

TOHO ELECTRONICS INC.

Program Controller TTM-P4W Series Instruction Manual



Thank you for purchasing our Program Controller TTM-P4W Series. Please read this Instruction Manual carefully to use the product correctly. TTM-P4W Series is a simplified program controller which enables program operation of up to "Patterns x Steps = 64".



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1. Cautions on Use

For safety purpose, following symbols are used in this manual.

 Warning	The case that a user may receive fatal damage, electric shock, or severe burn injury when the product is incorrectly used.
 Caution	The case that a user may receive minor damage or the equipment may get damage.

 Warning	Verify correct wiring before turning on electricity since incorrect wiring may cause an equipment failure or a fire. Modification of this equipment may cause malfunctioning or a fire. Do not add modification on this equipment.
 Caution	Wiring: Do not use empty terminals for irrelevant purposes. Operation: Do not use a sharp-pointed tool for operating keys.

- Hand over this operation manual to a person who actually operates the product.
- Do not reprint or duplicate this manual without permission.
- Content of this manual may be subject to modification without prior notice.
- We are not liable for any faults arising from misuse of the product.

Verification of the product

1) Verification of the model:

Refer the model name printed in the packing box to the order sheet.

2) Verification of accessories:

Instruction Manual (this manual) 1 copy

Mounting attachment..... 1 pc

3) Model

T T M - P 4 W - 0 - □ - A □ E □

①
②
③
④⑤⑥⑦

	Item	Description	
①	Model	P4W	48x48mm
②	Input	0	Thermocouple(K, J, R, T, N, S, B) RTD(Pt100)
③	Control Output 1	R	Relay Contact
		P	SSR Drive Voltage
		I	Current 4-20mA DC
④	Time Signal Output/Event Output 1	A	Relay Contact
⑤	Run Signal Output/Event Output 2/ Control Output 2	B	Relay Contact
		P	SSR Drive Voltage
⑥	External Input	E	DI (Non-voltage contact input)
⑦	Communication	X	RS-485

※"I" in Control Output1 can be switched to transmission output by parameter setting.

Prior to control operation

- Non-volatile memory is used for storing settings, which stays in the storage even when the power is cut.

2. Name and Size of Each Part

2.1 Name of each part

LED Lamp

RUN: Lights during operation mode

OUT1: Lights when control output 1 is ON (closed) and turns off when control output 1 is OFF (open).

OUT2: Lights when control output 2 is ON (closed) and turns off when control output 2 is OFF (open).

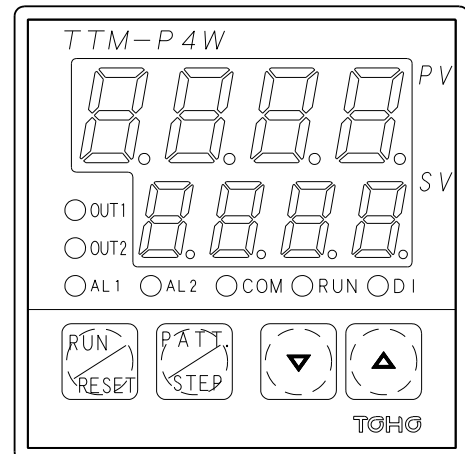
AL1: Lights during Event Output 1.

AL2: Lights during Event Output 2.

COM: Turns off when the product model "Communication" is not selected.

Lights when the product model "Communication" is selected. Blinks during communication.

DI: Lights when the external input is ON (closed) and turns off when the external input is OFF (open).



Operation Key

RUN/RESET key: RUN/RESET operation key

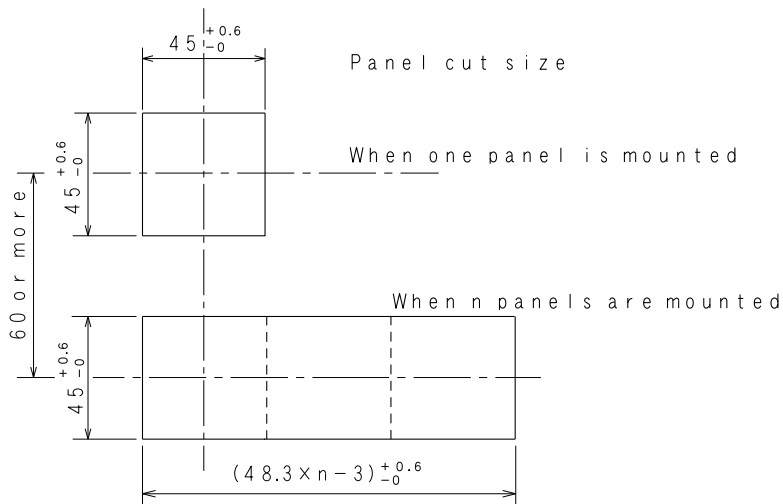
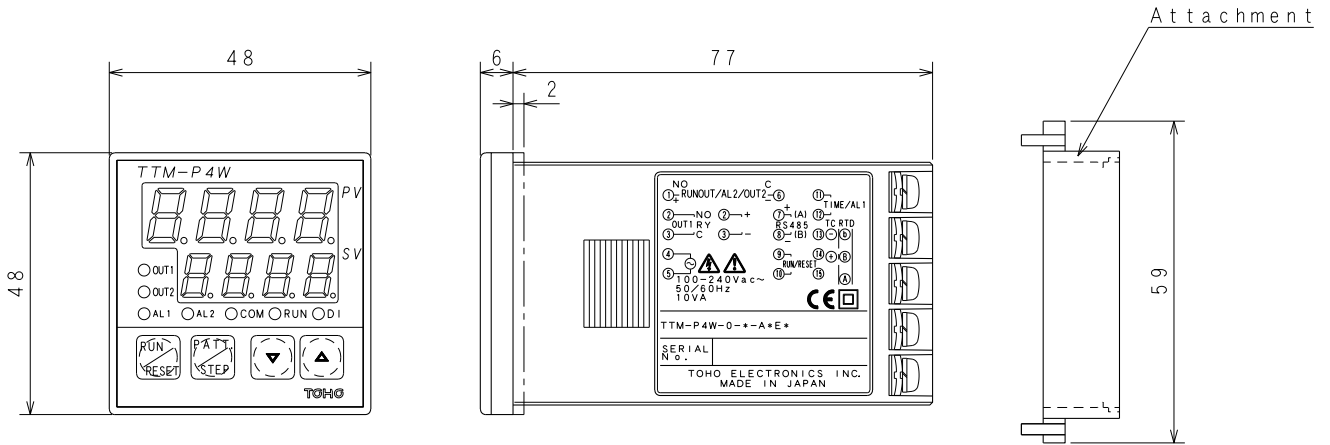
PATT./STEP key: PATTERN/STEP operation key

△ key: Setting value and parameter change key

▽ key: Setting value and parameter change key

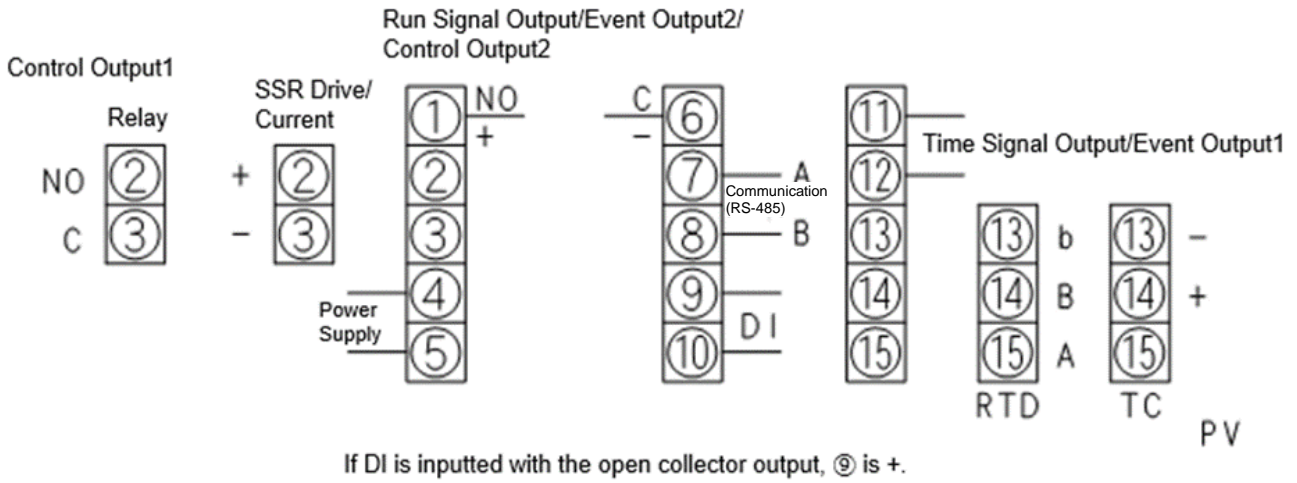
For the details of operation, see "6. Operation Flow and Parameter Description."

