: Function block No. 71 (Fn71)]

Parameter symbol	Data range	Factory set value
1. SLL	Input 1_Input range low to Input 1_Setting limiter high (When Control with PV select: PV select input range low to Input 1_Setting limiter high) Varies with the setting of the Decimal point position.	Input 1_Input range low (Control with PV select: PV select input range low)

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 1_Setting limiter low is changed.

● Input 2_Setting limiter low [Engineering Mode: Function block No. 72 (Fn72)]

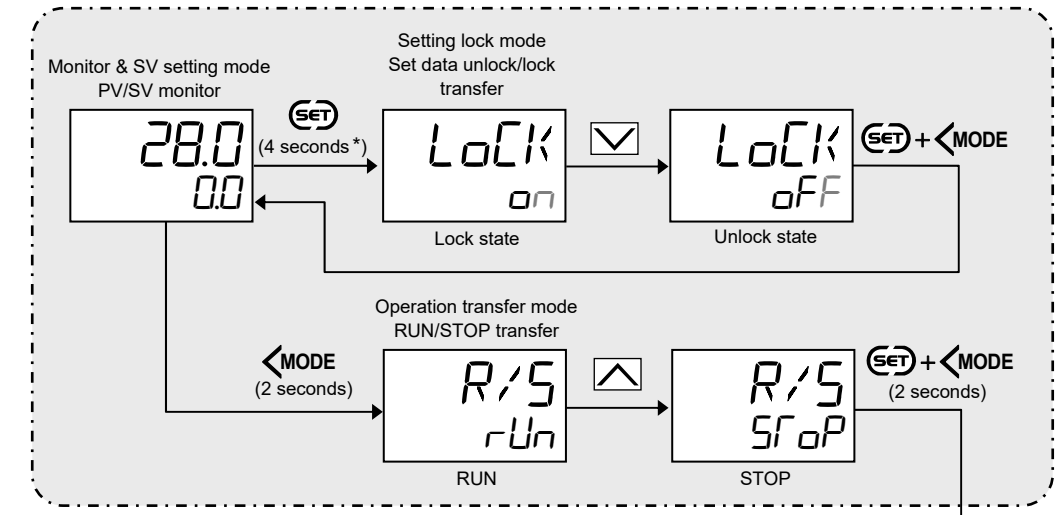
Parameter symbol	Data range	Factory set value
2. SLL	Input 2_Input range low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	Input 2_Input range low

To display "Input 2_Setting limiter low," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

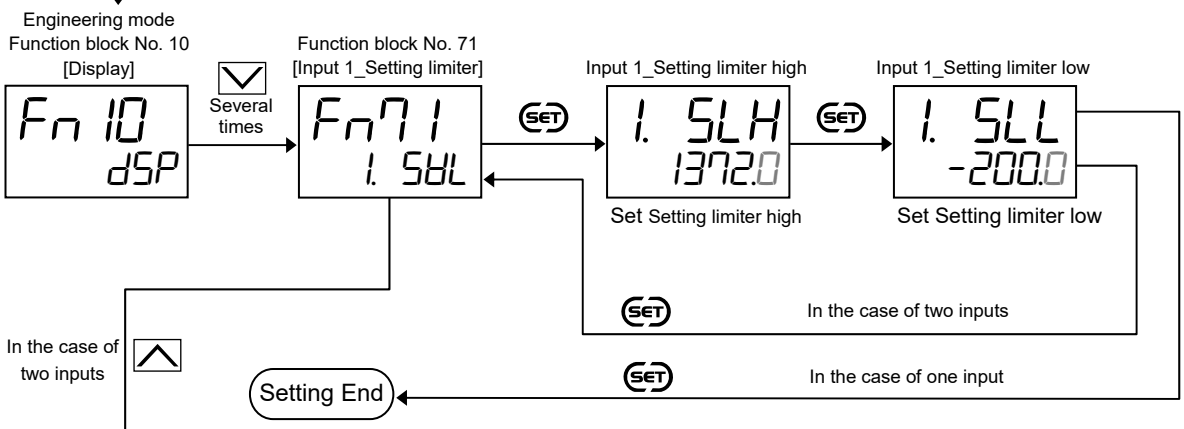
Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Input 2_Setting limiter low is changed.

■ Setting procedure

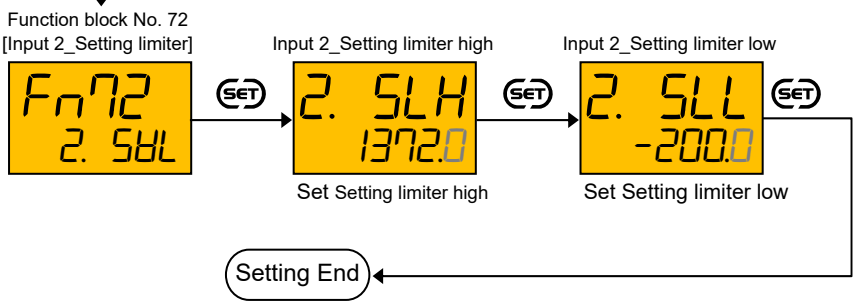
To enter the Engineering mode



* Press the SET key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



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



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

10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter)

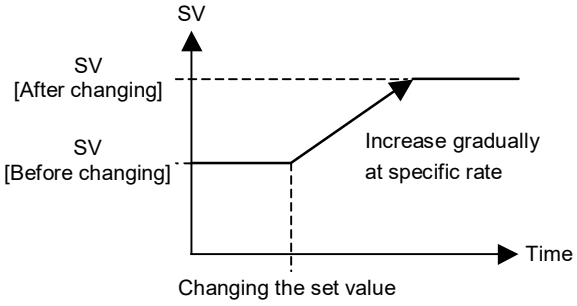
This function allows the Set value (SV) to change gradually, not rapidly or not at a time, when the Set value (SV) is changed.

■ Description of function

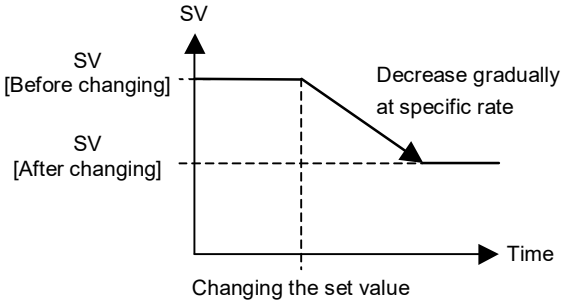
This function is to allow the Set value (SV) to be automatically changed at specific rates when a new Set value (SV).
Setting the Setting change rate limiter unit time parameter and the Setting change rate limiter (up and down) will enable setting the changing rate (setting change rate limiter/unit time) of the Setting change rate limiter (up or down).

[Application examples of Setting change rate limiter]

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



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



- When the Setting change rate limiter is used, the Set value (SV) will also ramp up or ramp down by the function at power-on and operation mode change from STOP to RUN.
- When the Set value (SV) is changed by the Memory area transfer function, the Setting change rate limiter functions from the Set value (SV) before the change (transfer) toward the set value after the change (transfer).
- If the Autotuning (AT) function is activated while the Set value (SV) is ramping up or ramping down by the Setting change rate limiter, the AT will starts after the Set value (SV) finishes ramp-up or ramp-down by the limiter, and the controller is in PID control mode until the AT starts.
  (In the AT of cascade control, the AT will start immediately.)
- When the value of Setting change rate limiter is changed during normal operation, the ramp-up or ramp-down rate will be changed unless the SV already has finished ramp-up or ramp-down by the function.
- When Setting change rate limiter is set to other than “OFF: No function (disabled)” and when the Event type is set to a SV monitor value, the Event re-hold function by the Set value (SV) change is invalid. However, the event using a local SV will have the Event re-hold function by the Set value (SV) change valid.
- During the Remote mode, the Input 1_Setting change rate limiter will function to Remote setting input value.
- During the Cascade control, the Input 2_Setting change rate limiter will be invalid (disabled).

■ Parameter setting

● Input 1_Setting change rate limiter (up) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.5V RU	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0

● Input 2_Setting change rate limiter (up) [Parameter Setting Mode: Parameter groupNo. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.5V RU	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0

To display "Input 2_Setting change rate limiter (up)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Setting change rate limiter (down) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.5V Rd	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0

● Input 2_Setting change rate limiter (down) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.5V Rd	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0

To display "Input 2_Setting change rate limiter (down)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

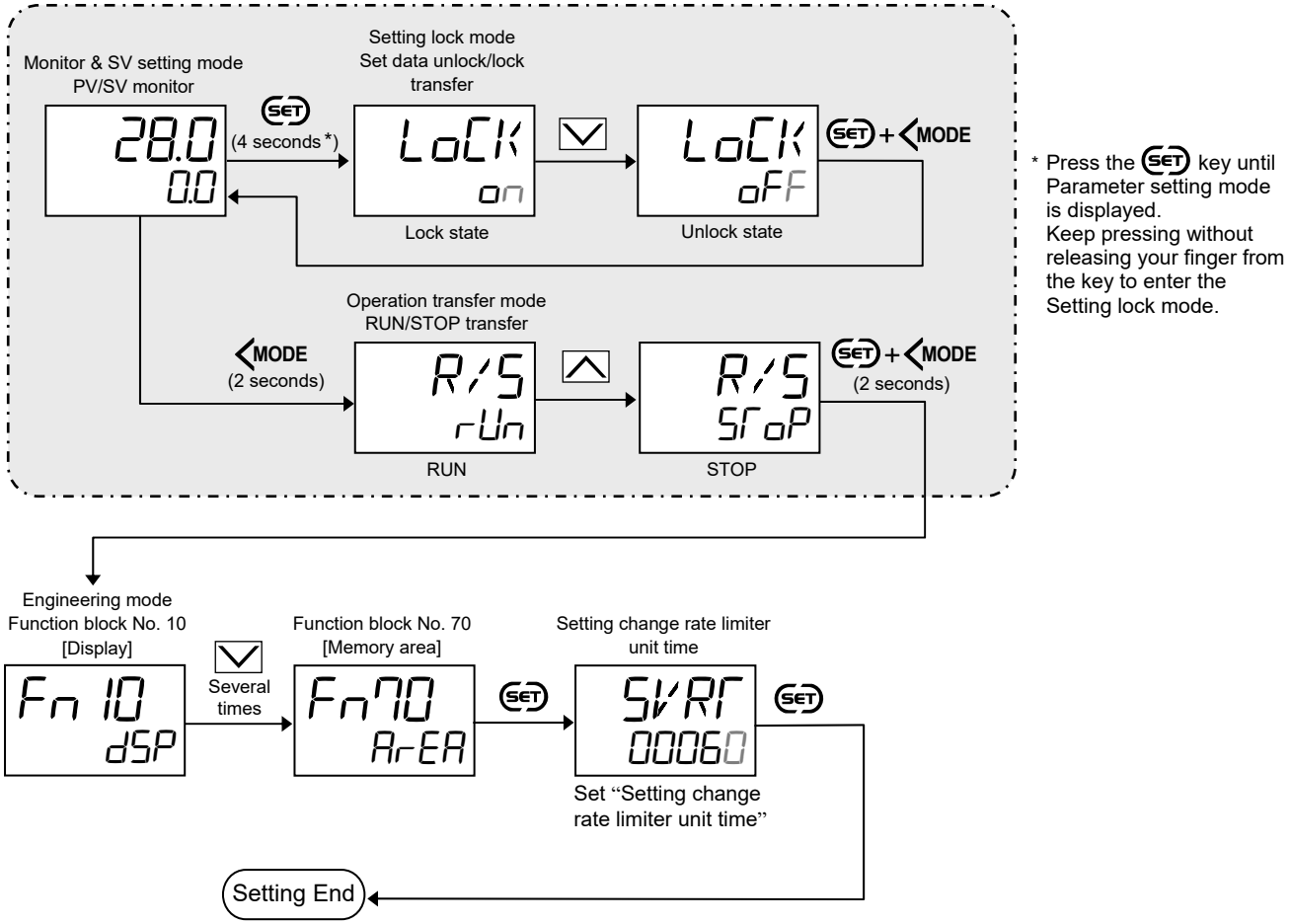
● Setting change rate limiter unit time [Engineering Mode: Function block No. 70 (Fn70)]

Parameter symbol	Data range	Factory set value
SVRT	1 to 3600 seconds	60

■ Setting procedure

● Set the Setting change rate limiter unit time parameter

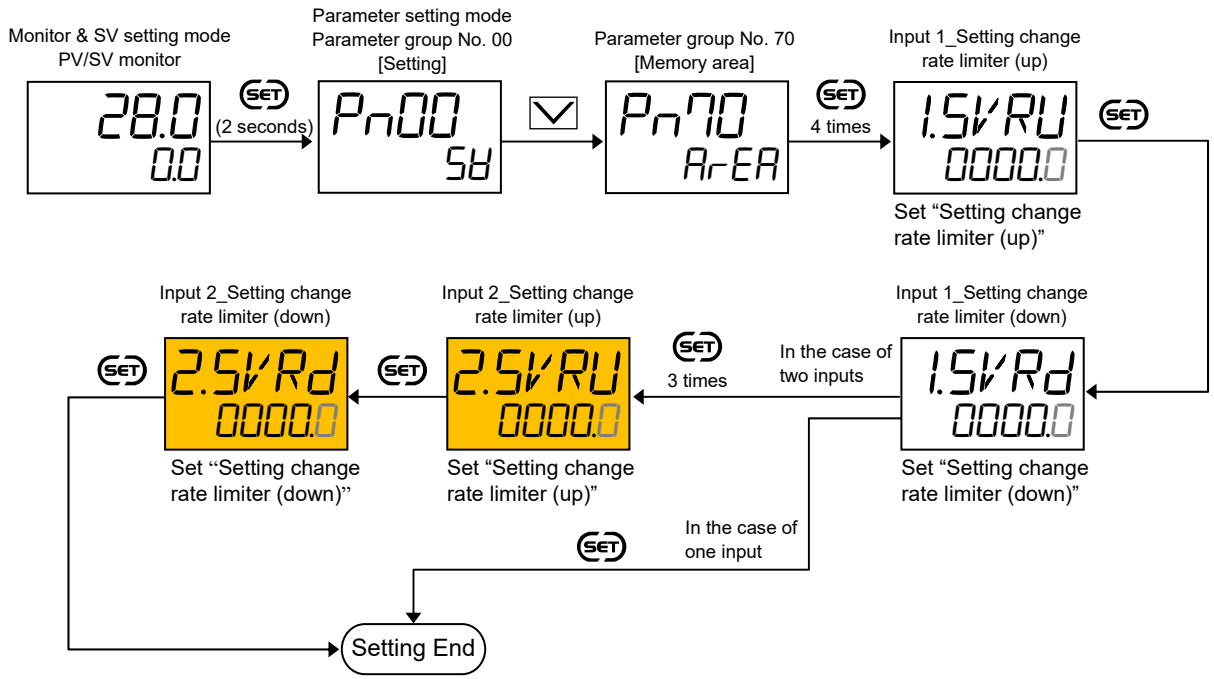
To enter the Engineering mode



* Press the (SET) key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

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

● Set the Setting change rate limiter (up/down)



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

10.3 Storing the Control Related Set Values (Memory Area Function)

This function allows PID related parameters such as a Set value (SV) to be stored as an area and up to 16 areas.

