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# Operation flows and Parameter Description

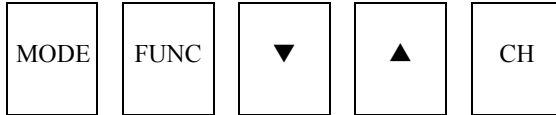
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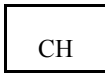
Model: TTX-700  
 Designation: Module Controller  
 Job number: G2745

APPROVED	APPROVED	CHECKED	DESIGNED	DATE February 13, 2004	Job. No. G2745	TITLE Operation flows and Parameter Description	
				MODEL  TTX-700		DWG. No.	PAGE
				<b>TOHO ELECTRONICS INC.</b>		45-5015-A	1/25

# 1. Description of operation keys and displays

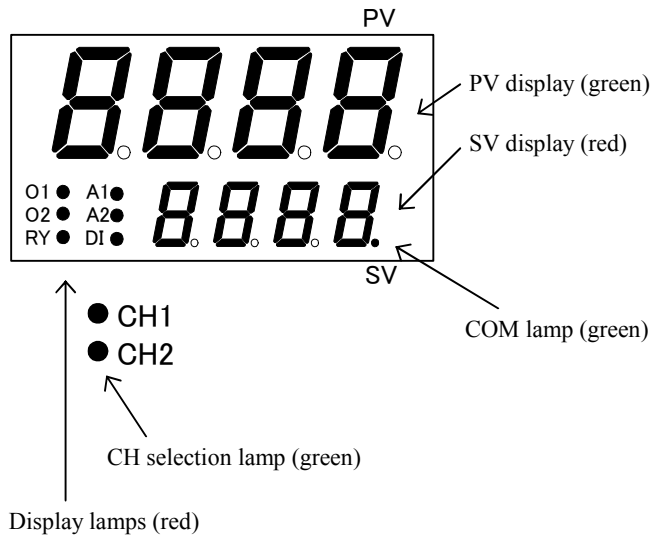
## 1.1 Description of operation keys



Operation key	Description
Mode key 	<ul style="list-style-type: none"> <li>Used to switch between screens.</li> </ul>
Function key 	<ul style="list-style-type: none"> <li>Executes preset functions.               <ol style="list-style-type: none"> <li>Digit shift key (selected digits blink): Active in all modes.</li> <li>AT start/stop: Only active in the operation mode. Functions switched over at each press.</li> <li>RUN/READY: Only active in the operation mode. Functions switched over at each press.</li> <li>Timer start/reset: Only active in the operation mode. Functions switched over at each press.</li> </ol> </li> </ul>
DOWN key 	<ul style="list-style-type: none"> <li>Used to reduce a setting.                (Holding it down 1s to 10s inclusive: 1 digit/100ms)                (Holding it down 10s to 20s inclusive: 10 digits/100ms)                (Holding it down more than 20s: 100 digits/100ms)</li> </ul>
UP key 	<ul style="list-style-type: none"> <li>Used to increase a setting.                (Holding it down 1s to 10s inclusive: 1 digit/100ms)                (Holding it down 10s to 20s inclusive: 10 digits/100ms)                (Holding it down more than 20s: 100 digits/100ms)</li> </ul>
Channel key 	<ul style="list-style-type: none"> <li>Switches between displays or setting channels.                The system switches between CH1 and CH2 at each press of the key.</li> </ul>

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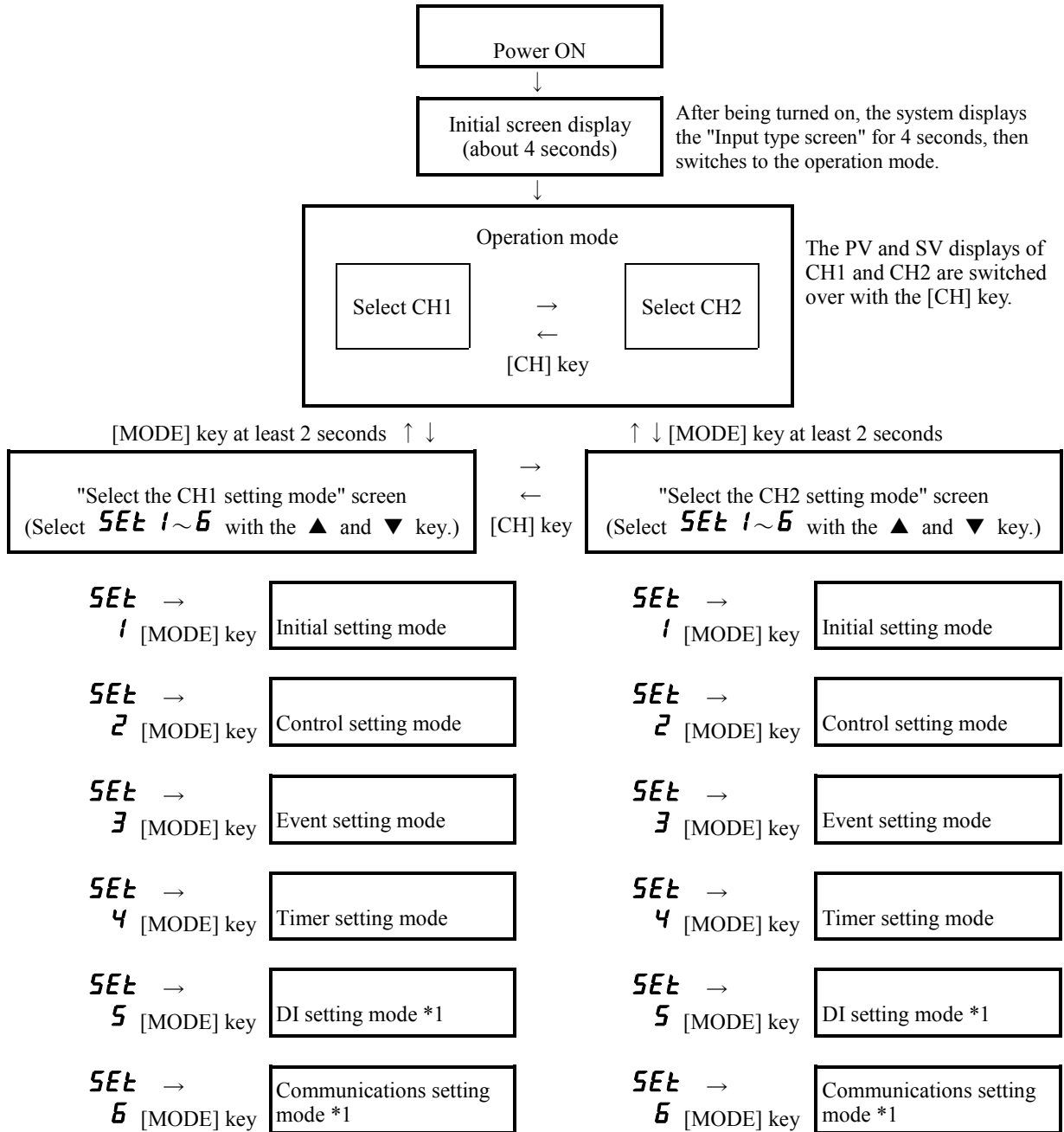
### 1.2 Description of the display panel



Display	Description
PV display	Displays the current measurement or parameter-configured character.
SV display	Displays a setting.
O1 lamp	Lit when the CH1 control output or heat-up output is ON.
O2 lamp	Lit when the CH2 control output or cooling output is ON.
RY lamp	Remains lit when READY or blinks during timer count.
A1 lamp	Lit when the CH1 event output is ON.
A2 lamp	Lit when the CH2 event output is ON.
DI lamp	Lit when a DI is ON.
COM lamp	Blinks during communications.
CH1 lamp	Lit when CH1 is selected.
CH2 lamp	Lit when CH2 is selected.