2.2 External dimensions and panel cut size





3. Wiring

3.1 TTM-P4W series



3.2 Caution on wiring

 Warning	<p>Before wiring, be sure to turn off the power supply. Otherwise, you may get an electric shock.</p>
 Caution	<p>This equipment does not execute control operation for about 4 seconds after the power is turned on. (Control output does not work. during the period) Pay attention when you use this equipment for interlock circuit. Confirm the wirings of the input terminal, power terminal, and optional terminal by reading the label at the side of the equipment.</p>

- Use crimping terminals matching to M3.5 screws. Also, when you wire to the central terminals, tighten the wire directly.
- As for wire rods to be used for connecting this equipment with a thermocouple, use a specific compensating lead wire or wire itself.
- When you use this equipment near the source of noise, use a shielded wire. Also, do not wire the input/output line in the same duct or wire conduit.
- Leave the input/output signal line more than 50 cm away from the power and load lines.

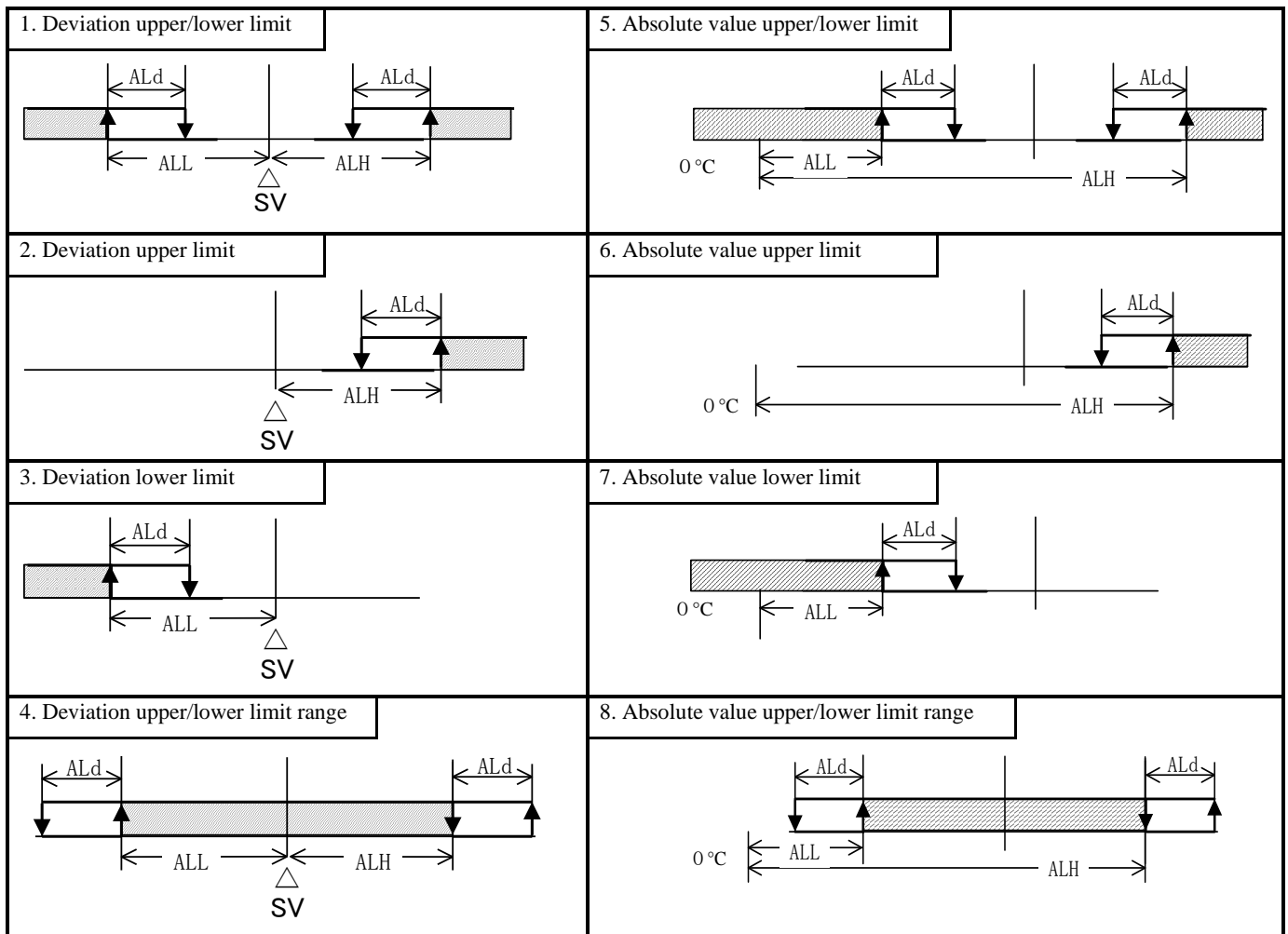
4. Terms and Functional Description

4.1 Set the Number of Patterns

- The maximum number of steps are determined depending on the number of patterns.
- The relationship between the number of patterns and the maximum number of steps is as shown in the table below.

Number of Patterns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Maximum number of Steps	64	32	21	16	12	10	9	8	7	6	5	5	4	4	4

4.2 Event Output 1 / Event Output 2



: Temperature Event Output operation range ALL: Event Output lower limit setting ALH: Event Output upper limit setting
ALd: Event Output sensitivity

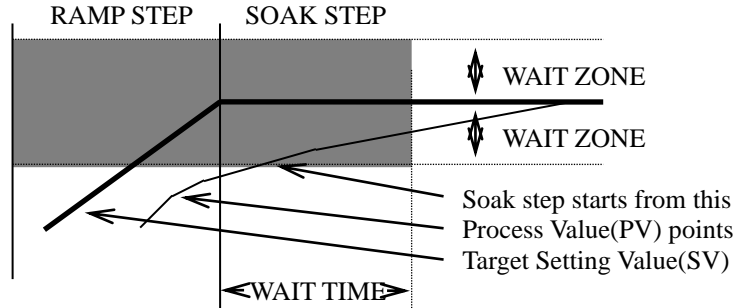
4.3 Wait operation

If the measured value (PV) has not reached the Wait Zone after the step time has elapsed, the next step will not start.

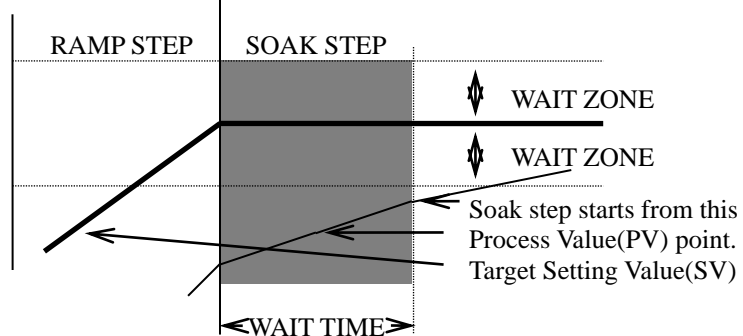
However, after the wait time has elapsed, the next step begins.

At the wait operation, the indication at SV blinks.

: Wait Zone... This means the deviation area between SV(Setting Value) and PV(Process Value) enable to start next step.