■ Description of function

The Memory area function is to store up to 16 areas of parameters such as a Set value (SV). Parameters that can be stored in an area are those inside the Parameter setting mode*.
One of the Areas is used for control, and the currently selected area is Control area.
Storing set values according to work processes in a location called “area” allows a necessary set of set values for the work process to be retrieved only by changing the area number.

* ON/OFF action differential gap (upper) and (lower) are excluded.

Parameters inside the Parameter setting mode are categorized into six groups by the setting contents.
These parameters are categorized into three groups during the “Level PID” function.

● Memory area parameters of Parameter group No. 00 (Pn00) [Set value (SV)]

Input 1_Set value (SV)
Input 2_Set value (SV)
Set value (SV) of differential temperature input

● Memory area parameters of Parameter group No. 40 (Pn40) [Event]

Event 1 set value (EV1) or Event 1 set value (EV1) [high]
Event 1 set value (EV1’) [low]
Event 2set value (EV2) or Event 2set value (EV2) [high]
Event 2set value (EV2’) [low]
Event 3set value (EV3) or Event 3set value (EV3) [high]
Event 3set value (EV3’) [low]
Event 4set value (EV4) or Event 4set value (EV4) [high]
Event 4set value (EV4’) [low]

● Memory area parameters of Parameter group No. 51 (Pn51) [Input 1_Control]

Input 1_Proportional band [heat-side]
Input 1_Integral time [heat-side]
Input 1_Derivative time [heat-side]
Input 1_Control response parameter
Input 1_Proactive intensity
Input 1_Manual reset
Input 1_FF amount
Input 1_Output limiter high [heat-side]
Input 1_Output limiter low [heat-side]
Input 1_Control loop break alarm (LBA) time
Input 1_LBA deadband (LBD)

● Memory area parameters of Parameter group No. 52 (Pn52) [Input 2_Control]

Input 2_Proportional band
Input 2_Integral time
Input 2_Derivative time
Input 2_Control response parameter
Input 2_Proactive intensity
Input 2_Manual reset
Input 2_FF amount
Input 2_Output limiter high
Input 2_Output limiter low
Input 2_Control loop break alarm (LBA) time
Input 2_LBA deadband (LBD)

● Memory area parameters of Parameter group No. 56 (Pn56) [Input_1 Cooling control]

Input 1_Proportional band [cool-side]
Input 1_Integral time [cool-side]
Input 1_Derivative time [cool-side]
Input 1_Overlap/Deadband
Input 1_Output limiter high [cool-side]
Input 1_Output limiter low [cool-side]

● Memory area parameters of Parameter group No. 70 (Pn70) [Memory area]

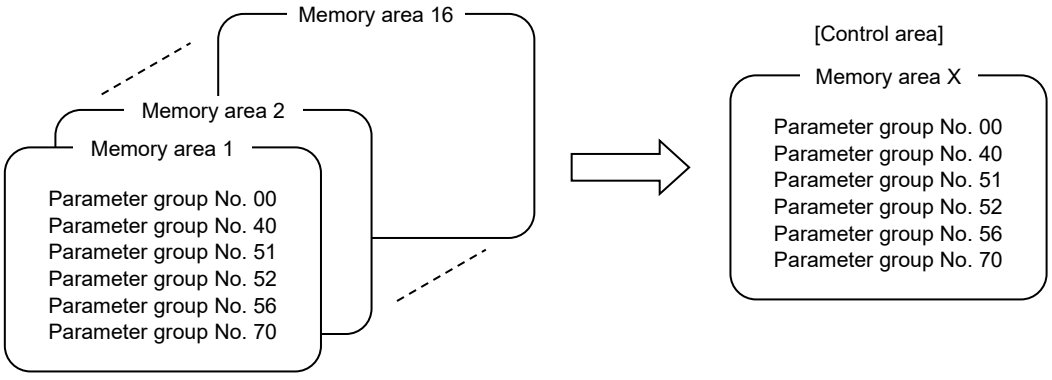
Select Trigger type for Memory area transfer
Area soak time
Link area number
Input 1_Setting change rate limiter (up)
Input 1_Setting change rate limiter (down)
Input 1_Auto/Manual transfer selection (Area)
Input 1_Manipulated output value (Area)
Input 2_Setting change rate limiter (up)
Input 2_Setting change rate limiter (down)
Input 2_Auto/Manual transfer selection (Area)
Input 2_Manipulated output value (Area)
Remote/Local transfer selection (Area)

[Groups used during the Level PID]

- **Group 0:** Parameter group No. 00, No. 40 and No. 70
- **Group 1:** Parameter group No. 51, No. 56
- **Group 2:** Parameter group No. 52

☞ For Level PID function, refer to **8.15. Controlling with Level PID (P. 8-98)**.

● **Structural image of Memory area**



The following four parameters are used in common in all Memory areas, and therefore are not included in the Memory area.

Parameter group No. 51: Input 1_ON/OFF action differential gap (upper)
Input 1_ON/OFF action differential gap (lower)
Parameter group No. 52: Input 2_ON/OFF action differential gap (upper)
Input 2_ON/OFF action differential gap (lower)

■ Transferring the Control area

The Control area is displayed on the Memory area display during the monitor display state. (See the right picture)

Control area can be transferred by Key operations, Digital input, or communication. Memory area transfer by Memory Area Soak time is also possible.

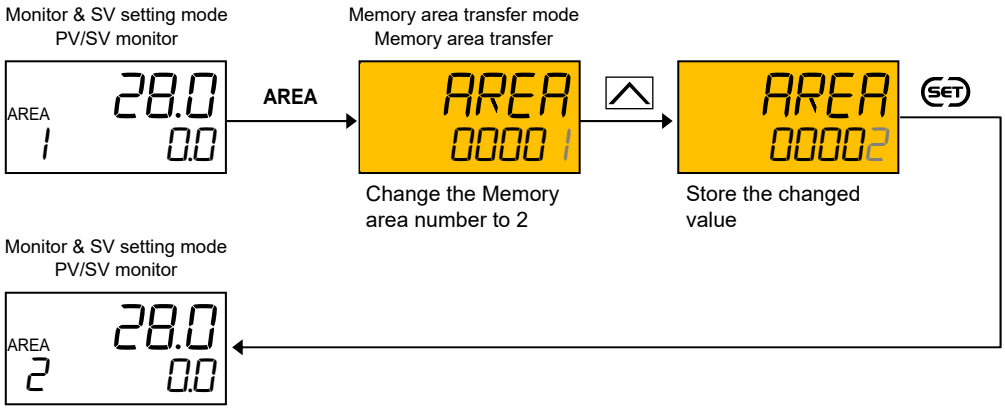
☞ For the communication, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)**.

Example

● Selection by front key operation

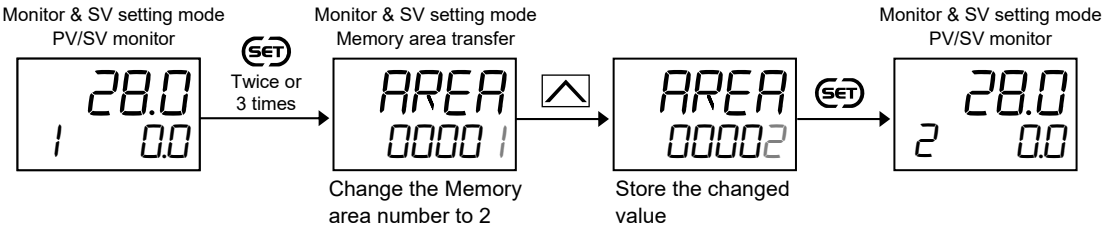
[FZ400/900]

Changing the Control area from 1 to 2



[FZ110]

Changing the Control area from 1 to 2



● Switching the Control area by Digital Input (DI)

To switch the control area by Digital input (DI), the instrument must have an option (Digital input). The memory area transfer must be set at DI1 function selection.
To change the Control area by Digital input (DI), two methods are offered; Transfer using the SET signal input and transfer without the SET signal.

・With a SET signal: After the Memory area has been selected by the DI, close the contact of the SET signal so that the Control area is transferred.
・Without a SET signal input:
After the Memory area has been selected by the DI, the Area will be automatically changed after the time period (1 to 5 seconds) set at "Area switching time (without area set signal)" in Function block No. 23 in the Engineering mode.

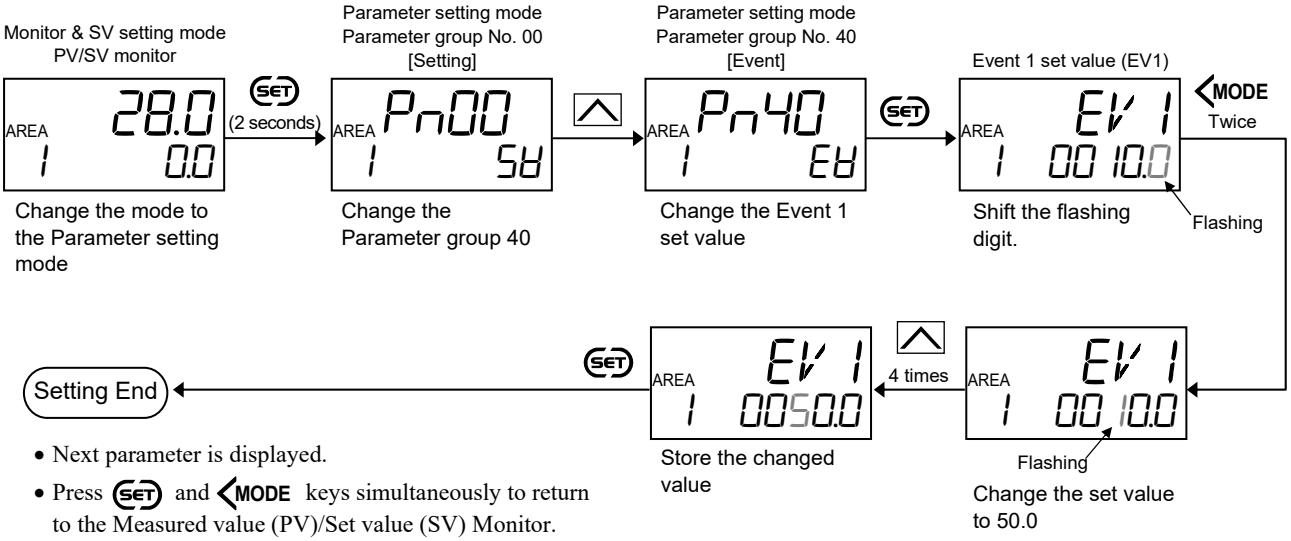
☞ For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Switching the Control area by Area soak time

Changing the Memory area by the Memory area soak time will need setting the Memory area No. to which the Memory area is switched.
Refer to **10.5 Running a Simple Ramp/Soak Operation (P. 10-18)** or **10.6 Using a Simple Sequence Operation (P. 10-26)** for details.