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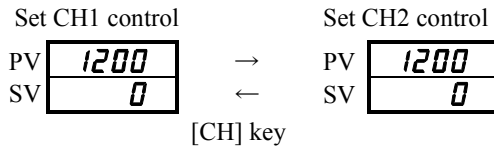
## 2. Operation flow



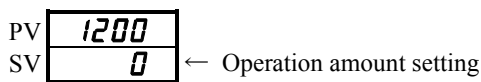
- To switch from a specific parameter mode to the "Select the setting mode" screen, press the [MODE] key for at least 2 seconds.
- Leaving the system in a parameter mode for 2 minutes returns it to the operation mode.
- Pressing the [CH] key for at least 2 seconds in the "Select the CH1 (CH2) setting mode" screen copies all parameter settings on CH1 (CH2) in the parameters on CH2 (CH1).

\*1: The DI setting mode and communications setting mode apply to both CH1 and CH2.  
Selecting heat-up/cooling control disables CH selection. (Input will only be possible through CH1.)

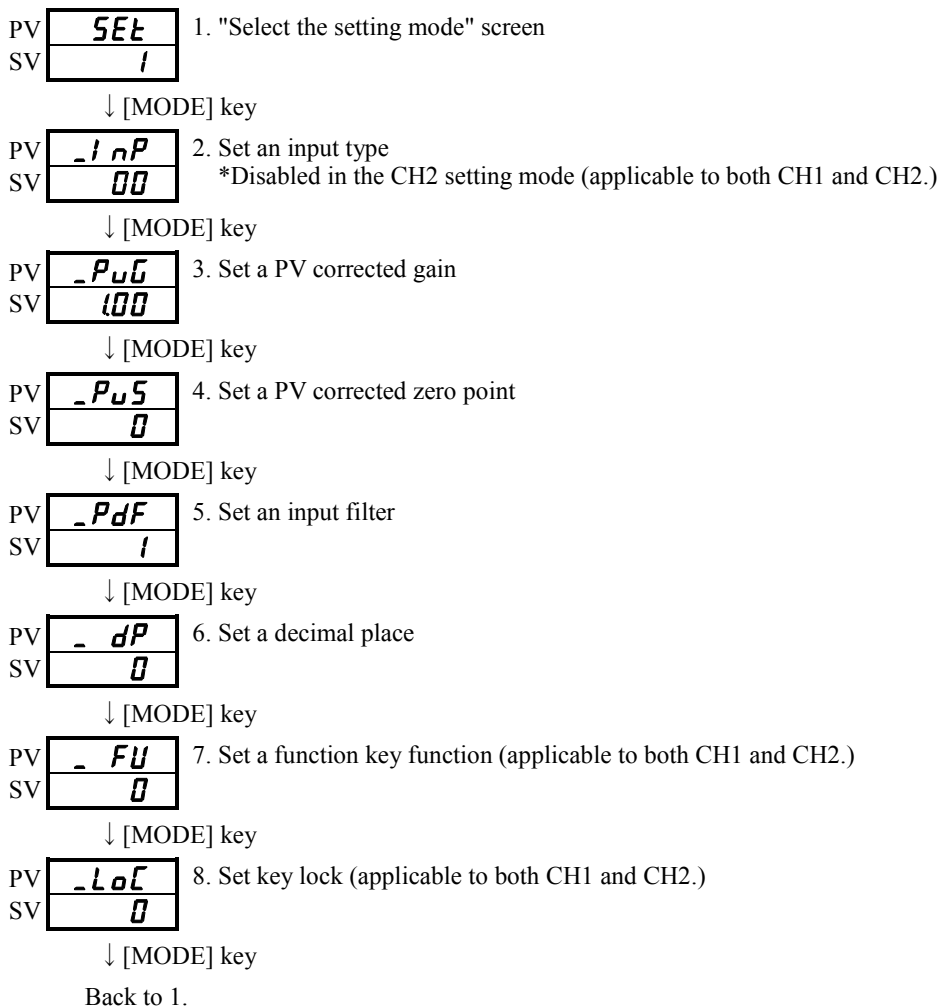
## 2.1 Operation mode



In the case of heat-up/cooling control, channel selection is impossible.  
 Selecting manual control displays a manual operation amount setting in the SV display.  
 This screen allows the setting to be changed.