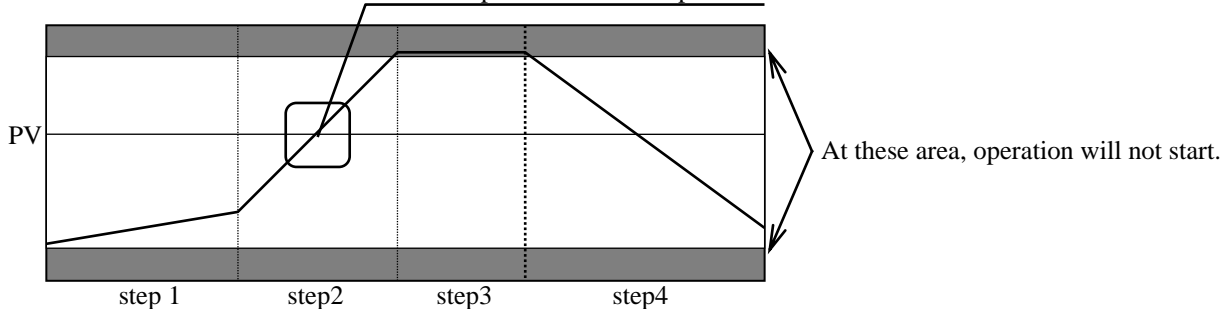
: Wait time... This means the maximum waiting period to start next step when PV(Process Value) does not reach to the SV(Setting Value).



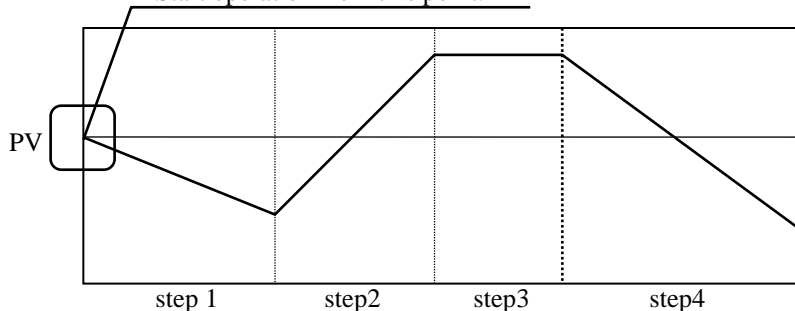
4.4 PV/SV start

PV start1. . . Operation will start from the Ramp step including the PV at the starting time of Program operation. In case more than one step applied, it starts the one with smaller step number.

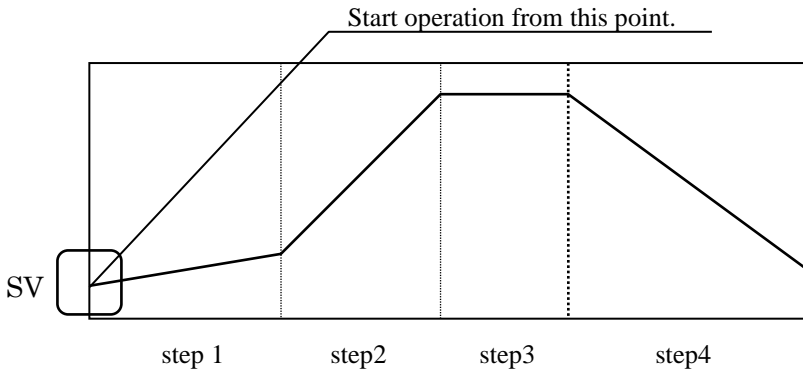
Start operation from this point.



PV start2. . . The operation is started with the PV (Process Value) at the start of operation as the start temperature. Start operation from this point.

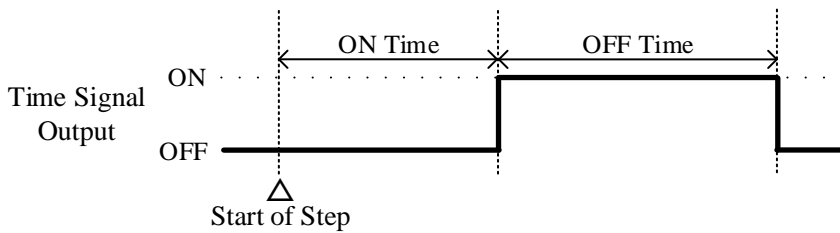


SV start. . . . Program operation starts from the SV start temperature setting "5.5.5".



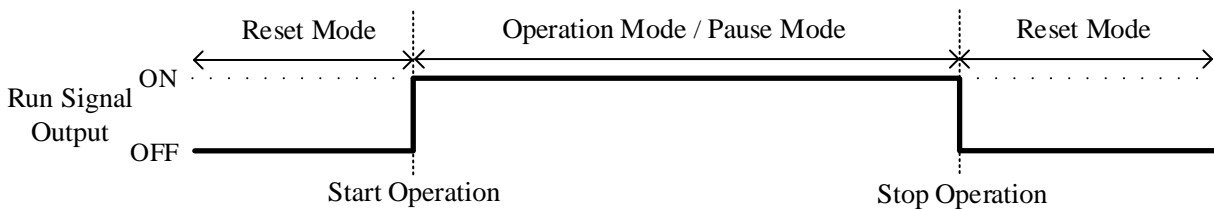
4.5 Time Signal Output

It is a function to output at any time at the start of operation or at the transition to the next step.



4.6 Run Signal Output

It is a function to turn on the output during the operation mode or pause mode. In reset mode, the output is turned off.



4.7 External Operation Function

- It is a function to switch between reset mode and operation mode by external input (DI).
- When "External operation selection setting" is "ON", the function is enabled.
- When the external input is open, the reset mode is set, and when the external input is closed, the operation mode is set.

4.8 Timer operation function

-It is a function to count the time without controlling in step 1. After "Step 1 Time" has elapsed, shift to the next step and start control.


-The function is enabled when all of the following conditions ① to ③ are met.

- ① Set "SV / PV start selection setting" to "PV start 1" or "PV start 2"
- ② Set "Step 1 temperature setting" to "E1 PE (lower limit -1)"
- ③ Set "Step 1 hour setting" to "1 minute" or more

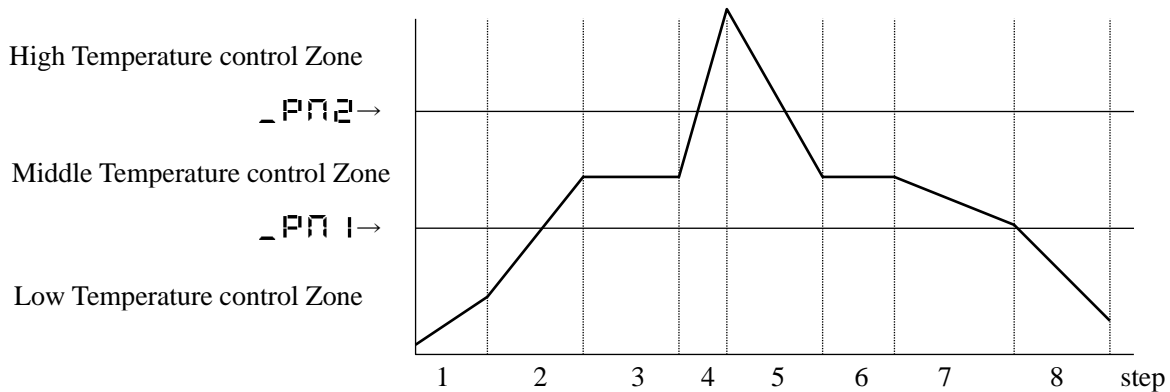
5. Before Program Operation

You can select the input type. Thermocouple(K, J, R, T, N, S, B) and RTD(Pt100) are provided for this product.

In this Instruction Manual, the following symbol is used in order to use this equipment safely.