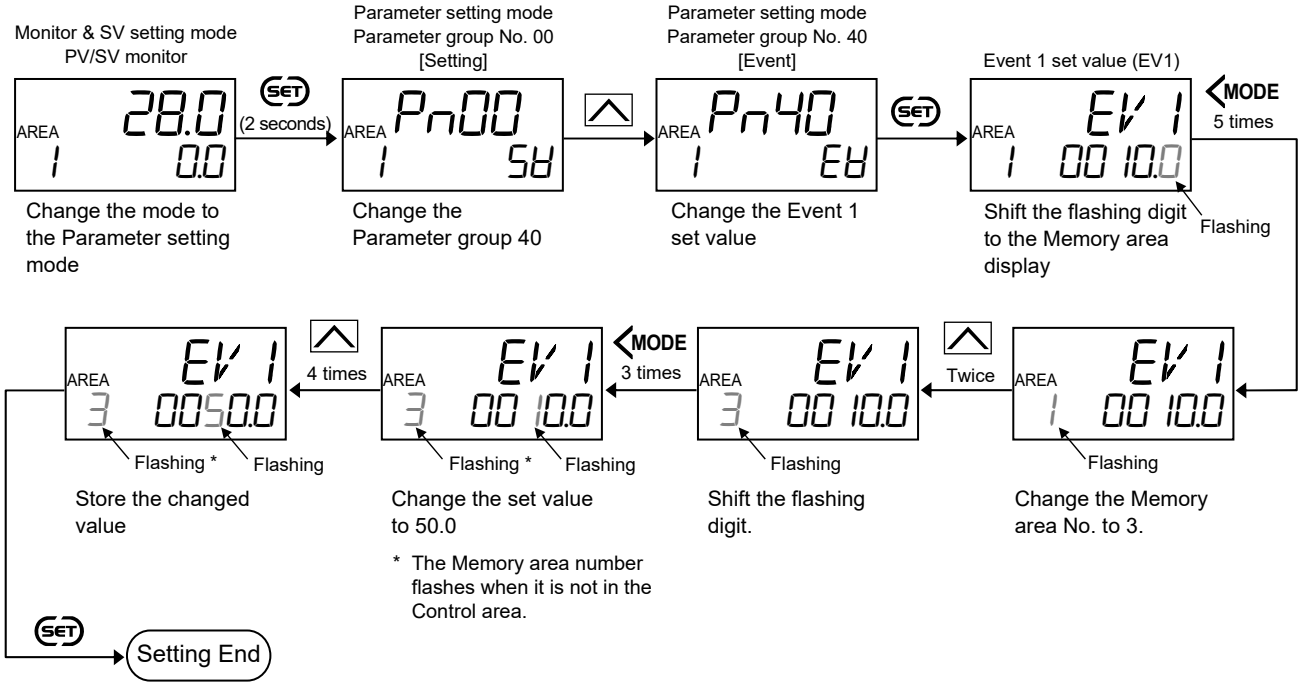
■ Changing the data in the Memory area

● Change the Event 1 set value in the Control area (Memory area 1) from 10.0 to 50.0



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

● Change the Event 1 set value from 10.0 to 50.0 in Memory area 3 when the Control area is Memory area 1.



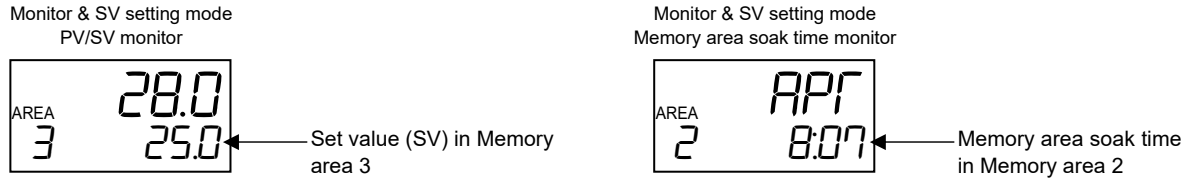
* The Memory area number flashes when it is not in the Control area.

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

■ Memory area display

During the PV/SV monitor display, the Set value (SV) displayed on the SV display is the Set value (SV) in the Memory area No. now displayed on the Memory area display.
During the Monitor & SV setting mode display, the time displayed on the Memory area soak time is the time of the Memory area No. now displayed on the Memory area display.

[Example]



■ Parameter setting

● Memory area transfer
[Monitor & SV Setting Mode] (FZ110)
[Memory Area Transfer Mode] (FZ400/900)

Parameter symbol	Data range	Factory set value
AREA	1 to 16	1

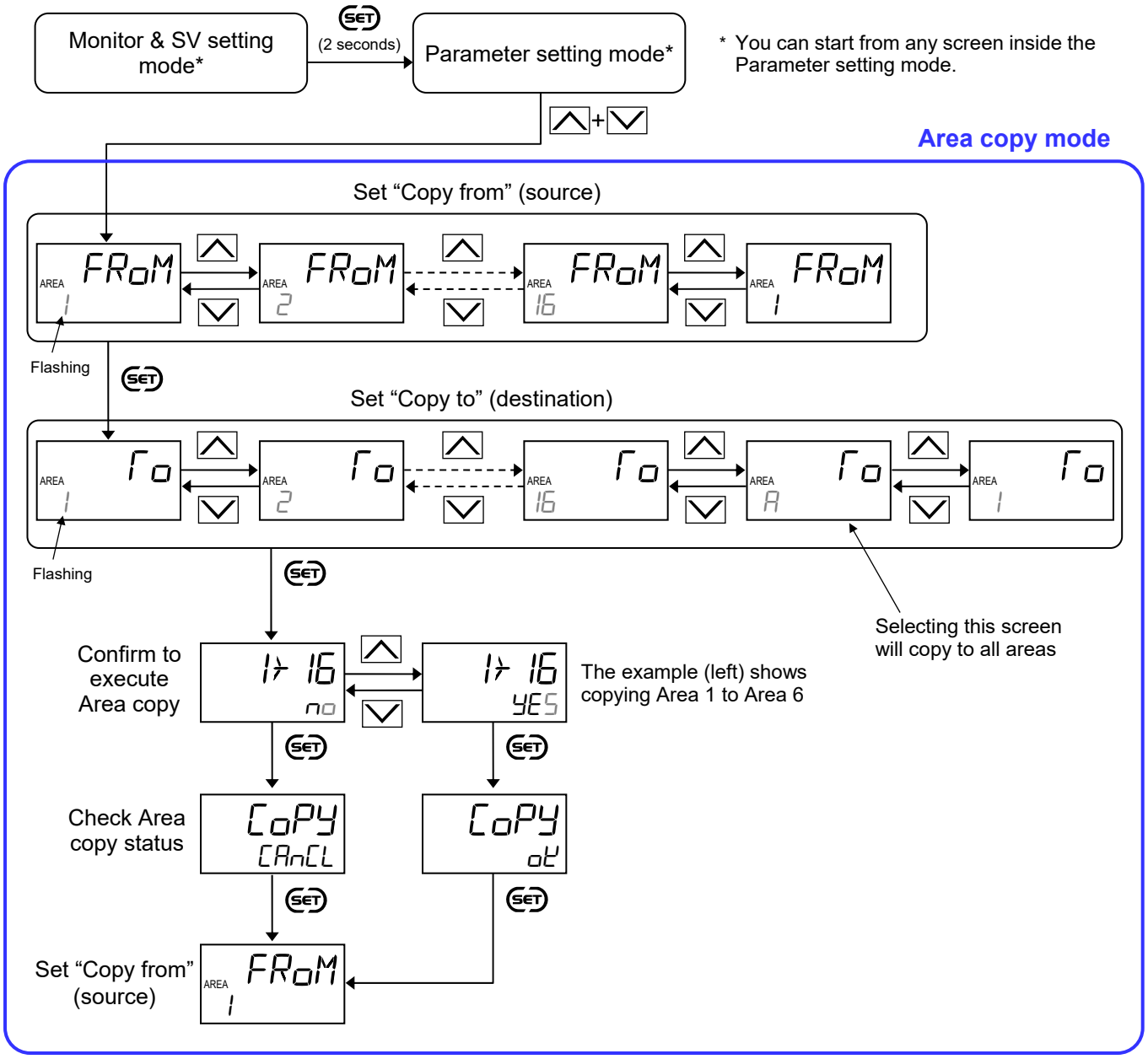
For FZ400/900, when the "Area lock" setting is "Memory area is not adjustable when the setting data is locked", this parameter will not be displayed.

Refer to "**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**" for the parameters that are automatically converted when the Memory area is changed.

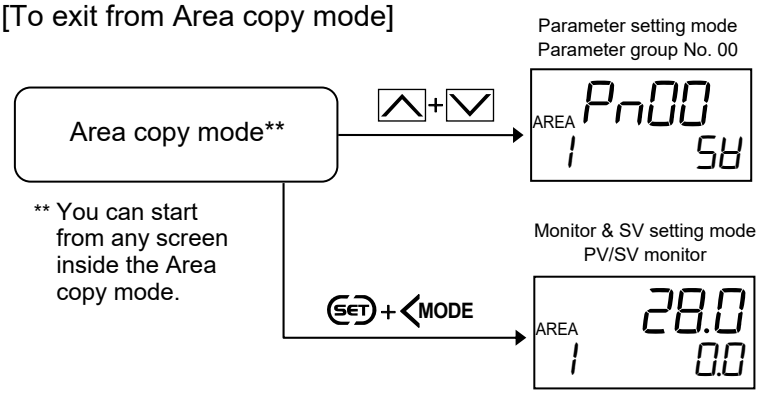
10.4 Copying the Data in Memory Area to Set Other Areas

Up to 16 Memory areas can be set, but it consumes time if Memory areas are set one after another. On this instrument, the data in the Memory area can be copied.

■ Screens for Area copy mode

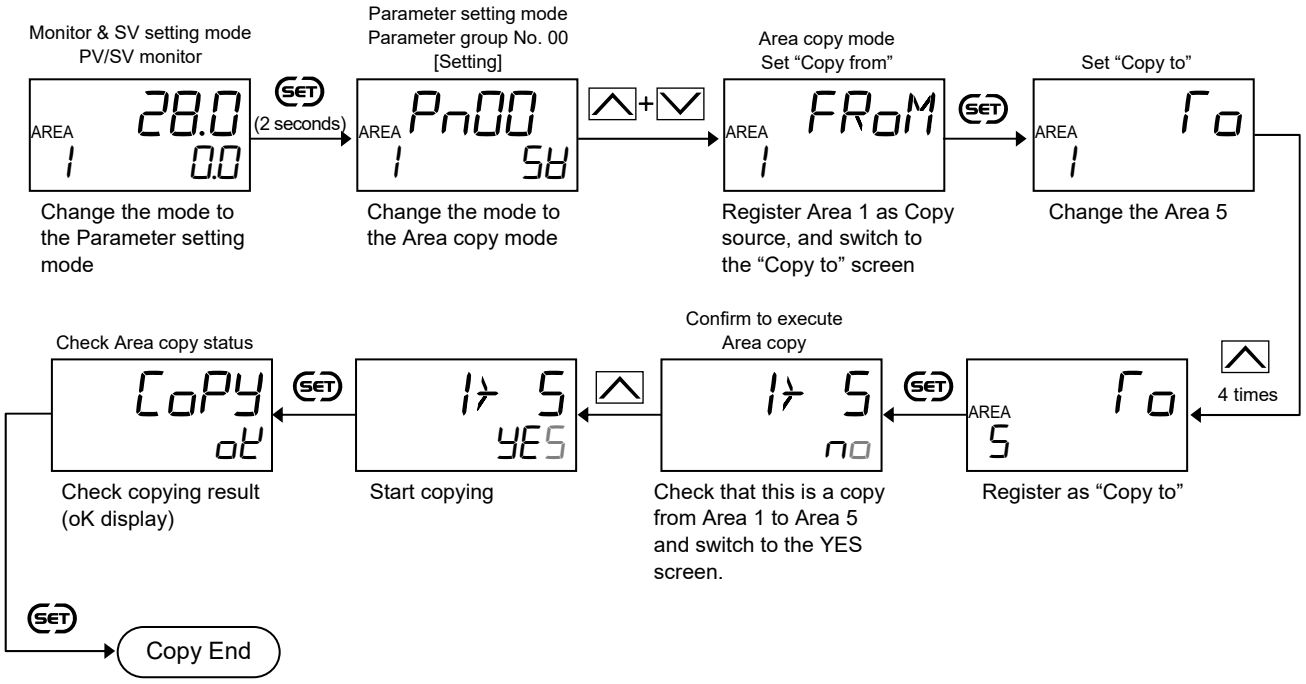


[To exit from Area copy mode]



[Example Area copy]

Copy the data in Memory Area 1 to Memory area 5



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

10.5 Running a Simple Ramp/Soak Operation

On this instrument multiple Memory areas can be linked to run a simple ramp/soak control.

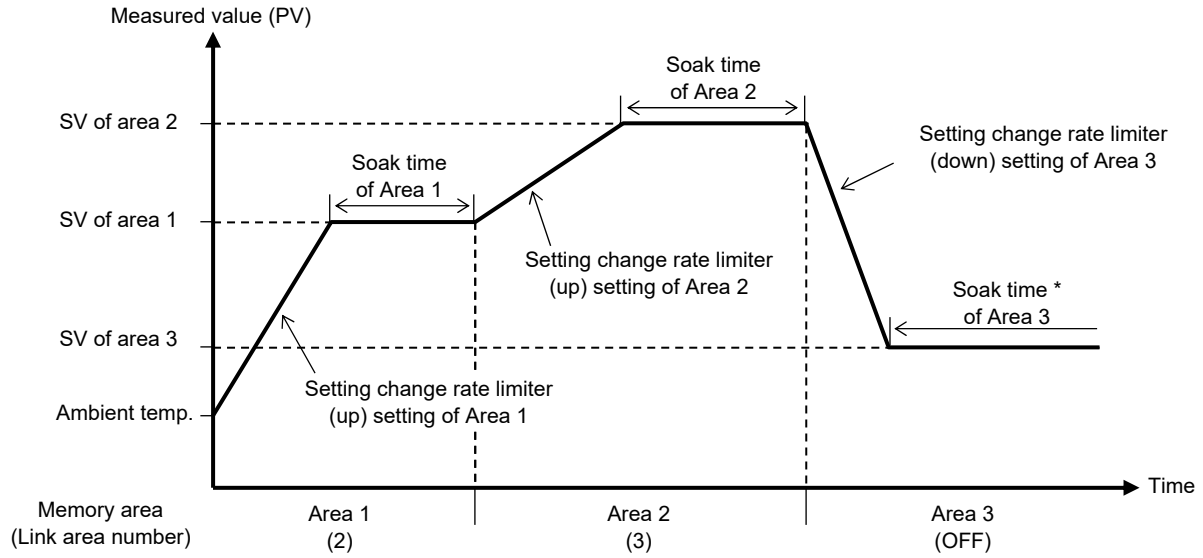
■ Description of function

Simple Ramp/Soak control is possible by setting a Set value (SV), Setting change rate limiter (up/down), Area soak time, and Link area number in each memory area.