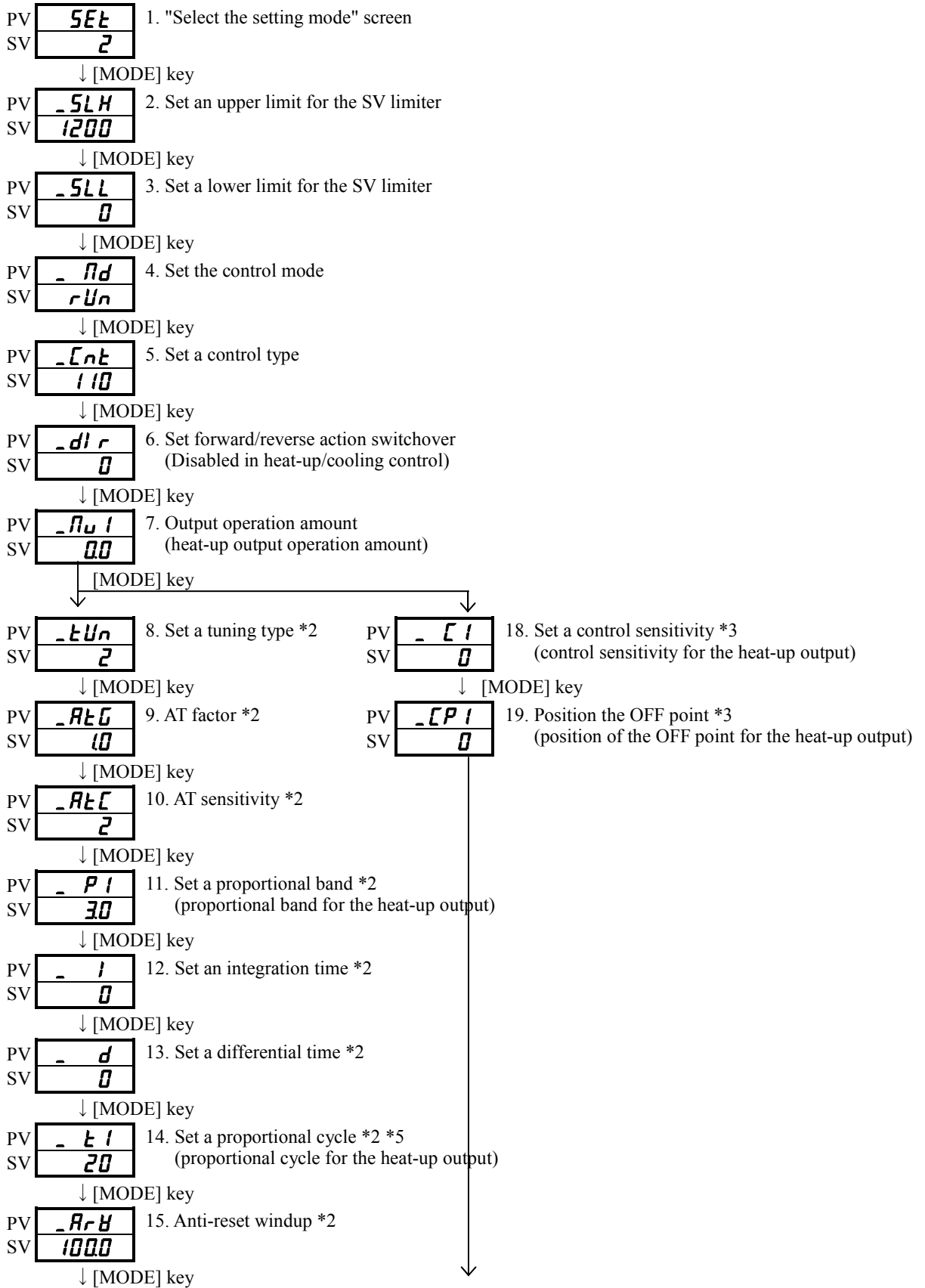


## 2.2 Initial setting mode

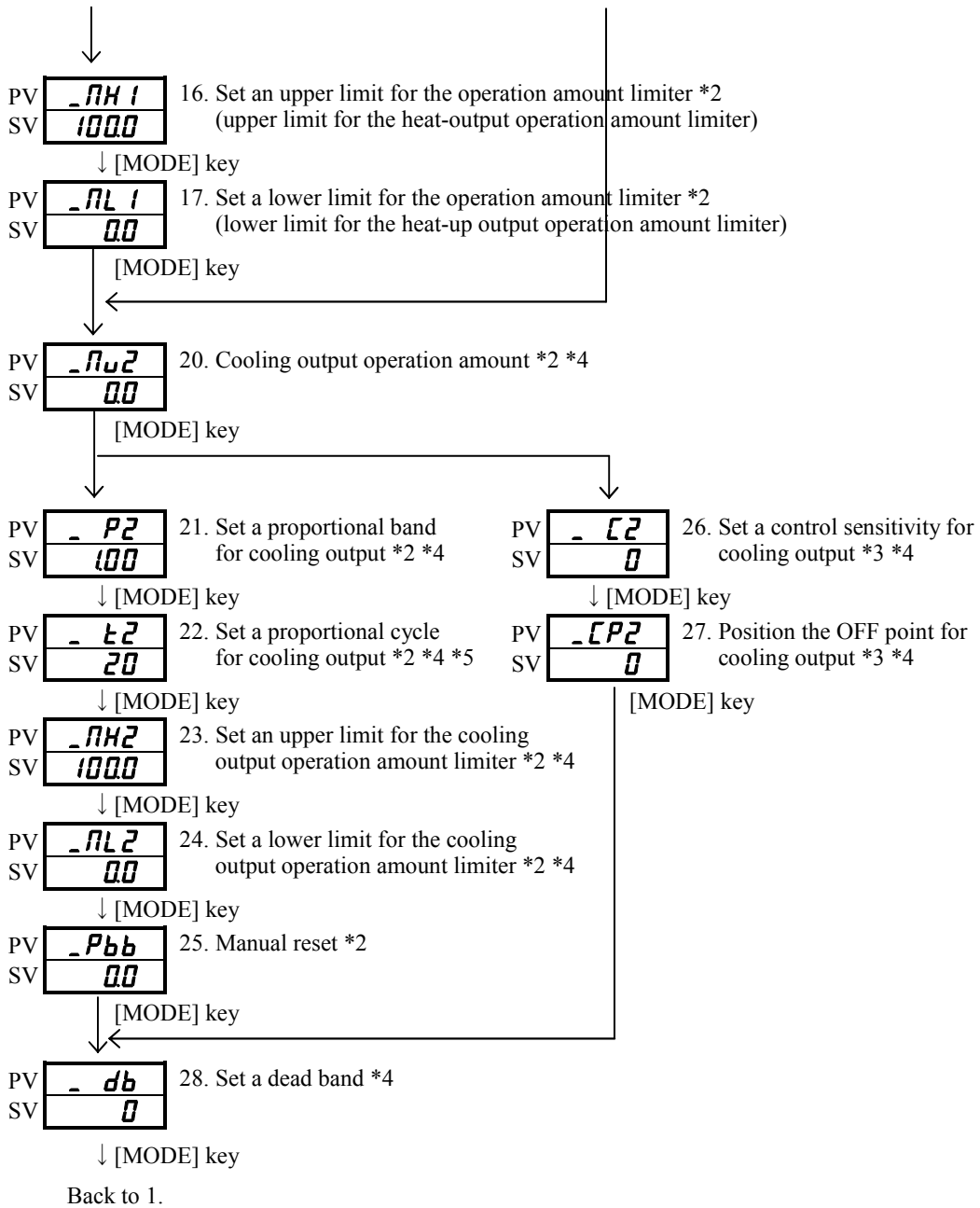


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### 2.3 Control setting mode



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\*2: Not displayed in ON/OFF control.  
 \*3: Not displayed in PID control.  
 \*4: Only displayed in heat-up/cooling control.  
 \*5: Not displayed in analog output.

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**2.4 Event (EV output) setting mode (only active when an option is selected)**

- PV 

SEt
-----

 SV 

3
---

 1. "Select the setting mode" screen
  - ↓ [MODE] key
  - PV 

_E IF
-------

 SV 

00
----

 2. Set the PV event output function
  - ↓ [MODE] key
  - PV 

_E IH
-------

 SV 

0
---

 3. Set an upper limit for event output \*6 \*7
  - ↓ [MODE] key
  - PV 

_E IL
-------

 SV 

0
---

 4. Set a lower limit for event output \*6 \*8
  - ↓ [MODE] key
  - PV 

_E IC
-------

 SV 

0
---

 5. Set an event output sensitivity \*6
  - ↓ [MODE] key
  - PV 

_E It
-------

 SV 

0
---

 6. Set a delay timer for event output \*9
  - ↓ [MODE] key
  - PV 

_E Ib
-------

 SV 

00
----

 7. Set the output function for a special event
  - ↓ [MODE] key
  - PV 

_E IP
-------

 SV 

0
---

 8. Set a polarity for event output
  - ↓ [MODE] key
  - PV 

_ Ct
------

 SV 

1
---

 9. Monitor a CT input
  - ↓ [MODE] key
  - PV 

_ Ct I
--------

 SV 

1
---

 10. Set an abnormality for event output current
  - ↓ [MODE] key
- Back to 1.

\*6: Not displayed when the measurement (PV) event output function is not used.  
 \*7: Not displayed when the measurement (PV) event output is not used in an upper limit alarm.  
 \*8: Not displayed when the measurement (PV) event output is not used in a lower limit alarm.  
 \*9: Not displayed when the measurement (PV) event output function/special event output is not used.