	Caution Before using this equipment, be sure to set the input type.
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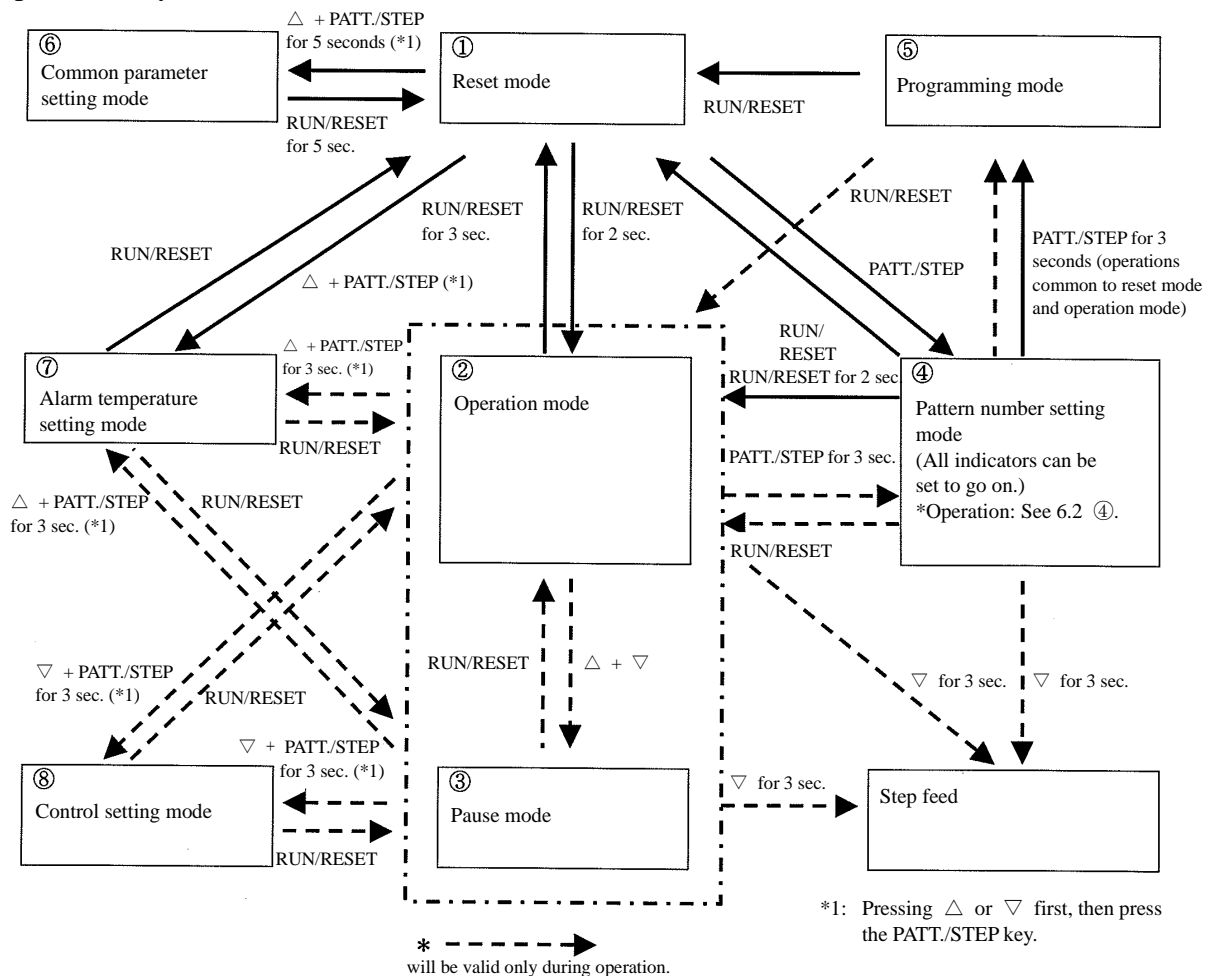
- This equipment can handle PID control. Because the control parameter can be set independently for low, middle, and high temperature, be sure to set each control temperature range. The setting by key input is stored even though the power is turned off.



6. Operation Flow and Parameter Description

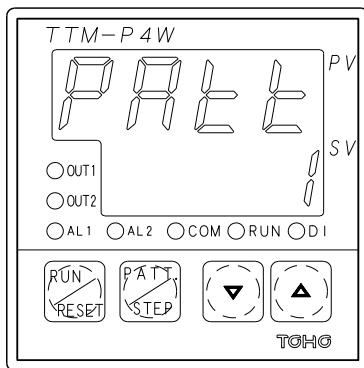
6.1 State transitions between modes

Operation keys will be used to switch between modes.



6.2 Detailed description of modes

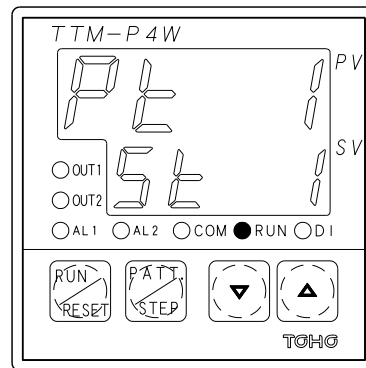
- ① Reset mode
 - This mode will stop control. (The system becomes this mode when the power is turned on.)
- ② Operation mode
 - This mode will conduct programmed run control. (The RUN lamp lights.)
 - The SV display will blink while a wait operation is in process in the wait zone or wait time.
 - After a patterned operation is complete, the SV display will display "E" and stop the control. The PV display will display the current temperature.
 - Holding the ∇ key down for 3 seconds during operation will enable step feed.
- ③ Pause mode
 - This mode will pause programmed run control. (The RUN lamp blinks.) It will stop the time and maintain the control temperature measured at that point in time.
- ④ Pattern number setting mode
 - This mode will set the pattern number of the program to be executed.
 - Use the Δ and ∇ keys to set a pattern number.
 - When the system shifted from "operation mode," holding the ∇ key down for 3 seconds will enable step feed.
 - When the system shifted from "operation mode," pressing the PATT./STEP key will display the time elapsed and time setting.
PV screen: time elapsed, SV screen: time setting
 - Pressing the Δ and ∇ simultaneously while holding down the PATT./STEP will turn on all the indicators.



<Display when shifted from reset mode>

PV: Displays the pattern number selection character.

SV: Displays the pattern number setting.



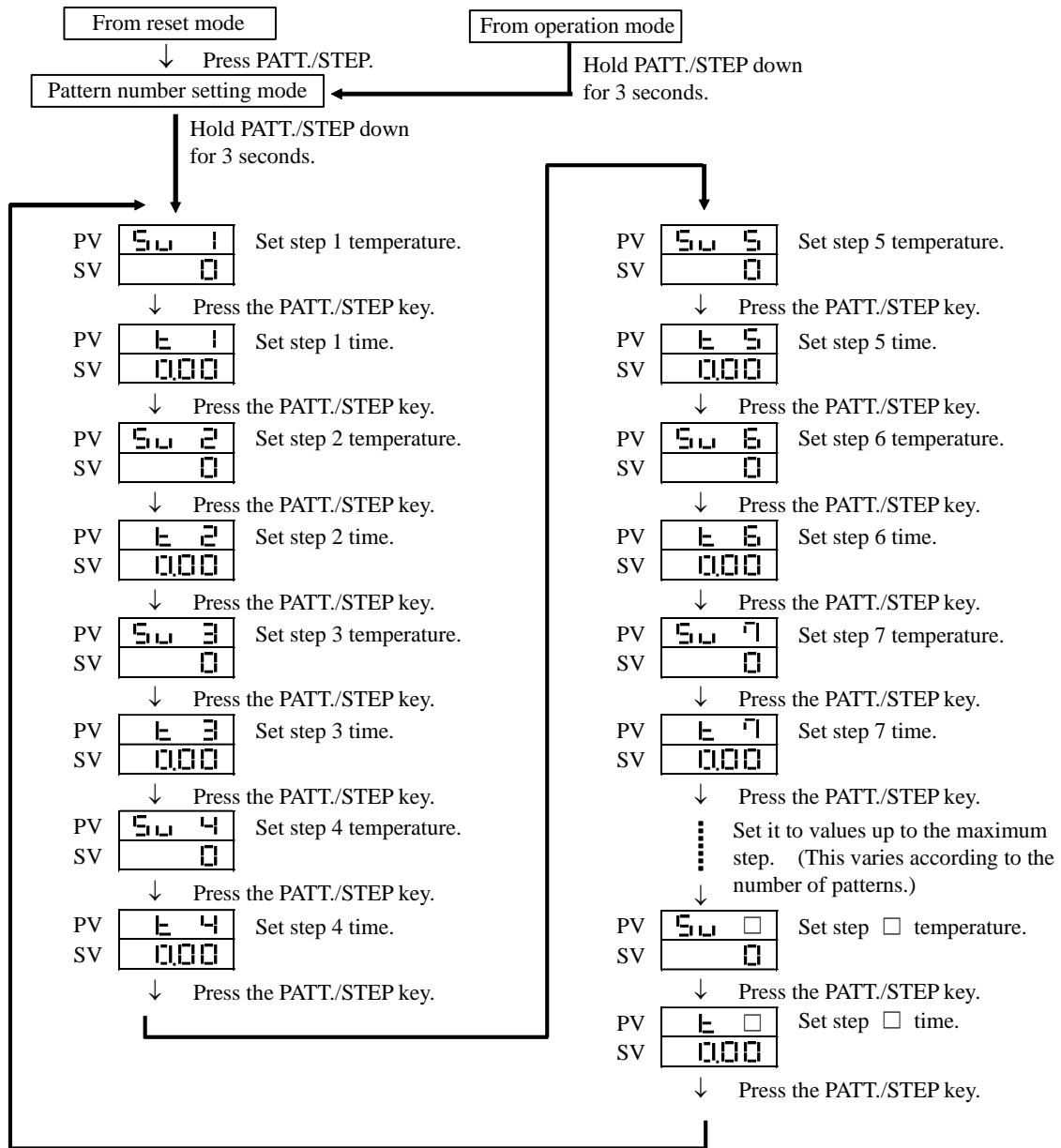
<Display when shifted from operation mode>

PV: Displays the pattern number being executed or the time elapsed.