- Set value (SV): Sets the fixed set point control (control by fixed set value) desired value of each memory area.
- Setting change rate limiter: Sets the slope of the Set value (SV) which is raised or lowered at each unit time.
- Area soak time: Sets the fixed set point control time of each memory area.
- Link area number: Sets the memory area numbers for linking the corresponding memory areas.

Besides the above, the Setting change rate limiter unit time and Area soak time unit are set in the Engineering mode.

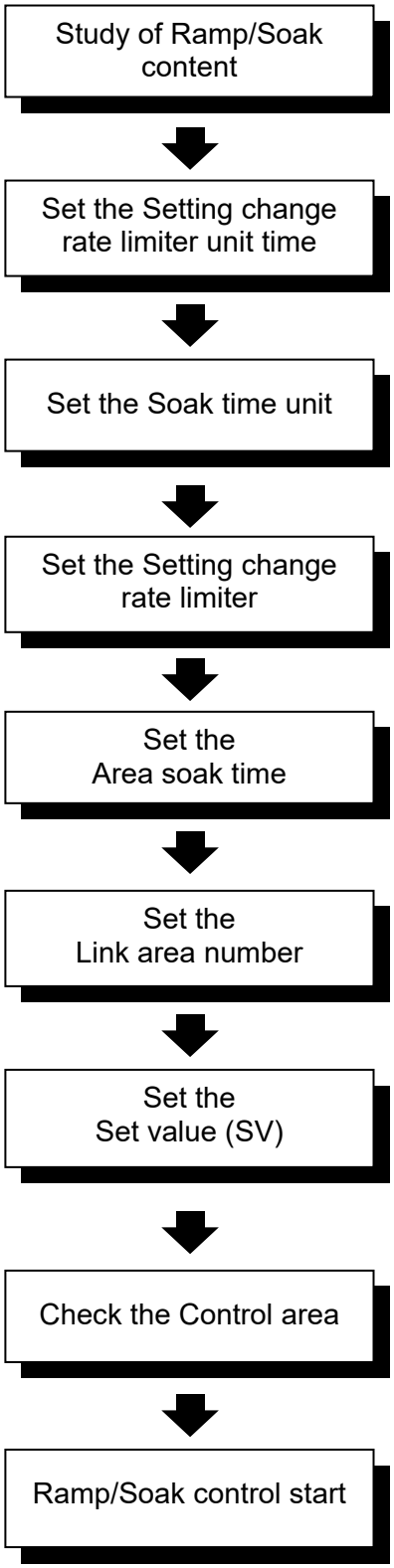
Example: Ramp/Soak control by linking Memory area 1 to 3



* As the area soak time for memory area linked last becomes invalid, the state of SV3 reached continues.

To check the elapsed time in each area, refer to the "Memory area soak time monitor" in the Monitor & SV setting mode.
For FZ400/900, Memory area soak time can be displayed on the MV display. Refer to **9.6 Changing the Display Contents of the MV Display [FZ400/900] (P. 9-24)**.

■ Operation flowchart



The Ramp/Soak control contents are studied, and the operation status is graphed, and the set values are summarized in a table in advance.

Refer to ■ **Settings before operation (P. 10-20),**
■ **Setting example (P. 10-21).**

Refer to ■ **Settings before operation (P. 10-20),**
■ **Setting example (P. 10-21).**

Refer to ■ **Setting example (P. 10-21)**
Set at each memory area.

Refer to ■ **Setting example (P. 10-21)**
Set at each memory area.

Refer to ■ **Setting example (P. 10-21)**
Set at each memory area.

Refer to ■ **Setting example (P. 10-21)**
Set at each memory area.

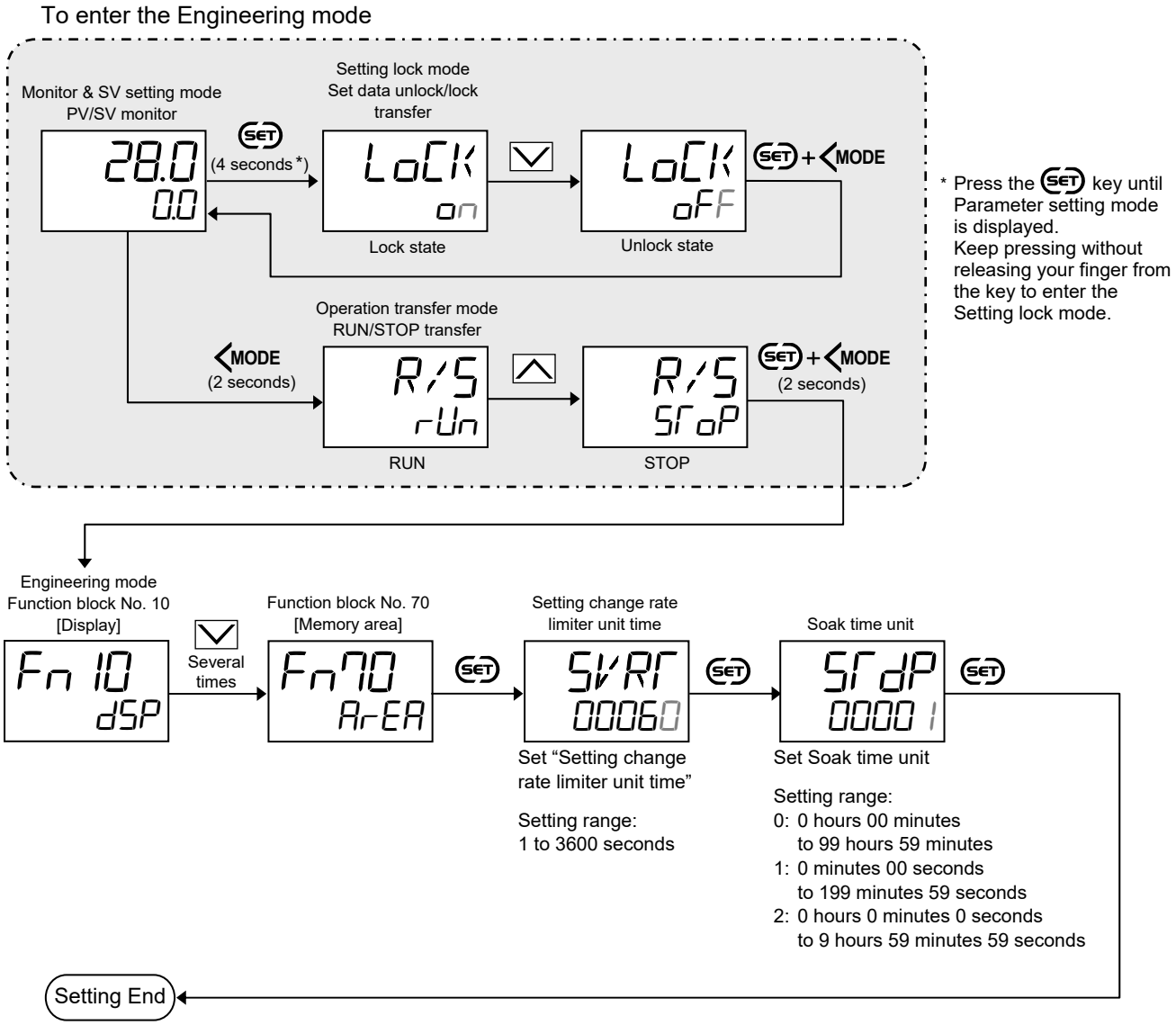
Refer to ■ **Setting example (P. 10-21)**
The start area is made the Control area before the start of Ramp/Soak control.

Refer to ■ **Setting example (P. 10-21)**
Changes from the STOP mode to the RUN mode, and starts Ramp/Soak control.

■ Settings before operation

When implementing Ramp/Soak control, it may be necessary to set the following items in advance.

- Setting change rate limiter unit time [Engineering mode: Function block No. 70 (Fn70)]
- Soak time unit [Engineering mode: Function block No. 70 (Fn70)]

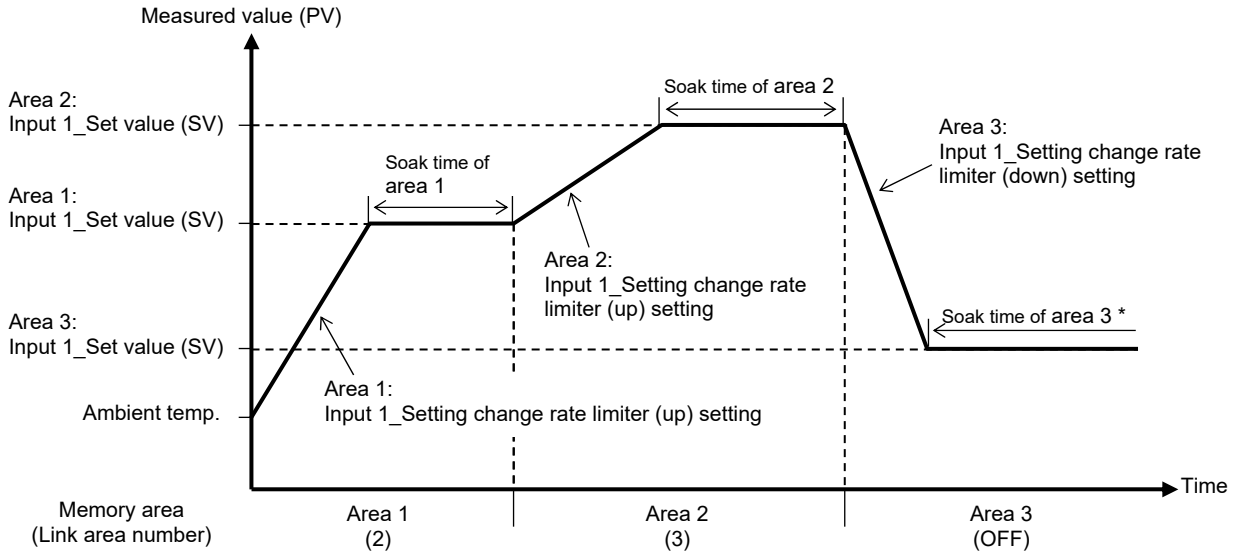


- Next parameter is displayed.
- Press (SET) and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the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

■ Setting example

This section uses the following sample of Ramp/Soak control to describe the setting procedures.

[Example: Ramp/Soak control by linking Memory area 1 to 3]



	Area 1	Area 2	Area 3
Input 1_Set value (SV)	150.0 °C	200.0 °C	50.0 °C
Input 1_Setting change rate limiter (up)	4.0 °C/min. (60 sec.)	2.0 °C/ min. (60 sec.)	OFF
Input 1_Setting change rate limiter (down)	OFF	OFF	9.0 °C/min. (60 sec.)
Area soak time	30 minutes	40 minutes	0 minutes *
Link area number	2	3	OFF

* In this example, the Area soak time for memory area 3 is set. However, as the Area soak time for the memory area linked last becomes invalid, the state of SV3 reached continues.

Step 1:
Study the Ramp/Soak control content.