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### 2.5 Timer setting mode

- PV 

SEt
-----

 11. "Select the setting mode" screen  
SV 

4
---

  
↓ [MODE] key
- PV 

_tNo
------

 2. Set a timer output destination  
SV 

0
---

  
↓ [MODE] key
- PV 

_tNF
------

 3. Set the timer function \*10  
SV 

1
---

  
↓ [MODE] key
- PV 

_HrN
------

 4. Switch between timer units \*10  
SV 

1
---

  
↓ [MODE] key
- PV 

_tSU
------

 5. Set a tolerance for timer SV start \*10 \*11  
SV 

0
---

  
↓ [MODE] key
- PV 

_tIN
------

 6. Set a timer time \*10  
SV 

000
-----

  
↓ [MODE] key
- PV 

_tIR
------

 7. Set a timer residual monitor \*10  
SV 

--

  
↓ [MODE] key  
Back to 1.

\*10: Not displayed when "Inactivate the timer" is selected.  
\*11: Not displayed when "Start the SV" is not selected.

### 2.6 DI input setting mode (applicable to both CH1 and CH2) (only active when an option is selected)

- PV 

SEt
-----

 1. "Select the setting mode" screen \*12  
SV 

5
---

  
↓ [MODE] key
- PV 

_dIF
------

 2. Set the DI input function \*12  
SV 

31
----

  
↓ [MODE] key
- PV 

_dIP
------

 3. Set a DI polarity \*12  
SV 

0
---

  
↓ [MODE] key
- PV 

15u2
------

 4. Set CH1 control 2 \*12 \*13  
SV 

0
---

  
↓ [MODE] key
- PV 

25u2
------

 5. Set CH2 control 2 \*12 \*13 \*14  
SV 

0
---

  
↓ [MODE] key  
Back to 1.

\*12: Not displayed if a DI input is not type-specified.  
\*13: Not displayed if SV switchover is not used.  
\*14: Not displayed in heat-up/cooling control.

## 2.7 Communications setting mode (applicable to both CH1 and CH2)

- PV 

SEt
-----

 1. "Select the setting mode" screen  
 SV 

6
---
- ↓ [MODE] key
- PV 

_Prt
------

 2. Set a communications protocol  
 SV 

0
---
- ↓ [MODE] key
- PV 

_Con
------

 3. Set a communications parameter  
 SV 

b8n2
------
- ↓ [MODE] key
- PV 

_bPS
------

 4. Set a communications speed  
 SV 

96
----
- ↓ [MODE] key
- PV 

_Adr
------

 5. Set a communications address  
 SV 

1
---
- ↓ [MODE] key
- PV 

_Rdt
------

 6. Set a response delay  
 SV 

0
---
- ↓ [MODE] key
- PV 

_Mod
------

 7. Set communications mode switchover  
 SV 

rH
----
- ↓ [MODE] key
- Back to 1.

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### 3. Parameter description

#### 3.1 Operation mode

	Character	Designation	Description	Initial value
		Operation mode	Mode used usually for PV/SV	
1		CH1 control setting	Setting range: <b><i>SLL</i></b> to <b><i>SLH</i></b> Setting units: °C (thermocouple and resistance bulb inputs) digit (current and voltage inputs)	<b><i>0</i></b>
2		CH2 control setting	Setting range: <b><i>SLL</i></b> to <b><i>SLH</i></b> Setting units: °C (thermocouple and resistance bulb inputs) digit (current and voltage inputs)	<b><i>0</i></b>

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### 3.2 Initial setting mode

	Character	Designation	Description	Initial value																																
1	<b>SEt</b> <b>!</b>	Setup mode for the "Select the setting mode" screen	Setting concerning inputs and other factors																																	
2	<b>_InP</b>	Set an input type	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 5px;"> <b>_InP</b>                      ※※                 </div> <p>Model with thermocouple and resistance bulb inputs</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>※※</th> <th>Input type</th> </tr> </thead> <tbody> <tr><td><b>00</b></td><td>Thermocouple K</td></tr> <tr><td><b>01</b></td><td>Thermocouple J</td></tr> <tr><td><b>02</b></td><td>Thermocouple R</td></tr> <tr><td><b>03</b></td><td>Thermocouple T</td></tr> <tr><td><b>04</b></td><td>Thermocouple N</td></tr> <tr><td><b>05</b></td><td>Thermocouple S</td></tr> <tr><td><b>06</b></td><td>Thermocouple B</td></tr> <tr><td><b>09</b></td><td>0 to 10mV</td></tr> <tr><td><b>10</b></td><td>Pt100</td></tr> <tr><td><b>11</b></td><td>JPt100</td></tr> </tbody> </table> <hr style="border-top: 1px dashed black;"/> <p>Model with current and voltage inputs</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>※※</th> <th>Input type</th> </tr> </thead> <tbody> <tr><td><b>20</b></td><td>0 to 10 VDC</td></tr> <tr><td><b>21</b></td><td>0 to 5 VDC</td></tr> <tr><td><b>22</b></td><td>1 to 5 VDC</td></tr> <tr><td><b>23</b></td><td>4 to 20 VDC</td></tr> </tbody> </table>	※※	Input type	<b>00</b>	Thermocouple K	<b>01</b>	Thermocouple J	<b>02</b>	Thermocouple R	<b>03</b>	Thermocouple T	<b>04</b>	Thermocouple N	<b>05</b>	Thermocouple S	<b>06</b>	Thermocouple B	<b>09</b>	0 to 10mV	<b>10</b>	Pt100	<b>11</b>	JPt100	※※	Input type	<b>20</b>	0 to 10 VDC	<b>21</b>	0 to 5 VDC	<b>22</b>	1 to 5 VDC	<b>23</b>	4 to 20 VDC	<b>00</b>
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3	<b>_PuG</b>	Set a PV corrected gain	Setting range: 0.50 to 2.00 Setting unit: Times	<b>100</b>																																
4	<b>_PuS</b>	Set a PV corrected zero point	Input for thermocouple and resistance bulb Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C	<b>0</b>																																
			Input for current and voltage Setting range: -1999 to 9999 (decimal place at a specified position) Setting unit: digit																																	
5	<b>_PdF</b>	Set the input filter	Setting range: 0 to 99 seconds	<b>1</b>																																