SV: Displays the step number being executed or the time setting.

⑤ Programming mode

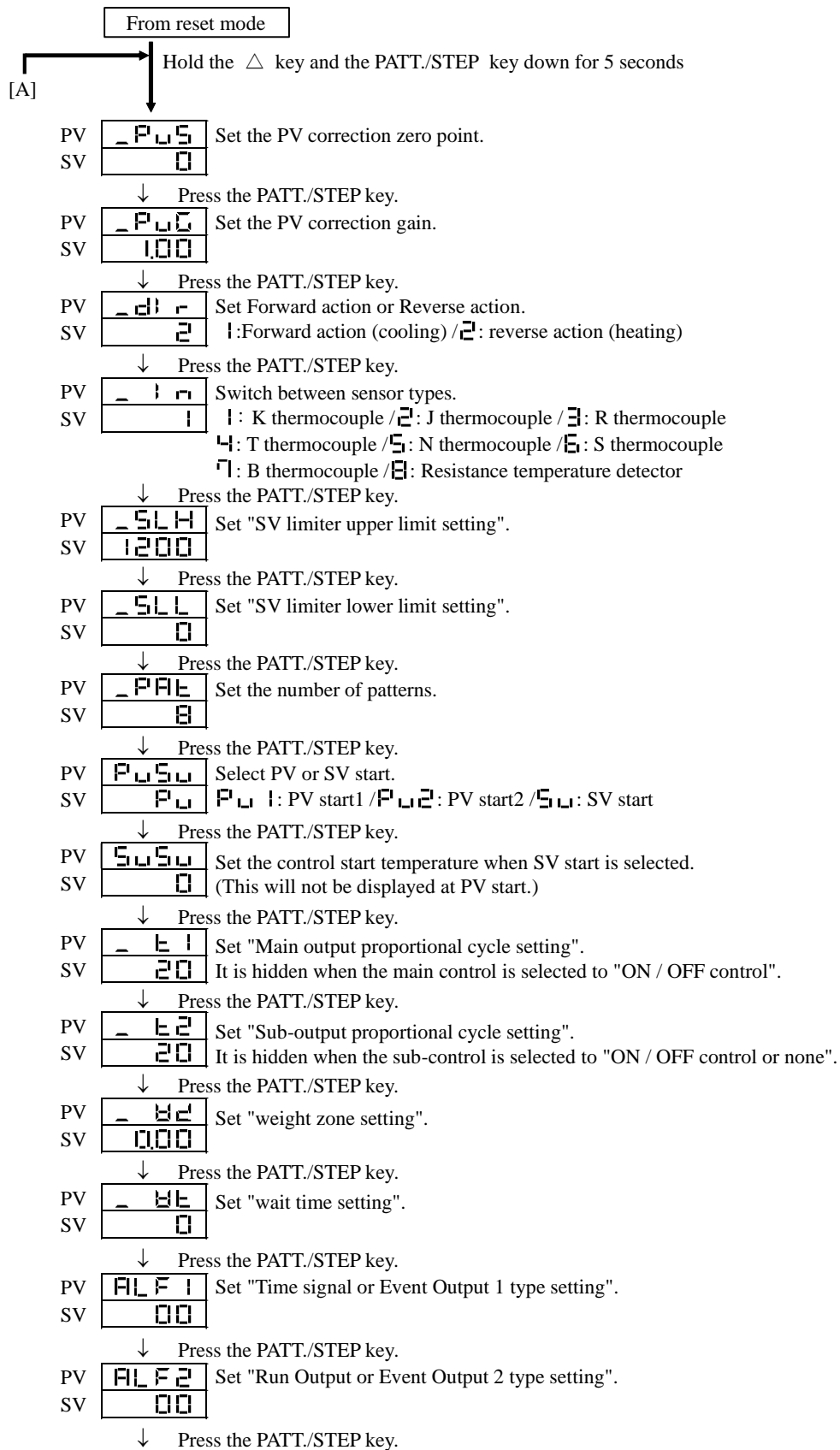
- This mode will set the program for each pattern.
- Setting the time to 0 minutes will invalidate that particular step.



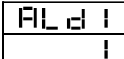
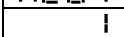
- If you press the $[\nabla]$ key when the temperature setting for each step is the minimum value in the setting range, "-" will be displayed, and on or after the set step, it will be invalid and the setting parameters will not be displayed. The operation ends at the step before the step set as "-".
- In changing a setting during operation, you cannot change the step temperature or step time during operation.
- If you press the $[\nabla]$ key when the temperature setting in step 1 of each pattern is the minimum value in the setting range, "E: ME" will be displayed, and timer operation will be performed in step 1 of the set pattern. For details, refer to "4.8. Timer operation function".
- If all steps are set to their initial values (0°C), setting a temperature will automatically set the next step to the same temperature as well.
- Setting a step time to a value higher than the maximum in the setting range (displayed as "-") will cause the product to run continuously at the set temperature in that particular step.

⑥ Common parameter setting mode

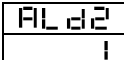

- This mode will set the parameter common to each pattern and step.





↓

PV  Set "Event Output 1 sensitivity setting".
SV  It is hidden when Time signal is selected.

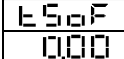

↓ Press the PATT./STEP key.

PV  Set "Event Output 2 sensitivity setting".
SV  It is hidden when Run Signal Output is selected.

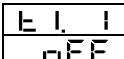
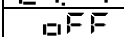
↓ Press the PATT./STEP key.

PV  Set "Time signal ON time setting".
SV  It is hidden when an Event Output 1 is selected.

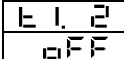

↓ Press the PATT./STEP key.

PV  Set "Time signal OFF time setting".
SV  It is hidden when an Event Output 1 is selected.
(The Time signal will be invalid when set to 0 minutes.)

↓ Press the PATT./STEP key.

PV  Select a Time signal for pattern 1 and step 1.
SV  ON/OFF (It is hidden when an Event Output 1 is selected or the Time signal is invalid.)

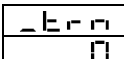
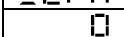
↓ Press the PATT./STEP key.

PV  Select a Time signal for pattern 1 and step 2.
SV  ON/OFF (It is hidden when an Event Output 1 is selected or the Time signal is invalid.)


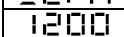
↓ Press the PATT./STEP key.

From this time on, Time signal selections will be set similarly up to pattern and step .
(It is hidden when an Event Output 1 is selected.)
* The number of steps will vary according to a setting concerning the number of patterns.

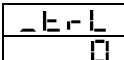
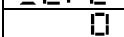
↓ Press the PATT./STEP key.

PV  Set "Transmission output function setting".
SV  It is hidden when the OUT1 function setting is "main control or sub-control".

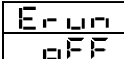
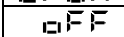
↓ Press the PATT./STEP key.

PV  Set "Transmission output scaling upper limit setting".
SV  It is hidden when the OUT1 function setting is "main control or sub-control".

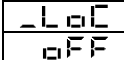
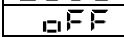
↓ Press the PATT./STEP key.

PV  Set "Transmission output scaling lower limit setting".
SV  It is hidden when the OUT1 function setting is "main control or sub-control".

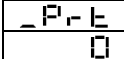

↓ Press the PATT./STEP key.