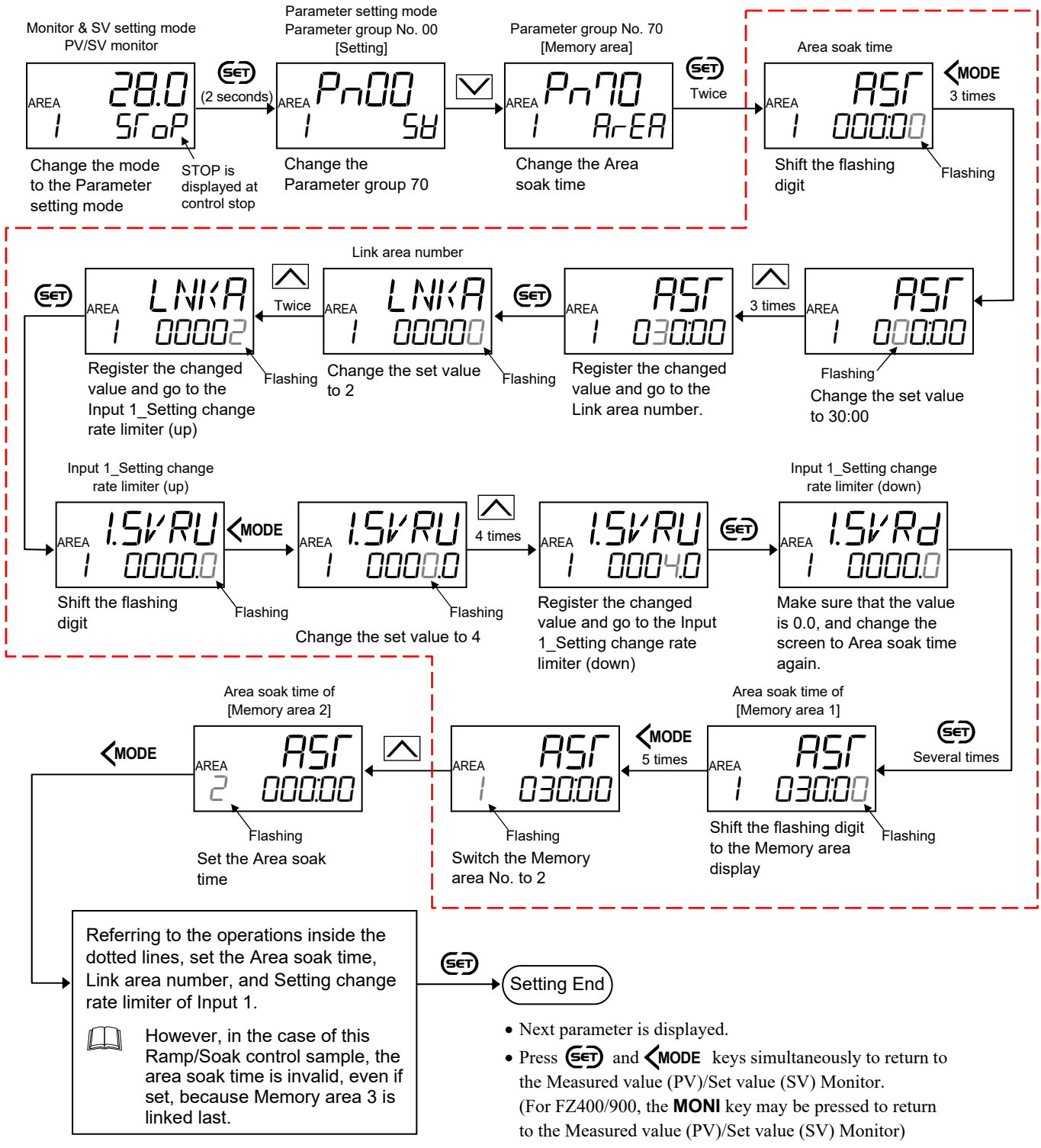
The Ramp/Soak control contents are studied and Ramp/Soak status is graphed and the set values of each memory area are summarized in a table as shown above.

Step 2:
Set the Setting change rate limiter unit time and Soak time unit.

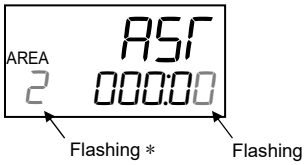
Refer to ■ **Settings before operation (P. 10-20)** and set the Setting change rate limiter unit time and Area soak time (In this example, the factory set values are used for both). Since control stops (STOP) at this time, go directly to the next step.

- Setting change rate limiter unit time: 60 seconds [factory set value]
- Soak time unit: 1 (0 minutes 00 seconds to 199 minutes 59 seconds) [factory set value]

Step 3:
Set the Setting change rate limiter, Area soak time and Link area number to each of Memory area 1, 2 and 3.

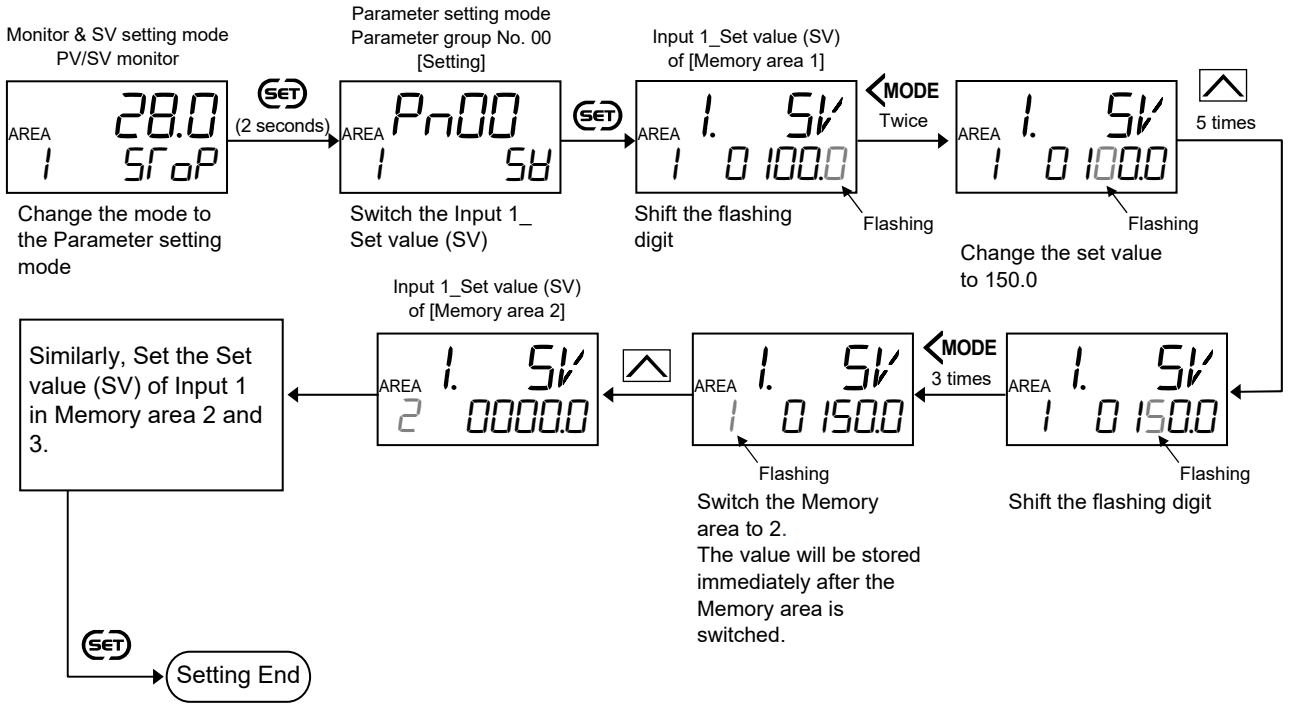


The Memory area number flashes when a Memory area other than that in the Control area is displayed.



(* Area other than Control area is displayed)

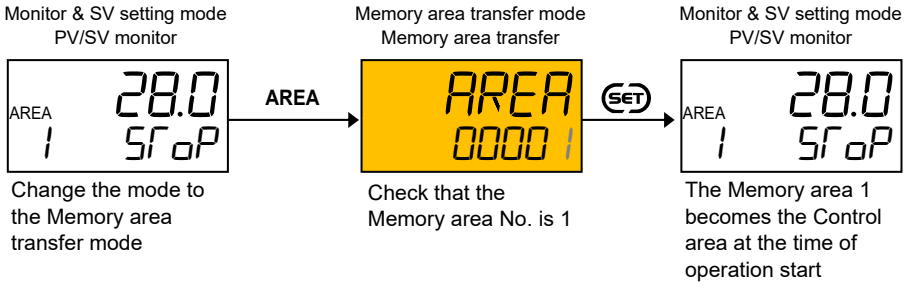
Step 4:
Set the SV to each of Memory area 1, 2 and 3.



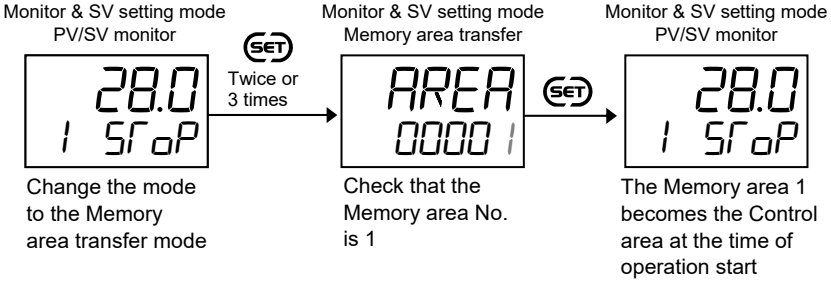
- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

Step 5:
Check the control area number.

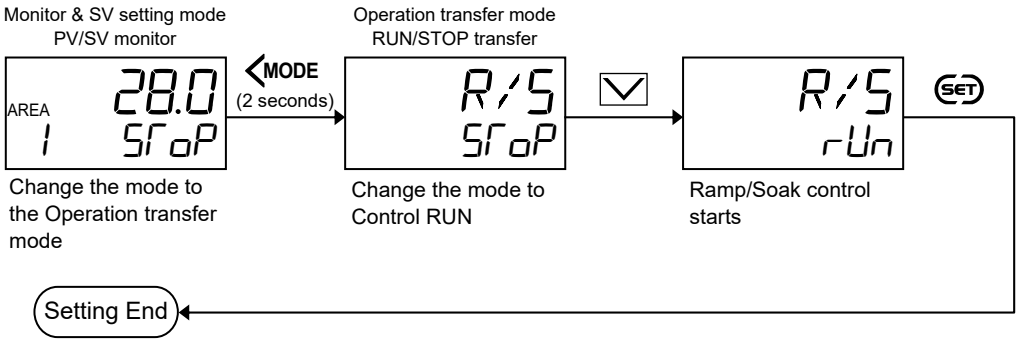
● FZ400/900



● FZ110



Step 6:
Change from STOP mode to RUN mode



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

■ Parameter setting

☞ For Setting change rate limiter (up/down) and Setting change rate limiter unit time, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

● Area soak time
[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
ASr	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. Data range of Area soak time can be selected on the Soak time unit.	0:00 (0 minutes 00 seconds)

☞ For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

● Link area number
[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
LNKA	0 to 16 0: No link	0

● Soak time unit
[Engineering Mode: Function block No. 70 (Fn70)]

Parameter symbol	Data range	Factory set value
SrdP	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 00 minutes 00 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 to 1	1

☞ For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

10.6 Using a Simple Sequence Operation

On this instrument, multiple Memory areas can be linked to run a simple sequence operation in each Memory area.

■ Description of function

Simple sequence operation is possible by setting a Set value (SV), Setting change rate limiter (up/down), Select Trigger type for Memory area transfer, Area soak time, Link area number, Auto/Manual transfer selection (Area), Manipulated output value (Area), and Remote/Local transfer selection (Area) in each memory area.

- Set value (SV): Sets the fixed set point control (control by fixed set value) desired value of each memory area.
- Setting change rate limiter:
  Sets the slope of the Set value (SV) which is raised or lowered at each unit time.
- Select Trigger type for Memory area transfer:
  Select a trigger type to switch the Memory area.
- Area soak time: Sets the fixed set point control time of each memory area.
- Link area number: Sets the memory area numbers for linking the corresponding memory areas.
  Memory area will be switched by generated events or contact status of Digital input (DI). To use the generated events as a switching method, setting up the event function is required. To use the Digital input (DI) as a switching method, "Area jump" must be preset in the DI function selection.

  ☞ For the Event function, refer to **7.1 Using Event Function (P. 7-2)**. For the DI function selection, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.
- Auto/Manual transfer selection (Area):
  Select the operation mode (Auto mode or Manual mode) at the time of switching the memory area. A selection of "Bump" or "Bumpless" is available both in Auto and Manual modes.

  📖 When the SV tracking function is selected at the time of switching from Manual to Auto mode, the Set value (SV) of the Memory area will be ignored.

  ☞ For more details of Bumpless action at the time of switching between Auto/Manual, refer to **6.8 Suppressing Sudden Change in Output (Balanceless Bumpless) (P. 6-33)**.

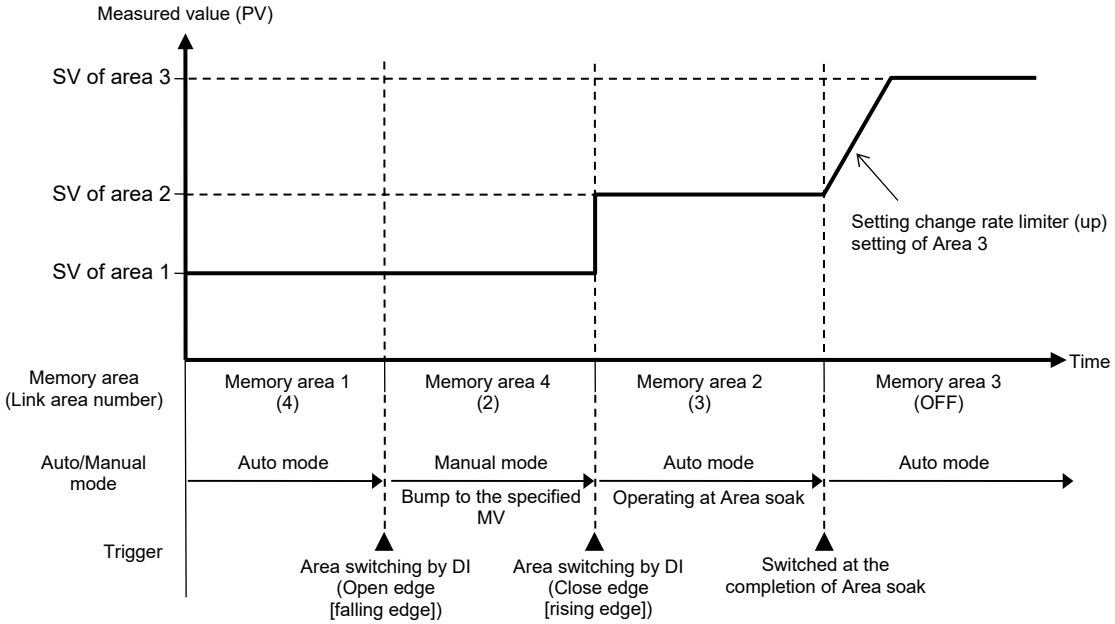
  ☞ For the SV tracking function, refer to **8.17 Continuing Stable Control after the Operation Transfer (SV Tracking) (P. 8-110)**.
- Manipulated output value (Area):
  When either "Auto mode (bump)" or "Manual mode (bump)" is selected in the Auto/Manual transfer selection (Area), the Manipulated output value just after the switching is complete needs to be set here.
- Remote/Local transfer selection (Area):
  Select the Operation mode at the time of Memory area switching.
  The operation mode depends on the action selected in Select function for input 2.
  - ・Remote setting input: Remote mode/Local mode switching
  - ・Cascade control: Cascade control/Single control switching
  - ・Control with PV select: Input 1/Input 2 switching
  - ・2-loop control/Differential temperature control:
    2-loop control/Differential temperature control switching

  📖 When the SV tracking function is selected at the time of the operation mode transfer, the operation mode follows the action set in the SV tracking.