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	Character	Designation	Description	Initial value												
6	<b>- DP</b>	Position the decimal point	Input for resistance bulb <table border="1"> <tr> <td><b>0</b></td> <td>Disable</td> </tr> <tr> <td><b>00</b></td> <td>Enable</td> </tr> </table> Input for current and voltage <table border="1"> <tr> <td><b>0</b></td> <td>Disable</td> </tr> <tr> <td><b>00</b></td> <td>1 digit</td> </tr> <tr> <td><b>000</b></td> <td>2 digits</td> </tr> <tr> <td><b>0000</b></td> <td>3 digits</td> </tr> </table>	<b>0</b>	Disable	<b>00</b>	Enable	<b>0</b>	Disable	<b>00</b>	1 digit	<b>000</b>	2 digits	<b>0000</b>	3 digits	<b>0</b>
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<b>000</b>	2 digits															
<b>0000</b>	3 digits															
7	<b>- FU</b>	Set the function key function	<table border="1"> <tr> <td><b>0</b></td> <td>No function</td> </tr> <tr> <td><b>1</b></td> <td>Digit shift key</td> </tr> <tr> <td><b>2</b></td> <td>RUN/READY key</td> </tr> <tr> <td><b>3</b></td> <td>AT key</td> </tr> <tr> <td><b>4</b></td> <td>Start/reset the timer</td> </tr> </table>	<b>0</b>	No function	<b>1</b>	Digit shift key	<b>2</b>	RUN/READY key	<b>3</b>	AT key	<b>4</b>	Start/reset the timer	<b>0</b>		
<b>0</b>	No function															
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<b>3</b>	AT key															
<b>4</b>	Start/reset the timer															
8	<b>- LoL</b>	Set the key lock	<table border="1"> <tr> <td><b>0</b></td> <td>OFF</td> </tr> <tr> <td><b>1</b></td> <td>Locks all</td> </tr> <tr> <td><b>2</b></td> <td>Locks the operation mode</td> </tr> <tr> <td><b>3</b></td> <td>Locks all but the operation mode</td> </tr> </table>	<b>0</b>	OFF	<b>1</b>	Locks all	<b>2</b>	Locks the operation mode	<b>3</b>	Locks all but the operation mode	<b>0</b>				
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<b>3</b>	Locks all but the operation mode															

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### 3.3 Control setting mode

	Character	Designation	Description	Initial value
1	<b>SEt</b> <b>2</b>	Control parameter mode for the "Select the setting mode" screen	Setting concerning the control constant	
2	<b>_SLH</b>	Set an upper limit for the SV limiter	Input for thermocouple and resistance bulb Setting range: Lower limit to the upper limit of the setting range Provided that the different between it and the lower limit for the SV limiter should be at least 50 digits. Setting unit: °C	<b>1200</b>
			Input for current and voltage Setting range: -1999 to 9999 (decimal place at a specified position) Provided that the different between it and the lower limit for the SV limiter should be at least 50 digits. Setting unit: digit	<b>9000</b>
3	<b>_SLL</b>	Set a lower limit for the SV limiter	Input for thermocouple and resistance bulb Setting range: Lower limit to the upper limit of the setting range Provided that the different between it and the upper limit for the SV limiter should be at least 50 digits. Setting unit: °C	<b>0</b>
			Input for current and voltage Setting range: -1999 to 9999 (decimal place at a specified position) Provided that the different between it and the upper limit for the SV limiter should be at least 50 digits. Setting unit: digit	<b>- 1000</b>
4	<b>_ rld</b>	Control mode	Used to set the control mode. <b>r dy</b> : Stops the control (outputs a lower limit for the operation amount limiter). <b>r Un</b> : Executes the control. <b>rRn</b> : Manual control	<b>rUn</b>

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Character	Designation	Description	Initial value																						
5	<b>_Cnt</b>	Set a control type	<b>110</b>																						
		<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b>_Cnt</b></td> </tr> <tr> <td style="text-align: center;">※☆*</td> </tr> </table> <p>PID function</p> <table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;">※□□</td> <td style="text-align: center;">Type</td> </tr> <tr> <td style="text-align: center;"><b>0</b>□□</td> <td>TYPE A</td> </tr> <tr> <td style="text-align: center;"><b>1</b>□□</td> <td>TYPE B (overshoot inhibition function)</td> </tr> </table> <p>Control types (heat-up output)</p> <table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;">□☆□</td> <td style="text-align: center;">Type</td> </tr> <tr> <td style="text-align: center;">□<b>1</b>□</td> <td>PID control</td> </tr> <tr> <td style="text-align: center;">□<b>2</b>□</td> <td>ON/OFF control</td> </tr> </table> <p>Control types for cooling output</p> <table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;">□□*</td> <td style="text-align: center;">Type</td> </tr> <tr> <td style="text-align: center;">□□<b>0</b></td> <td>Disable</td> </tr> <tr> <td style="text-align: center;">□□<b>1</b></td> <td>PID</td> </tr> <tr> <td style="text-align: center;">□□<b>2</b></td> <td>ON/OFF</td> </tr> </table> <p>Setting the control type for cooling output to any value other than <b>0</b> activates heat-up/cooling control.</p>	<b>_Cnt</b>	※☆*	※□□	Type	<b>0</b> □□	TYPE A	<b>1</b> □□	TYPE B (overshoot inhibition function)	□☆□	Type	□ <b>1</b> □	PID control	□ <b>2</b> □	ON/OFF control	□□*	Type	□□ <b>0</b>	Disable	□□ <b>1</b>	PID	□□ <b>2</b>	ON/OFF	
<b>_Cnt</b>																									
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□□ <b>2</b>	ON/OFF																								
6	<b>_dir</b>	Set forward/reverse action switchover	<b>0</b>																						
		<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b>0</b></td> <td>Reverse action</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Forward action</td> </tr> </table>	<b>0</b>	Reverse action	<b>1</b>	Forward action																			
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<b>1</b>	Forward action																								
7	<b>_lul</b>	Operation amount of output 1	<b>00</b>																						
		<p>Used to monitor the operation amount of output 1 and set an operation amount for manual control.                  Display range: 0.0 to 100.0% (-10.0 to 110.0%)                  Setting range: Lower limit to the upper limit for the operation amount limiter                  The range in ( ) is for models with current and voltage outputs.</p>																							
8	<b>_tUn</b>	Set a tuning type	<b>2</b>																						
		<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b>1</b></td> <td>Auto-tuning (heat-up output)</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td>Self-tuning (heat-up output)</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td>Auto-tuning (cooling output)</td> </tr> <tr> <td style="text-align: center;"><b>4</b></td> <td>Self-tuning (cooling output)</td> </tr> <tr> <td style="text-align: center;"><b>5</b></td> <td>Auto-tuning (heat-up/cooling output)</td> </tr> </table> <p>Select <b>1</b>, <b>3</b> and <b>5</b> and press the FUNC key once to activate the auto-tuning. While on the fly, press the FUNC key once to stop it.                  ( ) is for heat-up and cooling control.                  While not in heat-up or cooling control, select either <b>1</b> or <b>2</b>.                  *Not displayed in ON/OFF control.</p>	<b>1</b>	Auto-tuning (heat-up output)	<b>2</b>	Self-tuning (heat-up output)	<b>3</b>	Auto-tuning (cooling output)	<b>4</b>	Self-tuning (cooling output)	<b>5</b>	Auto-tuning (heat-up/cooling output)													
<b>1</b>	Auto-tuning (heat-up output)																								
<b>2</b>	Self-tuning (heat-up output)																								
<b>3</b>	Auto-tuning (cooling output)																								
<b>4</b>	Self-tuning (cooling output)																								
<b>5</b>	Auto-tuning (heat-up/cooling output)																								