PV  Select an external operation.
SV  **oR**: External operation / **oFF**: Internal operation

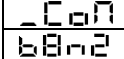
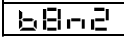
↓ Press the PATT./STEP key.

PV  Lock the key.
SV  **oR**: Locked / **oFF**: Unlocked

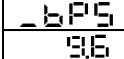
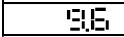
↓ Press the PATT./STEP key.

PV  Set "Communication protocol settings".
SV  It is hidden when "Product model" "Communication" is not selected.

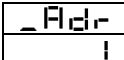

↓ Press the PATT./STEP key.

PV  Set "Communication settings".
SV  It is hidden when the product model. "Communication" is not selected.



↓ Press the PATT./STEP key.

PV  Set "Communication speed setting".
SV  **12**: 1200bps / **24**: 2400bps / **48**: 4800bps / **96**: 9600bps / **192**: 19200bps
It is hidden when the product model "Communication" is not selected.

↓ Press the PATT./STEP key.

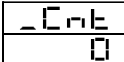
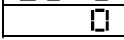
PV  Set "Communication address settings".
SV  It is hidden when the product model "Communication" is not selected.

↓ Press the PATT./STEP key.


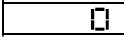
PV  Set "Response delay time setting".
SV  It is hidden when the product model "Communication" is not selected.

↓ Press the PATT./STEP key.

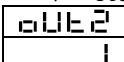

↓

PV  Set "Control type setting".
SV 

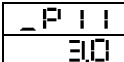
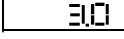
↓ Press the PATT./STEP key.

PV  Set "OUT1 function setting".
SV 

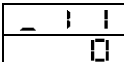
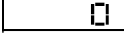
↓ Press the PATT./STEP key.

PV  Set "OUT2 function setting".
SV 

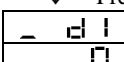

↓ Press the PATT./STEP key.

PV  Set "Main control proportional band low temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

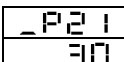
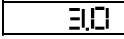
↓ Press the PATT./STEP key.

PV  Set "Main control integration time low temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

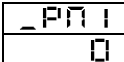
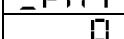
↓ Press the PATT./STEP key.

PV  Set "Main control differential time low temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

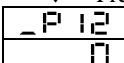
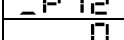
↓ Press the PATT./STEP key.

PV  Set "Sub-control proportional band low temperature setting".
SV  It is hidden when the sub-control is selected to "ON / OFF control or none".

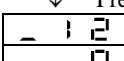
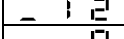
↓ Press the PATT./STEP key.

PV  Set "PID range midpoint 1 setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

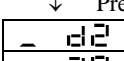
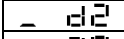
↓ Press the PATT./STEP key.

PV  Set "Main control proportional band middle temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

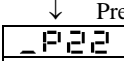
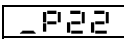
↓ Press the PATT./STEP key.

PV  Set "Main control integration time middle temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".


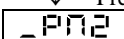
↓ Press the PATT./STEP key.

PV  Set "Main control integration time middle temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

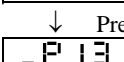
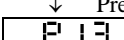
↓ Press the PATT./STEP key.

PV  Set "Sub-control proportional band middle temperature setting".
SV  It is hidden when the sub-control is selected to "ON / OFF control or none".

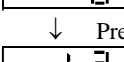

↓ Press the PATT./STEP key.

PV  Set the PID range midpoint 2 setting.
SV  It is hidden when the main control is selected to "ON / OFF control".

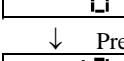

↓ Press the PATT./STEP key.

PV  Set "Main control proportional band high temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".


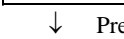
↓ Press the PATT./STEP key.

PV  Set "Main control integration time high temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

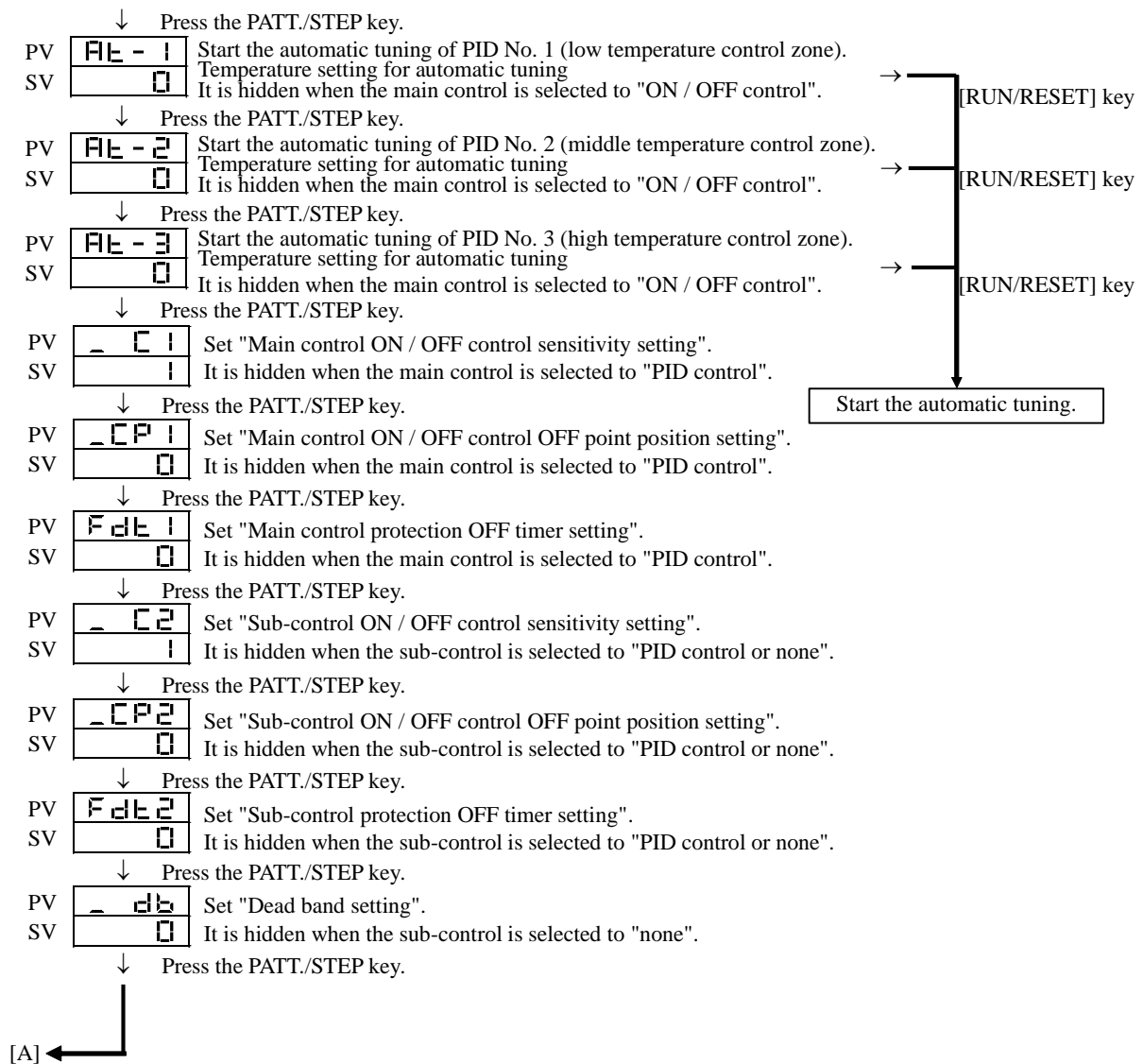
↓ Press the PATT./STEP key.

PV  Set "Main control differential time high temperature setting".
SV  It is hidden when the main control is selected to "ON / OFF control".

↓ Press the PATT./STEP key.

PV  Set "Sub-control proportional band high temperature setting".
SV  It is hidden when the sub-control is selected to "ON / OFF control or none".

↓ Press the PATT./STEP key.



- * Changing the setting concerning the number of patterns will switch the settings for the temperature settings for pattern parameters, time settings, and Time signal selections for common parameters back to the initial settings.
- * When the auto tuning is completed, the screen returns to the auto tuning startup screen. Auto tuning is possible even when locked.

About the setting method of the type setting of "Time signal / Event Output 1" and the type setting of "Run Signal Output / Event Output 2".