  ☞ For the SV tracking function, refer to **8.17 Continuing Stable Control after the Operation Transfer (SV Tracking) (P. 8-110)**.

Besides the above, the Setting change rate limiter unit time and Area soak time unit are set in the Engineering mode

Example: Operating a simple sequence using Memory areas 1 through 4



● Description of operation

1. Memory area 1: Operation mode: Auto mode
Control target: Set value (SV) of Memory area 1
Area soak time: 0:00 (No function)
Link area number: 4
Memory area switching trigger: Open edge (falling edge) of Digital input (DI1)

2. Memory area 4: Operation mode: Switched from Auto mode to Manual mode
Control output: Bumps to the value specified by the Manipulated output value (Area)
Area soak time: 0:00 (No function)
Link area number: 2
Memory area switching trigger: Close edge (rising edge) of Digital input (DI1)

3. Memory area 2: Operation mode: Switched from Manual mode to Auto mode
Control target: Set value (SV) of Memory area 2
Area soak time: 10 minutes
Link area number: 3
Memory area switching trigger: 0 (No assignment)
Area is switched after the completion of the Area soak.

4. Memory area 3: Operation mode: Auto mode continues
Control target: After changing the Set value (SV) by the Setting change rate limiter, control is done using the Set value (SV) in Memory area 3.
Area soak time: In this example, the Area soak time for memory area 3 is set. However, as the Area soak time for the memory area linked last becomes invalid, the state of SV3 reached continues.
Link area number: 0 (No function)
Memory area switching trigger: 0 (No assignment)

When both of Area soak time and Select trigger type for memory area transfer are valid, the switching takes place based on the *OR*-logic.

■ Parameter setting

☞ For Setting change rate limiter (up/down) and Setting change rate limiter unit time, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

● Select Trigger type for Memory area transfer [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
TRGA	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0

☞ To use the generated events as a switching method, setting up the event function is required. To use the Digital input (DI) as a switching method, "Area jump" must be preset in the DI function selection. For the Event function, refer to **7.1 Using Event Function (P. 7-2)**. For the DI function selection, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Area soak time [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
AST	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. Data range of Area soak time can be selected on the Soak time unit.	0:00 (0 minutes 00 seconds)

☞ For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

● Link area number [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
LNKA	0 to 16 0: No link	0

● Input 1_Auto/Manual transfer selection (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
I.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

● Input 1_Manipulated output value (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.MV.A	PID control, Position proportioning PID control: −5.0 to +105.0 % Heat/Cool PID control: −105.0 to +105.0 %	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control: 0.0

● Input 2_Auto/Manual transfer selection (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

To display “Input 2_Auto/Manual transfer selection (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Manipulated output value (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.MV.A	−5.0 to +105.0 %	−5.0

To display “Input 2_Manipulated output value (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Remote/Local transfer selection (Area) [Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
R/L.A	• When "Remote setting input" is selected at Select function for input 2 [1] 0: No transfer 1: Local mode 2: Remote mode	0
	• When "Cascade control" is selected at Select function for input 2 [2] 0: No transfer 1: Single control 2: Cascade control	
	• When "Control with PV select" is selected at Select function for input 2 [3] 0: No transfer 1: Input 1 2: Input 2	
	• When "2-loop control/Differential temperature control" is selected at Select function for input 2 [4] 0: No transfer 1: 2-loop control 2: Differential temperature control	

[1] For FZ400/900, this parameter is displayed when "Remote setting input" is selected in "Select function for input 2." For FZ110, this parameter is displayed when Remote setting input is supplied.

[2] Displayed when "Cascade control" is selected in "Select function for input 2."

[3] Displayed when "Control with PV select" is selected in "Select function for input 2."

[4] Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

To display "Remote/Local transfer selection (Area)"

- Proceed as follows for FZ400/900; Specify two inputs at the time of order, set Remote setting input, Cascade control, Control with PV select, or 2-loop control/Differential temperature control at "Select function for input 2" in Function block No. 58 in the Engineering mode.
- Proceed as follows for FZ110: Specify Remote setting input.

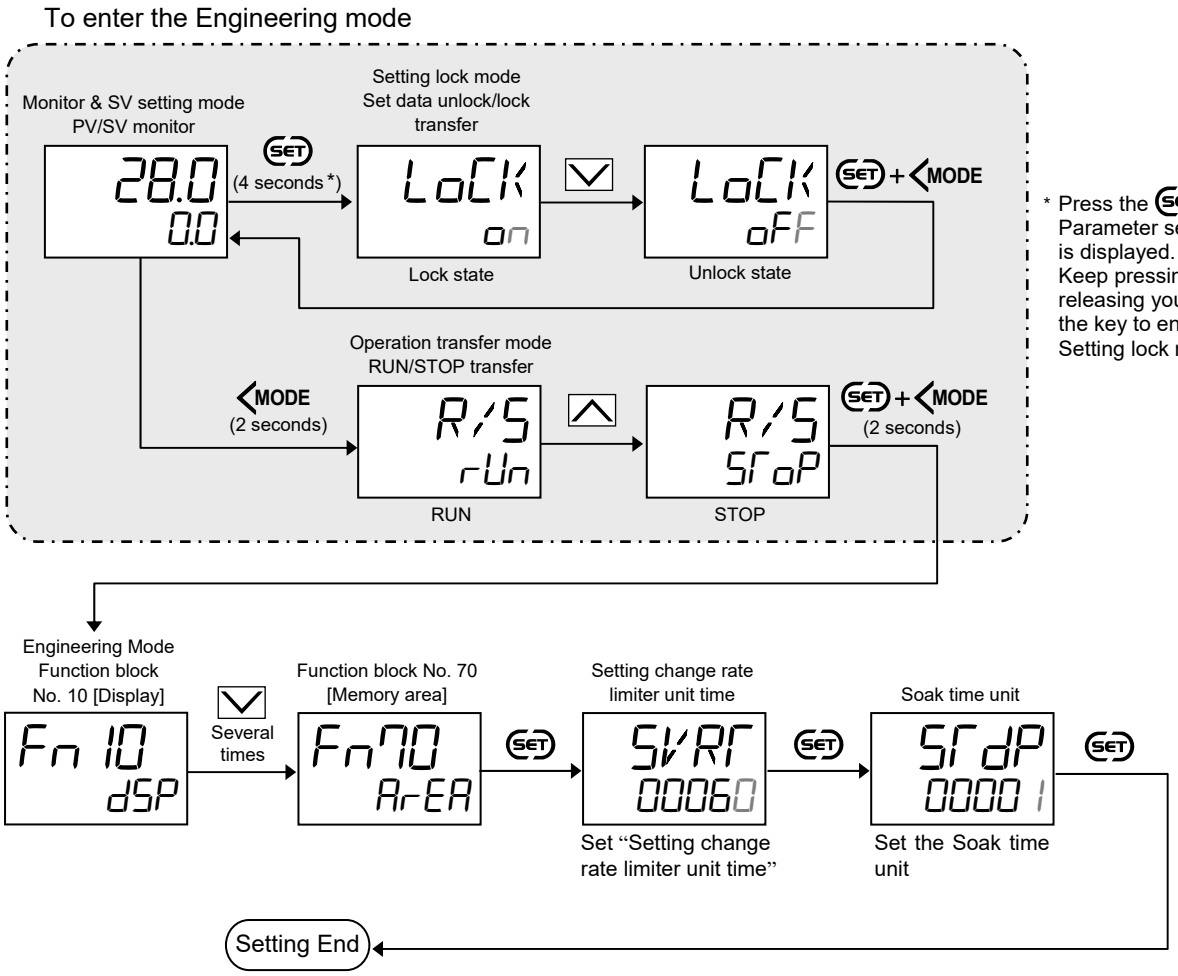
● Soak time unit [Engineering Mode: Function block No. 70 (Fn70)]

Parameter symbol	Data range	Factory set value
SrdP	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1

For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

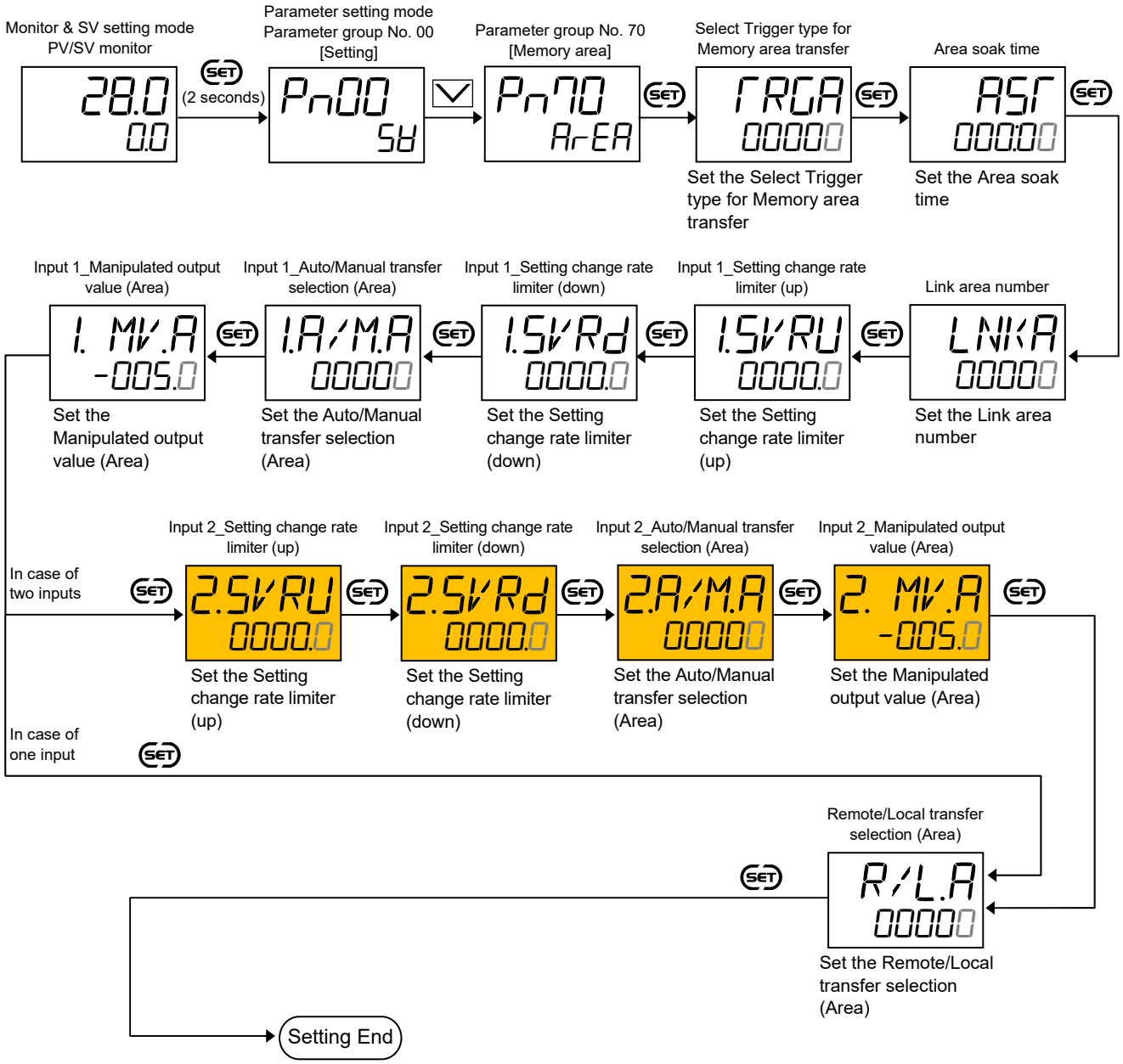
■ Setting procedure

● Set the Setting change rate limiter unit time parameter and Soak time unit



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

● Set the simple sequence related set items



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

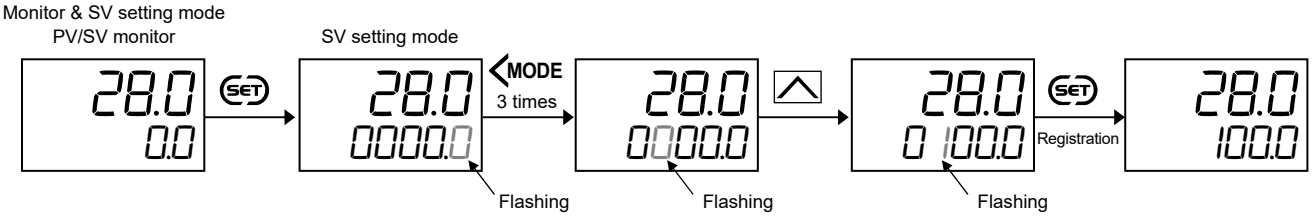
10.7 Registering a Set Value (SV) Without Pressing the SET Key

Basically the SET key must be pressed to register the data after changing the value of parameters.
There is another way of registering the Set value (SV) which takes in the changed data 2 seconds after the change.