	Character	Designation	Description	Initial value
9	<b><i>_RtG</i></b>	AT factor	Setting range: 0.1 to 10.0 Setting unit: Times *Not displayed in ON/OFF control.	<b><i>10</i></b>
10	<b><i>_RtC</i></b>	AT sensitivity	Model with thermocouple and resistance bulb inputs Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C	<b><i>2</i></b>
			Model with current and voltage inputs Setting range: 0 to 9999 (decimal place at a specified position) Setting unit: digit *Not displayed in ON/OFF control.	<b><i>20</i></b>
11	<b><i>_PI</i></b>	Set a proportional band	Setting range: 0.1 to 200.0% Setting unit: % of <b><i>SLL</i></b> to <b><i>SLH</i></b> *Not displayed in ON/OFF control.	<b><i>30</i></b>
12	<b><i>_I</i></b>	Set an integration time	Setting range: 0 to 3600 seconds *Not displayed in ON/OFF control.	<b><i>0</i></b>
13	<b><i>_d</i></b>	Set a derivative time	Setting range: 0 to 3600 seconds *Not displayed in ON/OFF control.	<b><i>0</i></b>
14	<b><i>_tI</i></b>	Set a proportional cycle	Setting range: 1 to 120 seconds *Not displayed in ON/OFF control.	<b><i>20</i></b>
15	<b><i>_RrB</i></b>	Anti-reset windup	Setting range: 0.0 to 100.0% (-10.0 to 110.0%) Setting unit: % The range in ( ) is for models with current and voltage outputs. *Not displayed in ON/OFF control.	<b><i>1000</i></b>
16	<b><i>_PHI</i></b>	Set an upper limit for the operation amount limiter	Setting range: Lower limit for the operation amount limiter to 100.0% (110.0%) The range in ( ) is for models with current and voltage outputs. *Not displayed in ON/OFF control.	<b><i>1000</i></b>
17	<b><i>_PLI</i></b>	Set a lower limit for the operation amount limiter	Setting range: 0.0% (-10.0%) to the upper limit for the operation amount limiter The range in ( ) is for models with current and voltage outputs. *Not displayed in ON/OFF control.	<b><i>00</i></b>
18	<b><i>_CI</i></b>	Set a control sensitivity	Thermocouple and resistance bulb inputs Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C	<b><i>0</i></b>
			Current and voltage inputs Setting range: 0 to 9999 (decimal place at a specified position) Setting unit: digit *Only displayed in ON/OFF control.	
19	<b><i>_CPI</i></b>	Position the OFF point	Thermocouple and resistance bulb inputs Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C	<b><i>0</i></b>
			Current and voltage inputs Setting range: -1999 to 9999 (decimal place at a specified position) Setting unit: digit *Only displayed in ON/OFF control.	

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	Character	Designation	Description	Initial value
20	<b><i>_Pv2</i></b>	Operation amount for cooling output	Used to monitor an operation amount for output 2 and to set an operation amount for manual control. Display range: 0.0 to 100.0% (-10.0 to 110.0%) Setting range: Lower limit to the upper limit for the operation amount limiter The range in ( ) is for models with current and voltage outputs. *Only displayed for heat-up/cooling control.	<b>00</b>
21	<b><i>_P2</i></b>	Set a proportional band for cooling output	Setting range: 0.10 to 10.00 times Setting unit: Magnification with regard to the proportional band for output 1 *Only displayed in heat-up/cooling PID control.	<b>100</b>
22	<b><i>_t2</i></b>	Set a proportional cycle for cooling output	Setting range: 1 to 120 seconds *Only displayed in heat-up/cooling PID control.	<b>20</b>
23	<b><i>_PH2</i></b>	Set an upper limit for the cooling output operation amount limiter	Setting range: Lower limit for the operation amount limiter to 100.0% *Only displayed in heat-up/cooling PID control.	<b>1000</b>
24	<b><i>_PL2</i></b>	Set a lower limit for the cooling output operation amount limiter	Setting range: 0.0% to the upper limit for the operation amount limiter *Only displayed in heat-up/cooling PID control.	<b>00</b>
25	<b><i>_C2</i></b>	Set a control sensitivity for cooling output	Thermocouple and resistance bulb inputs Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C ----- Current and voltage inputs Setting range: 0 to 9999 (decimal place at a specified position) Setting unit: digit *Only displayed in heat-up/cooling ON/OFF control.	<b>0</b>
26	<b><i>_CP2</i></b>	Position the OFF point for cooling output	Thermocouple and resistance bulb inputs Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C ----- Current and voltage inputs Setting range: -1999 to 9999 (decimal place at a specified position) Setting unit: digit *Only displayed in heat-up/cooling ON/OFF control.	<b>0</b>
27	<b><i>_Pbb</i></b>	Manual reset	Setting range: 0.0 to 100.0% -100.0 to +100.0 (heat-up/cooling) Setting unit: % *Not displayed in ON/OFF control.	<b>00</b>
28	<b><i>_db</i></b>	Set a dead band	Thermocouple and resistance bulb inputs Setting range: -100.0 to +100.0 -100.0 to +100 Setting unit: °C ----- Current and voltage inputs Setting range: -1000 to 1000 (decimal place at a specified position) Setting unit: digit *Only displayed in heat-up/cooling control.	<b>0</b>

### 3.4 Event setting mode (active when an option is selected)

	Character	Designation	Description	Initial value																																
1	<b>SEL</b> <b>3</b>	Event setting mode for the "Select the setting mode" screen	Setting concerning the event output function																																	
2	<b>_E IF</b>	Set the event output function (PV event)	<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b>_E IF</b></td> </tr> <tr> <td style="text-align: center;">①②</td> </tr> </table> <p>PV event function</p> <table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th>②</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>0</b></td> <td>Disable</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Upper/lower limit for deviation</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td>Upper limit for deviation</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td>Lower limit for deviation</td> </tr> <tr> <td style="text-align: center;"><b>4</b></td> <td>Deviation range</td> </tr> <tr> <td style="text-align: center;"><b>5</b></td> <td>Upper/lower limit</td> </tr> <tr> <td style="text-align: center;"><b>6</b></td> <td>Upper limit</td> </tr> <tr> <td style="text-align: center;"><b>7</b></td> <td>Lower limit</td> </tr> <tr> <td style="text-align: center;"><b>8</b></td> <td>Range</td> </tr> </tbody> </table> <p>Additional function</p> <table border="1"> <thead> <tr> <th>①</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>0</b></td> <td>Disable</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Hold</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td>Standby sequence</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td>Hold + standby sequence</td> </tr> </tbody> </table>	<b>_E IF</b>	①②	②	Type	<b>0</b>	Disable	<b>1</b>	Upper/lower limit for deviation	<b>2</b>	Upper limit for deviation	<b>3</b>	Lower limit for deviation	<b>4</b>	Deviation range	<b>5</b>	Upper/lower limit	<b>6</b>	Upper limit	<b>7</b>	Lower limit	<b>8</b>	Range	①	Type	<b>0</b>	Disable	<b>1</b>	Hold	<b>2</b>	Standby sequence	<b>3</b>	Hold + standby sequence	<b>00</b>
<b>_E IF</b>																																				
①②																																				
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<b>1</b>	Hold																																			
<b>2</b>	Standby sequence																																			
<b>3</b>	Hold + standby sequence																																			
3 4	<b>_E IH</b> <b>_E IL</b>	Set an upper limit for event output Set a lower limit for event output	<p>Thermocouple and resistance bulb inputs Setting range: -199.9 to 999.9 or -1999 to 9999 Setting unit: °C</p> <hr/> <p>Current and voltage inputs Setting range: -1999 to 9999 (decimal place at a specified position) Setting unit: digit *Not displayed when the PV event function is set to "Disable."</p>	<b>0</b>																																
5	<b>_E IC</b>	Set an event output sensitivity	<p>Thermocouple and resistance bulb inputs Setting range: 0.0 to 999.9 0 to 9999 Setting unit: °C</p> <hr/> <p>Current and voltage inputs Setting range: 0 to 9999 (decimal place at a specified position) Setting unit: digit *Not displayed when the PV event function is set to "Disable."</p>	<b>0</b>																																