PV **ALF**
SV **00**

Action types (to be set by using the ∇ key)

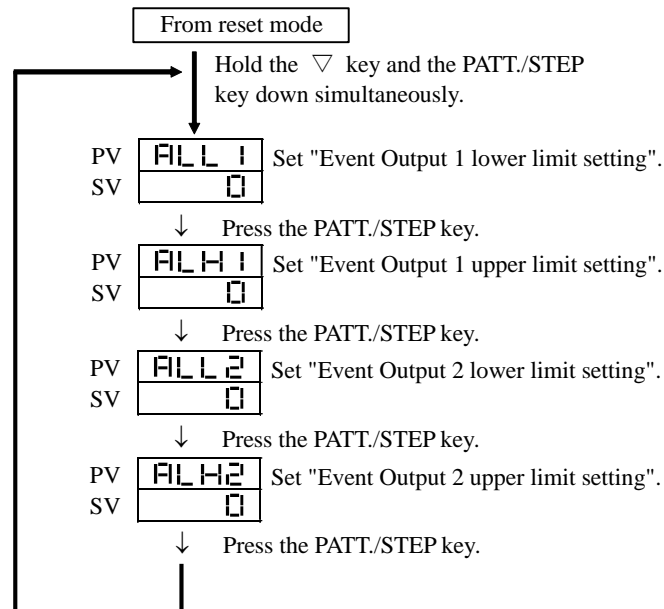
0	Nil <"Time signal / Event Output 1" type setting> If this is selected, it will be a Time signal. <"Run Signal Output / Event Output 2" type setting> If this is selected, the output will be during operation.
1	Deviation upper and lower limit event
2	Deviation upper limit event
3	Deviation lower limit event
4	Deviation upper and lower limit range event
5	Absolute value upper and lower limit event
6	Absolute value upper limit event
7	Absolute value lower limit event
8	Absolute value upper and lower limit range event

Additional functions (to be set by using the Δ key)

0	No additional functions
1	Output held
2	Standby sequence
3	Output held + standby sequence

⑦ Event temperature setting mode

- This mode will set the event temperature.
- Use the PATT./STEP key to select an Event Output 1 Lower Limit "ALL 1", an Event Output 1 Upper Limit "ALH 1", an Event Output 2 Lower Limit "ALL 2" and an Event Output 2 Upper Limit "ALH 2" (This may not be displayed depending on the type of action selected for an Event Output.)
- * If no key is pressed for 10 seconds after the temperature setting is changed, then the product will switch automatically to "reset mode."



⑧ Control setting mode

- This mode will set the control setting mode (during operation only).

6.3 Parameter description

Program setting mode parameters

Character	Description	Initial value	Setting range
Su □	Set a step □ temperature	0	Setting range (K: 0 to 1300 °C/J: 0 to 800°C/R: 0 to 1700°C/ T: 0 to 1300 °C/N: 0 to 800°C/S: 0 to 1700°C/ B: 0 to 1800 °C /S: 0 to 1700°C/Pt100Ω: 0.0 to 500.0°C)
Et □	Set a step □ time	0.00	0 to 99 hours 59 minutes

Common parameter setting mode parameters

Character	Description	Initial value	Setting range
_PUS	Set the PV correction zero point	0	-199 to +199°C
_PUG	Set the PV correction gain	1.00	0.50 to 2.00 times
_dbr	Forward/reverse switchover	2	1: Forward action (cooling)/2: reverse action (heating)
_In	Sensor switchover	1	1: K thermocouple/2: J thermocouple/3: R thermocouple 4: T thermocouple/5: N thermocouple/6: S thermocouple 7: B thermocouple/8: Resistance temperature detector
_SLH	SV limiter upper limit	1200	<Thermocouple > SLL + 50°C to setting range upper limit <Resistance temperature detector> SLL + 50.0°C to setting range upper limit
_SLL	SV limiter lower limit	0	<Thermocouple > setting range lower limit to SLH-50°C <Resistance temperature detector> setting range lower limit to SLH-50.0°C
_PAt	Set the number of patterns	8	1 to 15 patterns
PUSu	Select PV/SV start	PV	PV1: PV start 1 / PV2: PV start 2 / SV: SV start
SUSu	Set an SV start temperature	0	Lower limit to upper limit of the temperature setting range
_Et	Main control proportional period	R (relay output): 20 S (SSR output): 2	1 to 120 seconds
_Et2	Sub-control proportional period	R (relay output): 20 S (SSR output): 2	1 to 120 seconds
_Et2	Wait zone	0	<Thermocouple > 0 to 100°C <Resistance temperature detector> 0.0 to 100.0°C
_Et	Wait time	0.00	0 to 99 hours 59 minutes
ALF1	Time signal / Event Output 1 type	00 (Time signal)	0: Nil (Time signal/Run Signal Output) 1: Deviation upper and lower limit 2: Deviation upper limit 3: Deviation lower limit 4: Deviation upper and lower limit range 5: Absolute value upper and lower limit 6: Absolute value upper limit 7: Absolute value lower limit 8: Absolute value upper and lower limit range
ALF2	Run signal Output / Event Output 2 type	00 (Run Signal Output)	0: No additional functions 1: Output held 2: Standby sequence 3: Output held + standby sequence
ALd1	Event Output 1 sensitivity	1	<Thermocouple > 0 to 199°C
ALd2	Event Output 2 sensitivity	1	<Resistance temperature detector> 0.0 to 199.9°C
ESon	Time signal ON time	0.00	0 to 99 hours 59 minutes
ESoF	Time signal OFF time	0.00	0 to 99 hours 59 minutes

Character	Description	Initial value	Setting range																		
<u>E r r</u>	Transmission output function	0	0: PV(measured value) output 1: SV(set value) output 2: MV1(main control operation amount) output 3: MV2(sub-control operation amount) output 4: Control SV output																		
<u>E r H</u>	Transmission output scaling upper limit	1200	measuring range lower limit to measuring range upper limit *1																		
<u>E r L</u>	Transmission output scaling lower limit	0	measuring range lower limit to measuring range upper limit *1																		
<u>E r u r</u>	Select an external operation	OFF	ON: external operation /OFF: internal operation																		
<u>L o c</u>	Lock the key	OFF	ON/OFF																		
<u>E o n</u>	Communication parameter	b8N2	<table border="1"> <tr> <td>***1</td> <td>Stop bit length 1 bit</td> </tr> <tr> <td>***2</td> <td>Stop bit length 2 bits</td> </tr> <tr> <td>**N*</td> <td>Parity none</td> </tr> <tr> <td>**O*</td> <td>Parity odd No.</td> </tr> <tr> <td>**E*</td> <td>Parity even No.</td> </tr> <tr> <td>*7**</td> <td>Data length 7 bits</td> </tr> <tr> <td>*8**</td> <td>Data length 8 bits</td> </tr> <tr> <td>N***</td> <td>BCC check nonexistent (settable for TOHO protocol)</td> </tr> <tr> <td>B***</td> <td>BCC check existent (settable for TOHO protocol)</td> </tr> </table> <p>For MODBUS (RTU) Settable only with 8N2, 8N2, 8o1, 8o2, 8E1 and 8E2</p> <p>For MODBUS (ASCII) Settable only with 7N1,7N2,7o1,7o2,7E1,7E2, 8N1,8N2,8o1,8o2,8E1,8E2</p>	***1	Stop bit length 1 bit	***2	Stop bit length 2 bits	**N*	Parity none	**O*	Parity odd No.	**E*	Parity even No.	*7**	Data length 7 bits	*8**	Data length 8 bits	N***	BCC check nonexistent (settable for TOHO protocol)	B***	BCC check existent (settable for TOHO protocol)
***1	Stop bit length 1 bit																				
***2	Stop bit length 2 bits																				
**N*	Parity none																				
**O*	Parity odd No.																				
**E*	Parity even No.																				
*7**	Data length 7 bits																				
*8**	Data length 8 bits																				
N***	BCC check nonexistent (settable for TOHO protocol)																				
B***	BCC check existent (settable for TOHO protocol)																				
<u>b P S</u>	Communication speed	9.6	1.2:1200bps 2.4:2400bps 4.8:4800bps 9.6:9600bps 19.2:19200bps																		
<u>A d r</u>	Communication address	1	TOHO protocol:1to 99(stations) MODBUS protocol:1 to 247 (stations)																		
<u>A B E</u>	Response delay time	5	0 to 250 (ms)																		

*1: If "Transmission output scaling upper limit(E r H)" and "Transmission output scaling lower limit(E r L)" have the same value, the output will be 4mA regardless of the value of "Transmission output function(E r r)".