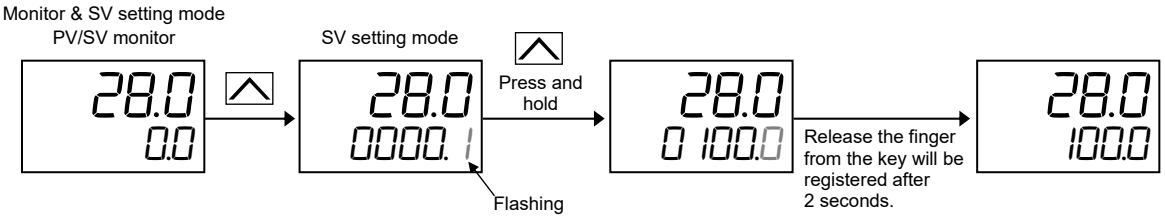
■ Description of function

[Example: Changing the Set value (SV) to 100.0]

● To register the value by pressing the SET key (SET key method)



● To register the value without pressing the SET key (Direct method)



- To set the Set value (SV) in the PV/SV monitor, press the ∧ or ∨ key.
- Keep pressing the ∧ or ∨ key to accelerate the speed of increase/decrease.
- In the above explanation, the value is changed by using the ∧ or ∨ key, but MODE key may be used to shift the blinking digit to change the value digit by digit.

📖 To use a registration method without pressing the SET key, go to "Data registration" in Function Block No. 11 in the Engineering mode.

📖 Registration without pressing the SET key is only applicable to the Set value (SV). Other parameters are not available in this method. Available mode is Monitor & SV setting mode only.

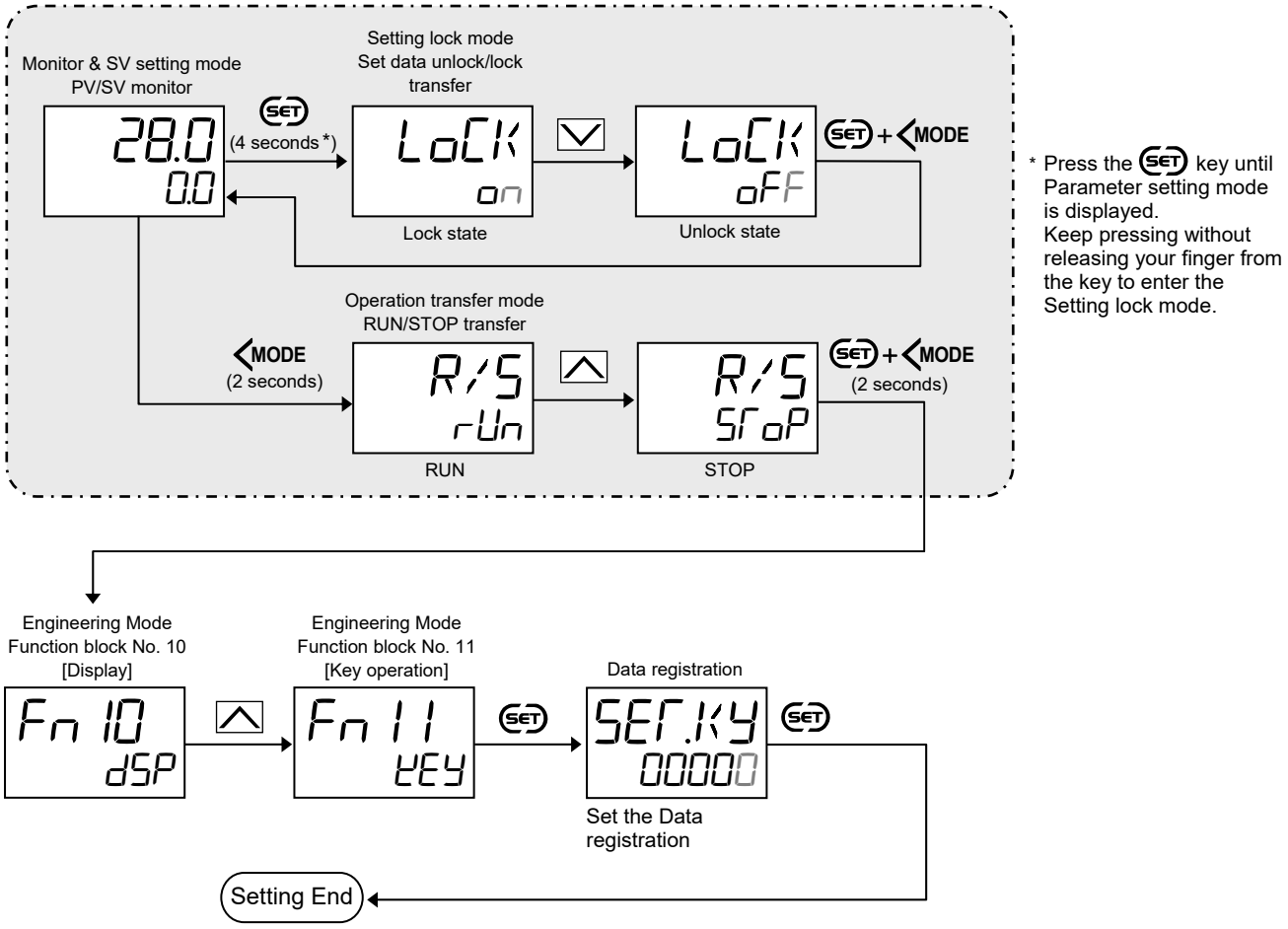
■ Parameter setting

● Data registration
[Engineering Mode: Function blockNo. 11 (Fn 11)]

Parameter symbol	Data range	Factory set value
SET.KY	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0

■ Setting procedure

To enter the Engineering mode



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

10.8 Accessing Some Functions Directly (FUNC Key) [FZ400/900]

FZ400/900 has a FUNC key which allows a specified function to be assigned to it.

■ Description of function

Functions assignable to the FUNC key

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

Explanation of key action

A: Mode is changed for every press of the key.
B: Function is turned on and off for every press of the key.
C: Function is released or reset by pressing the key.
D: Pressing the key switches the memory area to the preset area set in the Link area number in the Parameter setting mode. When the Link area number is not specified, a memory area with the number of the current control area number +1 will be used.

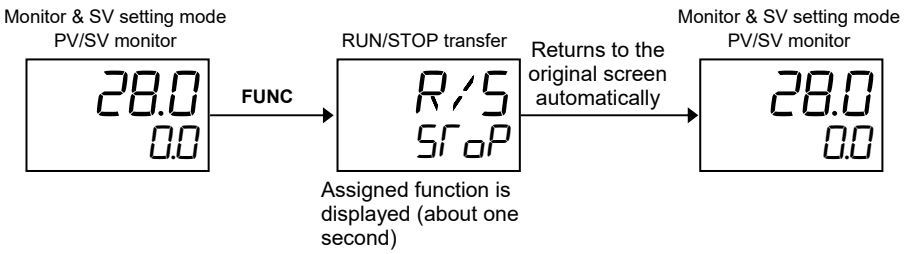
For details of each function, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Selection of key action is possible from “Press once” and “Press and hold” to enable the switching.

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

● Displays when switched by the FUNC key

[Example] RUN/STOP switching is assigned to the FUNC key



■ Parameter setting

● FUNC key assignment
[Engineering Mode: Function block No. 11 (Fn11)]

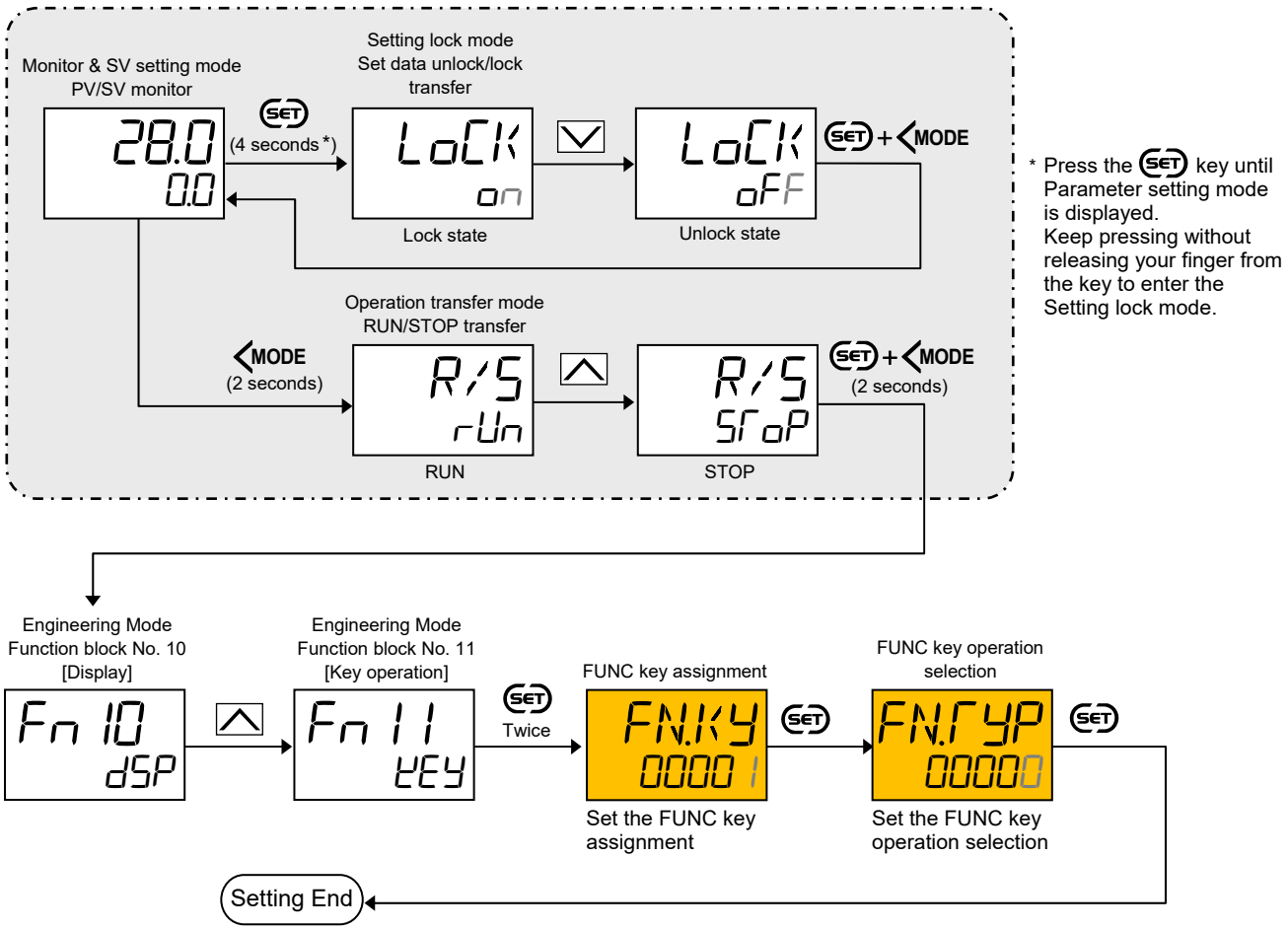
Parameter symbol	Data range	Factory set value
FNKY	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data unlock/lock transfer 15: Area jump	1

● FUNC key operation selection
[Engineering Mode: Function block No. 11 (Fn11)]

Parameter symbol	Data range	Factory set value
FNTYP	0: Press once The function set at “FUNC key assignment” is activated upon a press of the FUNC key. 1: Press and hold The function set at "FUNC key assignment" is activated by holding the FUNC key pressed.	0

■ Setting procedure

To enter the Engineering mode



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

10.9 Restricting Key Operation (Set Data Lock)

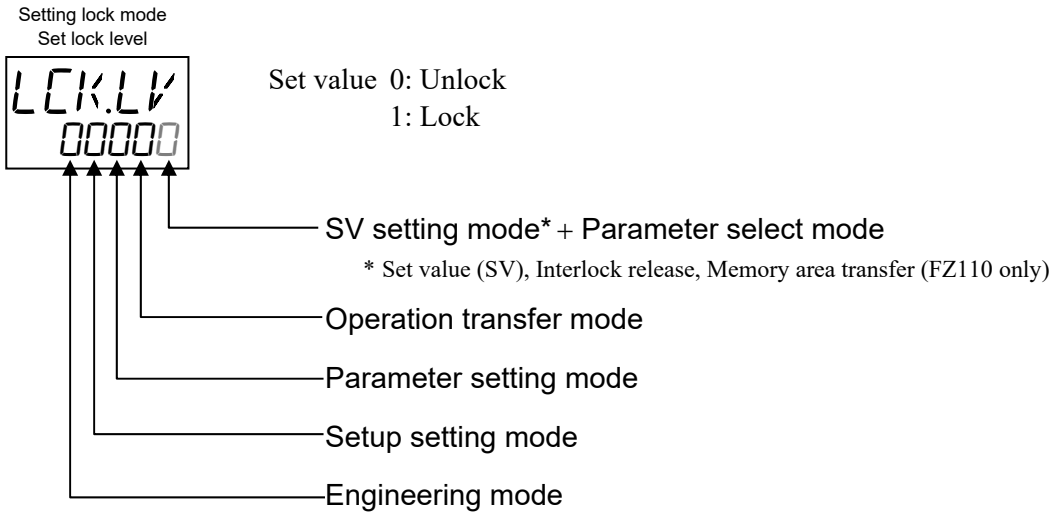
The Set data lock function limits access of unauthorized personnel to the parameters and prevents parameter change by mistake.