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	Character	Designation	Description	Initial value																		
6	<b><i>_E t</i></b>	Set the event output delay timer	Setting range: 0 to 9999 seconds * Not displayed if the PV event function and special event function are set to "Disable."	<b>0</b>																		
7	<b><i>_E Ib</i></b>	Event output function (special)	<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b><i>_E Ib</i></b></td> </tr> <tr> <td style="text-align: center;">①②</td> </tr> </table> <p>Special event function</p> <table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th style="text-align: center;">②</th> <th style="text-align: center;">Type</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>0</b></td> <td>Disable</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>PV error</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td>Heater error</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td>PV + heater error</td> </tr> </tbody> </table> <p>Additional function</p> <table border="1"> <thead> <tr> <th style="text-align: center;">①</th> <th style="text-align: center;">Type</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>0</b></td> <td>Disable</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Hold</td> </tr> </tbody> </table>	<b><i>_E Ib</i></b>	①②	②	Type	<b>0</b>	Disable	<b>1</b>	PV error	<b>2</b>	Heater error	<b>3</b>	PV + heater error	①	Type	<b>0</b>	Disable	<b>1</b>	Hold	<b>00</b>
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<b>1</b>	Hold																					
8	<b><i>_E IP</i></b>	Set a polarity for event output	<table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;"><b><i>_E IP</i></b></td> </tr> <tr> <td style="text-align: center;">①</td> </tr> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">①</th> <th style="text-align: center;">Type</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>0</b></td> <td>Normally open</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Normally closed</td> </tr> </tbody> </table>	<b><i>_E IP</i></b>	①	①	Type	<b>0</b>	Normally open	<b>1</b>	Normally closed	<b>0</b>										
<b><i>_E IP</i></b>																						
①																						
①	Type																					
<b>0</b>	Normally open																					
<b>1</b>	Normally closed																					
9	<b><i>_ Ct</i></b>	CT input monitor	Used to monitor the current level of the heater current sensor. Display range: 0 to 60A																			
10	<b><i>_ Ct I</i></b>	Set an abnormal current in the heater.	Setting range: 1 to 30A	<b>1</b>																		

### 3.5 Timer setting mode

	Character	Designation	Description	Initial value																
1	<b>SEt</b> <b>4</b>	Timer parameter mode for the "Select the setting mode" screen	Makes settings concerning the timer parameters.																	
2	<b>_tNo</b>	Set a timer output destination	<table border="1"> <thead> <tr> <th></th> <th>Output destination type</th> </tr> </thead> <tbody> <tr> <td><b>0</b></td> <td>Disable the timer</td> </tr> <tr> <td><b>1</b></td> <td>Control</td> </tr> <tr> <td><b>2</b></td> <td>Event output</td> </tr> </tbody> </table>		Output destination type	<b>0</b>	Disable the timer	<b>1</b>	Control	<b>2</b>	Event output	<b>0</b>								
	Output destination type																			
<b>0</b>	Disable the timer																			
<b>1</b>	Control																			
<b>2</b>	Event output																			
3	<b>_tNF</b>	Set the timer function	<table border="1"> <thead> <tr> <th></th> <th>Type</th> </tr> </thead> <tbody> <tr> <td><b>1</b></td> <td>Auto start (ON delay)</td> </tr> <tr> <td><b>2</b></td> <td>Manual start (ON delay)</td> </tr> <tr> <td><b>3</b></td> <td>Event start (ON delay)</td> </tr> <tr> <td><b>4</b></td> <td>Auto start (OFF delay)</td> </tr> <tr> <td><b>5</b></td> <td>Manual start (OFF delay)</td> </tr> <tr> <td><b>6</b></td> <td>Event start (OFF delay)</td> </tr> <tr> <td><b>7</b></td> <td>SV start (OFF delay)</td> </tr> </tbody> </table> <p>* Not displayed if the "Set an output destination" parameter is set to "Disable the timer."</p>		Type	<b>1</b>	Auto start (ON delay)	<b>2</b>	Manual start (ON delay)	<b>3</b>	Event start (ON delay)	<b>4</b>	Auto start (OFF delay)	<b>5</b>	Manual start (OFF delay)	<b>6</b>	Event start (OFF delay)	<b>7</b>	SV start (OFF delay)	<b>1</b>
	Type																			
<b>1</b>	Auto start (ON delay)																			
<b>2</b>	Manual start (ON delay)																			
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<b>5</b>	Manual start (OFF delay)																			
<b>6</b>	Event start (OFF delay)																			
<b>7</b>	SV start (OFF delay)																			
4	<b>_HrN</b>	Switch between timer units	<table border="1"> <tbody> <tr> <td><b>1</b></td> <td>Hours and minutes</td> </tr> <tr> <td><b>2</b></td> <td>Minutes and seconds</td> </tr> </tbody> </table> <p>* Not displayed if the timer destination is set to "Disable the timer."</p>	<b>1</b>	Hours and minutes	<b>2</b>	Minutes and seconds	<b>1</b>												
<b>1</b>	Hours and minutes																			
<b>2</b>	Minutes and seconds																			
5	<b>_tSu</b>	Set a tolerance for timer SV start	<p>Thermocouple and resistance bulb inputs Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C</p> <hr/> <p>Current and voltage inputs Setting range: 0 to 9999 (decimal place at a specified position) Setting unit: digit * Not displayed if the timer destination is set to "Disable the timer." Not displayed if the timer function is set to any setting other than "SV start."</p>	<b>0</b>																
6	<b>_tIN</b>	Set a timer time	<p>Setting range: 0:00 to 99.59 (hours and minutes) 0:00 to 99.59 (minutes and seconds) * Not displayed if the timer destination is set to "Disable the timer."</p>	00:00																
7	<b>_tIR</b>	Timer residual time monitor	<p>Residual time monitor While in this screen, press the FUNC key once to start the timer. *Not displayed if the timer destination is set to "Disable the timer."</p>																	

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**3.6 DI input setting mode (applicable to both CH1 and CH2) (active when an option is selected)**