Control setting mode parameters

Character	Description	Initial value	Setting range					
			No.	Main control	Sub-control			
_Cnt	Control type	0	0	PID	N/A			
			1	ON/OFF	N/A			
			2	PID	PID			
			3	PID	ON/OFF			
			4	ON/OFF	ON/OFF			
OUT 1	OUT1 function	0	0:Main output 1:Sub-output 2:Transmission output(for analog output)					
OUT 2	OUT2 function	1	0:Main output 1:Sub-output 2:Run Signal Output / Event Output					
_P 1 1	Main control proportional band low temperature	3.0%	0.1 to 200.0 %					
_P 1 2	Main control proportional band middle temperature	3.0%						
_P 1 3	Main control proportional band high temperature	3.0%						
_ I 1	Integration time low temperature	0 seconds	0 to 3600 seconds					
_ I 2	Integration time middle temperature	0 seconds						
_ I 3	Integration time high temperature	0 seconds						
_ d 1	Differentiation time low temperature	0 seconds	0 to 3600 seconds					
_ d 2	Differentiation time middle temperature	0 seconds						
_ d 3	Differentiation time high temperature	0 seconds						
At - 1	Auto Tuning execution temperature for low temperature control zone	0°C	As per the PID range setting					
At - 2	Auto Tuning execution temperature for middle temperature control zone	0°C						
At - 3	Auto Tuning execution temperature for high temperature control zone	0°C						
_Pn 1	PID range midpoint 1	0°C	Between minimum and maximum in the temperature setting range -50°C					
_Pn 2	PID range midpoint 2	0°C	Intermediate point 1 to the maximum in the temperature setting range					
_P 2 1	Sub-control proportional band low temperature	3.0%	0.1 to 200.0 %					
						_P 2 2	Sub-control proportional band middle temperature	3.0%

Character	Description	Initial value	Setting range
_ C 1	Main control sensitivity	1°C	<Thermocouple > 0 to 199 °C <resistance temperature detector> 0.0 to 199.9 °C
_ CP 1	Main control off-point position	0°C	<Thermocouple > 0 to 199 °C <Resistance temperature detector> 0.0 to 199.9 °C
F dt 1	Main control protection off Timer	0minutes	0 to 99 minutes
_ C 2	Sub-control sensitivity	1°C	<Thermocouple> 0 to 199 °C <Resistance temperature detector> 0 to 199.9 °C
_ CP 2	Sub-control off-point position	0°C	<Thermocouple > 0 to 199 °C <Resistance temperature detector> 0 to 199.9 °C
F dt 2	Sub-control protection off Timer	0minutes	0 to 99 minutes
_ db	Dead band	0°C	<Thermocouple> 0 to 199 °C <Resistance temperature detector> 0 to 199.9 °C

Event temperature setting mode parameters

Character	Description	Initial value	Setting range
ALL 1 ALH 1	Event Output 1 lower and upper limits	Upper limit: 0 Lower limit: 0	<Thermocouple> -1999 to +9999°C <Resistance temperature detector> -199.9 to +999.9°C
ALL 2 ALH 2	Event Output 2 lower and upper limits	Upper limit: 0 Lower limit: 0	<Thermocouple> -1999 to +9999°C <Resistance temperature detector> -199.9 to +999.9°C

7. Setting and Display Ranges

Measuring Range and Designated Resolution

Input Type		Measuring/Display Range	Setting Range	Designated Resolution
Thermocouple	K	-210 to 1382	-200 to 1372	1°C
	J	-210 to 860	-200 to 850	1°C
	R	-10 to 1710	0 to 1700	1°C
	T	-210 to 410	-200 to 400	1°C
	N	-210 to 1310	-200 to 1300	1°C
	S	-10 to 1710	0 to 1700	1°C
	B	-20 to 1802	0 to 1800	1°C
Resistance Temperature Detector	Pt100Ω	-199.9 to 530.0	-199.9 to 500.0	0.1°C

※ Difference between maximum setting value and minimum setting value is 50 digits or greater.

8. Specifications and Rating

8.1 General specifications

Storage cell		Each setting value is stored in EEPROM.
Power supply voltage		100 to 240 VAC \pm 10%, 50/60Hz (free power supply)
Power consumption		10 VA or less
Insulation resistance		Measuring terminal – case: 500 VDC, 20 M Ω Power supply terminal – case: 500 VDC, 20 M Ω
Withstand voltage		Measuring terminal – case: 1000 VAC for 1 minute Power supply terminal – case: 1500 VAC for 1 minute
Operating environment	Ambient temperature	0 to 50°C
	Ambient humidity	20 to 90%RH (no condensation)
Storage environment	Ambient temperature	-25 to +70°C (no freezing and condensation)
	Ambient humidity	5 to 95%RH (no condensation)
Weight		180 g or less
Installation environment		<ul style="list-style-type: none"> - No corrosive gas, dust, and oil - Place far from the source of electric noise and less affected by the electro- magnetic field - No mechanical vibration and shock - No direct sunlight - Indoor - Max. 2,000 m above sea level - 2 or less of pollution degree
Installation		Installation category II
Control type		PID or ON/OFF

8.2 Rating and performance

Input	Thermocouple		K, J, R, T, N, S, B (JIS C1602-2015) When a wire is disconnected: Indicated as "----"
			Display Accuracy $\pm(0.3\%+1 \text{ digit})$ of the input value or $\pm 2^{\circ}\text{C}$, whichever is higher (ambient temperature $23\pm 10^{\circ}\text{C}$) Provided that -99 to 0°C is $\pm 3^{\circ}\text{C}$ and -210 to -100°C is $\pm 4^{\circ}\text{C}$. B thermocouple with less than 400°C has no regulation
	Resistance Temperature Detector		3-wire Type Pt100 (JIS C 1604-2013) When a wire is disconnected: Indicated as "----"
			Display Accuracy $\pm(0.3\%+1 \text{ digit})$ of the input value or 0.9°C , whichever is higher (ambient temperature $23\pm 10^{\circ}\text{C}$)
	Sampling period		0.25 seconds
	Indication accuracy		Measured value $\pm(0.3\% + 1 \text{ digit})$ or $\pm 2^{\circ}\text{C}$, whichever is larger (Ambient temperature: $23^{\circ}\text{C} \pm 10^{\circ}\text{C}$)
Output 1	Rating	Relay output	Contact type: 1a contact Contact capacity: 250 VAC, 3 A (resistance load) Minimum load: 5 VDC, 100 mA
		SSR output	Output voltage: 0 VDC/12 VDC Output voltage accuracy: $\pm 1 \text{ V}$ (Ambient temperature: 0 to 50°C) Load resistance: 600Ω or more
		Current output	Output current: $4 \sim 20 \text{ mADC}$ Output current accuracy: 0.3% against DC20mA (Ambient Temperature $23\pm 10^{\circ}\text{C}$) Load resistance: 600Ω or less
Time signal/Event Output 1			Contact type: 1a contact Contact capacity: 250 VAC, 2.4 A (resistance load) Minimum load: 5 VDC, 10 mA
Run Signal Output / Event Output 2 / Control Output 2			Contact type: 1a contact Contact capacity: 250 VAC, 2.4 A (resistance load) Minimum load: 5 VDC, 10 mA
DI (external input)			Minimum input time: 500 ms OFF voltage: Max. 6 VDC ON current: Max. 6 mA Allowable resistance between terminals: ON: Max. 333Ω OFF: Min. $500 \text{ K}\Omega$
Timer accuracy			Setting time $\pm(1.5\% + 0.5 \text{ seconds})$
Display	PV display		4-digit 7-segment LED (White), character height 10 mm
	SV display		4-digit 7-segment LED (Green), character height 8 mm
	Lamp		RUN, OUT1,OUT2,AL1 and AL2: Red LED COM and DI:Green LED

9. Maintenance and Inspection

- 9.1 Error indication: E r r □: Memory error (Abnormality of EEPROM)
E r r 1: A/D conversion error (Abnormality of A/D conversion)
E r r □: Automatic tuning error

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