■ Description of function

The Set data lock function restricts changing values depending on the parameter mode. The Area lock restricts switching the Memory areas.

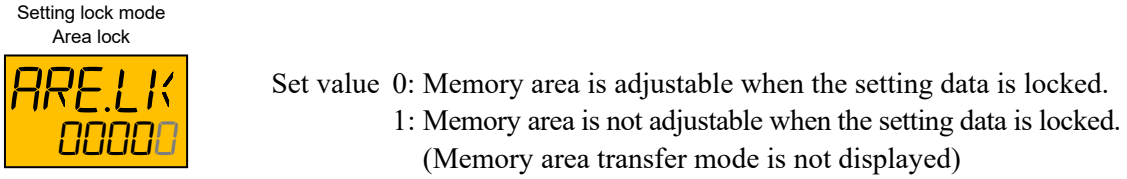
● Set lock level

Select the parameter mode to lock.



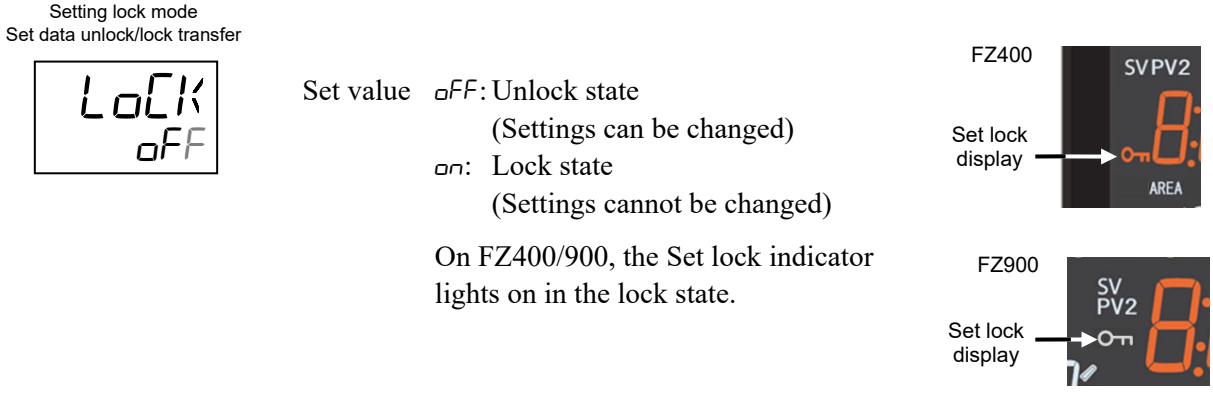
● Area lock (FZ400/900 only)

For FZ400/900: Select enable/disable Memory area switching
For FZ110: Locking Memory area switching is available by the Set lock level.



● Set data unlock/lock transfer

The parameter set with Set lock level and Area lock can be locked/unlocked.

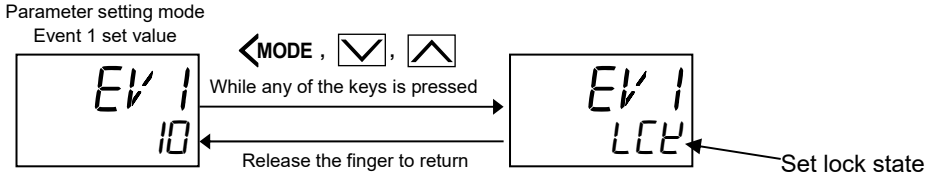


● When the set value was likely to be changed during the Set data lock state

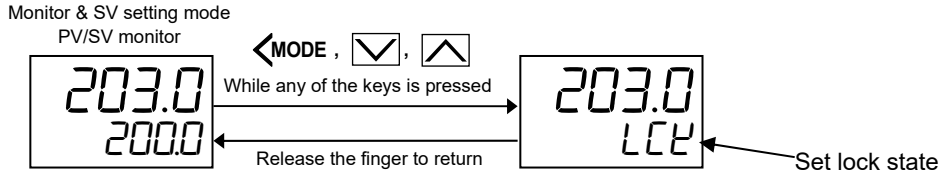
A character will be shown on the Set value (SV) display unit to show the lock mode when any of MODE , ▽ or △ key is pressed.

The "LCK" is displayed only while the relevant key is pressed. Releasing the finger from the key will return the display to the original.

Example 1: "Event 1 set value" screen when the Parameter setting mode is locked.



Example 2: "PV/SV monitor" screen when the SV setting mode is locked
(Direct method is selected at Function block No. 11 in the Engineering mode)



Switching the Set data lock is available anytime irrespective or RUN or STOP state.

Parameter switching is available during the Set data lock state for checking the data.
When the SV setting mode is locked, the Set value (SV) setting screen in the SV setting mode will not be displayed.

Even during the Set data lock state, setting through the communication (optional function) and selection of functions by the FUNC key is possible. It should be noted that when the parameters in the Engineering mode are changed, the instrument must be stopped (or stay in the STOP mode).

■ Parameter setting

● Set data unlock/lock transfer [Setting Lock Mode]

Parameter symbol	Data range	Factory set value
LoCK	oFF: Unlock state on: Lock state	oFF

● Set lock level [Setting Lock Mode]

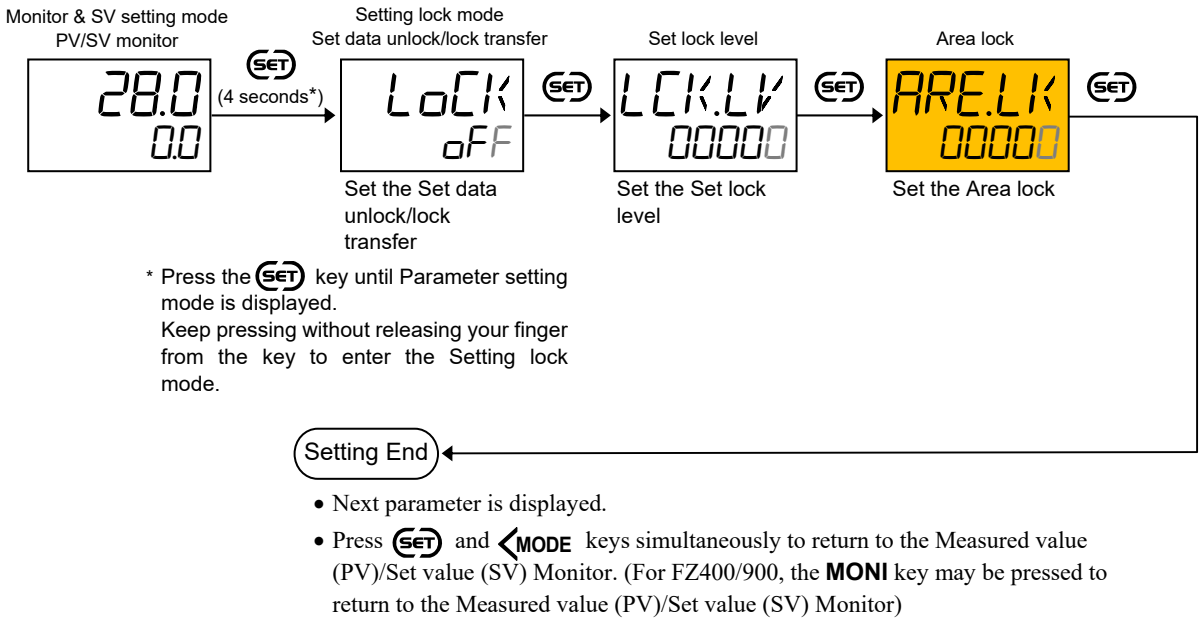
Parameter symbol	Data range	Factory set value
LCK.LV	Set Lock/Unlock at each digit. 00000 ← SV display 0: Unlock 1: Lock SV setting mode * + Parameter select mode * Set value (SV), Interlock release, Memory area transfer (FZ110 only) Operation transfer mode Parameter setting mode Setup setting mode Engineering mode	00000

● Area lock [Setting Lock Mode]

Parameter symbol	Data range	Factory set value
ARE.LK	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0

■ Setting procedure

Set data lock can be found in the Set data lock mode.



10.10 Initializing the Set Data

The set values can be initialized when all the set values need to be reset.

■ Description of function

When the pass code is entered on the “Initialize” screen in Function block No. 91 in the Engineering mode, all the set values are initialized and reset to the factory set values.

This action initializes and erases all the set values set so far. Record your setting separately if necessary. **3. PARAMETER LIST (P. 3-1)** has a field for user set values which can be used for recording.

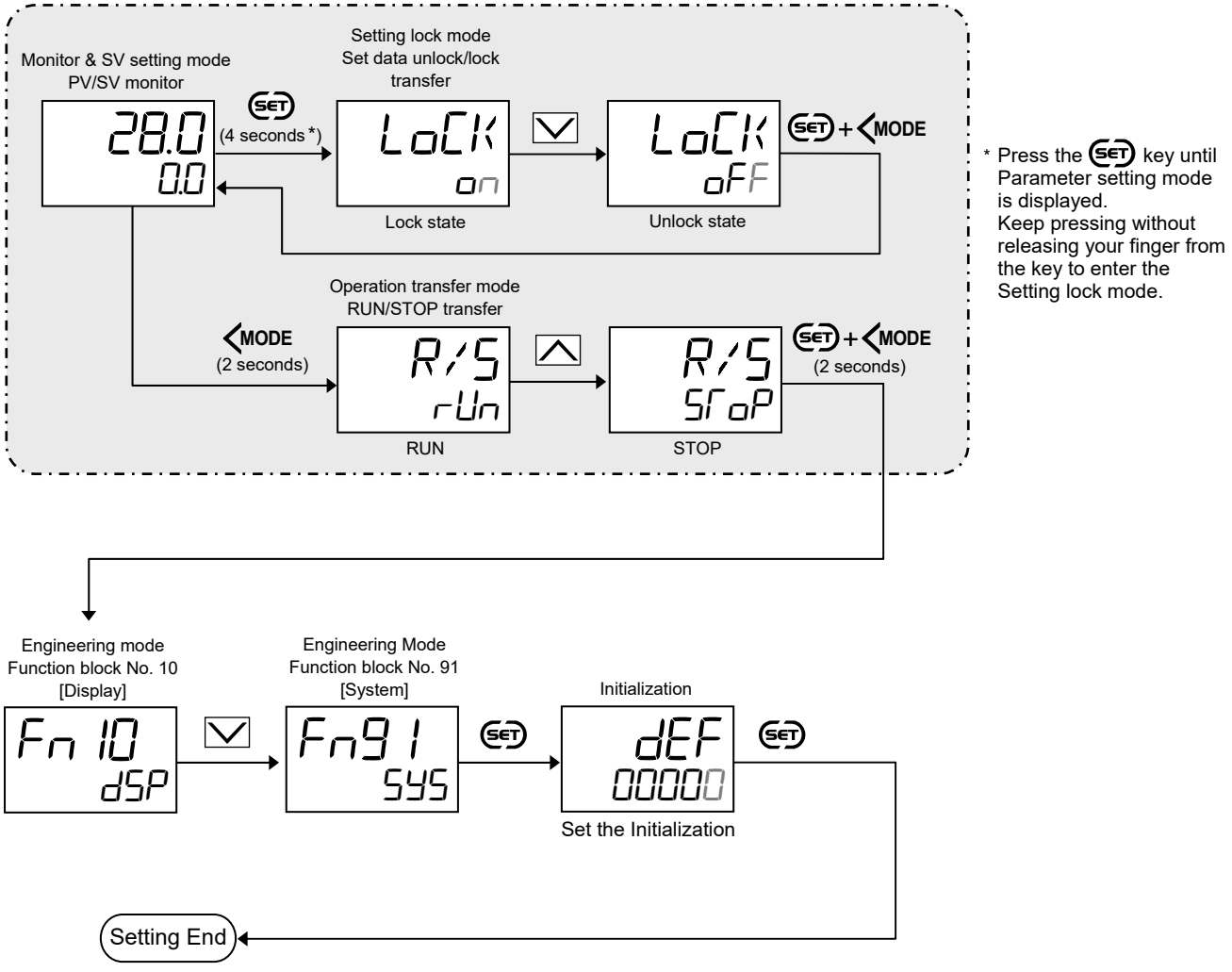
■ Parameter setting

● Initialization
[Engineering Mode: Function block No. 91 (Fn91)]

Parameter symbol	Data range	Factory set value
dEF	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0

■ Setting procedure

To enter the Engineering mode



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

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* Mode
A: Monitor & SV setting Mode
B: Parameter select mode
C: Operation transfer mode
D: Setting lock mode
E: Memory area transfer mode
F: Parameter setting mode
G: Setup setting mode
H: Engineering mode

Displayed in case of FZ400/900.

Symbol		Name	Mode*	Page
1 (1)				
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Symbol		Name	Mode*	Page
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2.ATTM	2.ATTM	Input 2_AT remaining time monitor	G Sn54	2-13, 3-20
2. ATU	2. ATU	Input 2_Autotuning (AT)	C —	2-7, 3-6
2.AUNE	2.AUNE	Input 2_Action (low) input error	H Fn52	2-19, 3-39
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2. dF	2. dF	Input 2_PV digital filter (RS digital filter)	G Sn22	2-12, 3-16
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