Character	Designation	Description	Initial value																																										
1	<b>SEt</b> <b>5</b>	DI mode for the "Select the setting mode" screen																																											
2	<b>_dl F</b>	Assign DI functions	<b>3 1</b>																																										
		<table border="1" style="margin-bottom: 10px;"> <tr> <td colspan="3" style="text-align: center;"><b>_dl F</b></td> </tr> <tr> <td colspan="3" style="text-align: center;">②①</td> </tr> </table> <table border="1" style="margin-bottom: 10px;"> <tr> <td style="text-align: center;">①</td> <td></td> <td style="text-align: center;">Active</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>SV</td> <td>SV2</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td>RUN</td> <td>READY</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td>Auto</td> <td>Manual</td> </tr> <tr> <td style="text-align: center;"><b>4</b></td> <td>Reverse action</td> <td>Forward action</td> </tr> <tr> <td style="text-align: center;"><b>5</b></td> <td>AT stop</td> <td>AT start</td> </tr> <tr> <td style="text-align: center;"><b>6</b></td> <td>Reverse action SV</td> <td>Forward action, SV2</td> </tr> <tr> <td style="text-align: center;"><b>7</b></td> <td>Timer reset</td> <td>Timer start</td> </tr> </table> <table border="1"> <tr> <td style="text-align: center;">②</td> <td colspan="2" style="text-align: center;">Select a function-activated channel</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td colspan="2">CH1 only</td> </tr> <tr> <td style="text-align: center;"><b>2</b></td> <td colspan="2">CH2 only</td> </tr> <tr> <td style="text-align: center;"><b>3</b></td> <td colspan="2">CH1 + CH2</td> </tr> </table>	<b>_dl F</b>			②①			①		Active	<b>1</b>	SV	SV2	<b>2</b>	RUN	READY	<b>3</b>	Auto	Manual	<b>4</b>	Reverse action	Forward action	<b>5</b>	AT stop	AT start	<b>6</b>	Reverse action SV	Forward action, SV2	<b>7</b>	Timer reset	Timer start	②	Select a function-activated channel		<b>1</b>	CH1 only		<b>2</b>	CH2 only		<b>3</b>	CH1 + CH2		
<b>_dl F</b>																																													
②①																																													
①		Active																																											
<b>1</b>	SV	SV2																																											
<b>2</b>	RUN	READY																																											
<b>3</b>	Auto	Manual																																											
<b>4</b>	Reverse action	Forward action																																											
<b>5</b>	AT stop	AT start																																											
<b>6</b>	Reverse action SV	Forward action, SV2																																											
<b>7</b>	Timer reset	Timer start																																											
②	Select a function-activated channel																																												
<b>1</b>	CH1 only																																												
<b>2</b>	CH2 only																																												
<b>3</b>	CH1 + CH2																																												
3	<b>_dl P</b>	DI polarity	<b>0</b>																																										
		<table border="1" style="margin-bottom: 10px;"> <tr> <td colspan="2" style="text-align: center;"><b>_dl P</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">①</td> </tr> </table> <table border="1"> <tr> <td style="text-align: center;">①</td> <td style="text-align: center;">Polarity</td> </tr> <tr> <td style="text-align: center;"><b>0</b></td> <td>Closed active</td> </tr> <tr> <td style="text-align: center;"><b>1</b></td> <td>Open active</td> </tr> </table>	<b>_dl P</b>		①		①	Polarity	<b>0</b>	Closed active	<b>1</b>	Open active																																	
<b>_dl P</b>																																													
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<b>0</b>	Closed active																																												
<b>1</b>	Open active																																												
4	<b>15u2</b>	CH1 control setting 2	<b>0</b>																																										
		Thermocouple and resistance bulb inputs Setting range: <b>SLL</b> to <b>SLH</b> Setting unit: °C <hr style="border-top: 1px dashed black;"/> Current and voltage inputs Setting range: <b>SLL</b> to <b>SLH</b> Setting unit: digital Only displayed when the DI function is set to "SV2."																																											
5	<b>25u2</b>	CH2 control setting 2	<b>0</b>																																										
		Thermocouple and resistance bulb inputs Setting range: <b>SLL</b> to <b>SLH</b> Setting unit: °C <hr style="border-top: 1px dashed black;"/> Current and voltage inputs Setting range: <b>SLL</b> to <b>SLH</b> Setting unit: digital Only displayed when the DI function is set to "SV2."																																											

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### 3.7 Communications setting mode

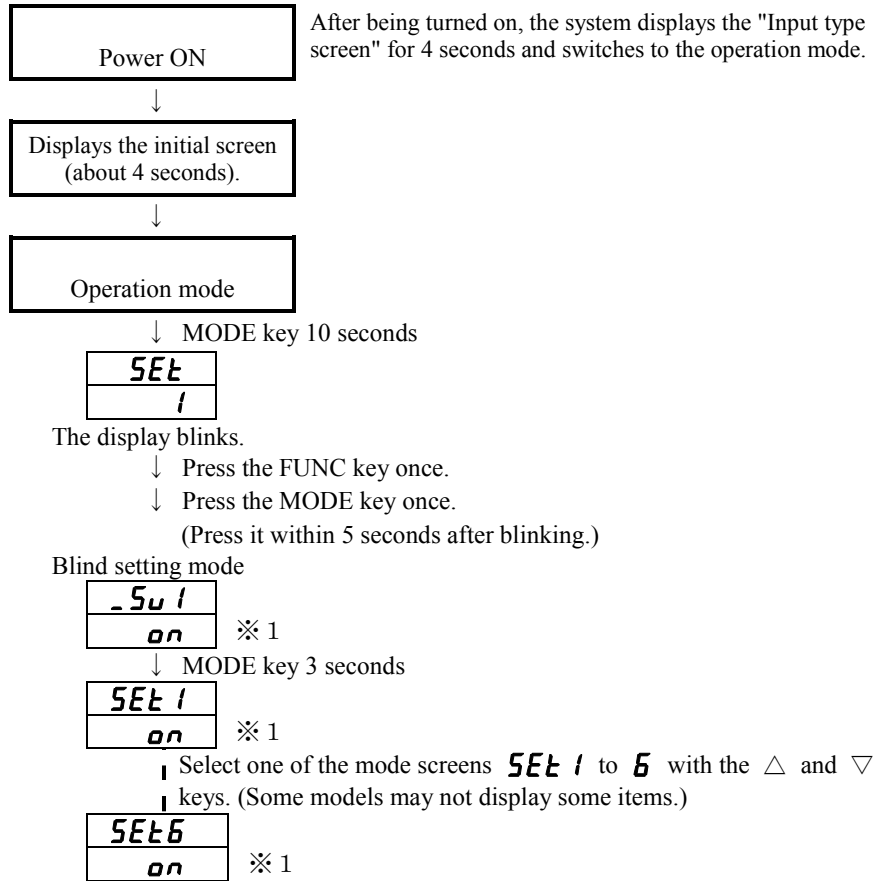
Character	Designation	Description	Initial value																														
1	<b>SEt</b> <b>6</b>	Communications parameter mode for the "Select the setting mode" screen																															
2	<b>_Prt</b>	Set a communications protocol	<b>0</b>																														
		<table border="1"> <tr> <td><b>0</b></td> <td>Toho model 100 protocol</td> </tr> <tr> <td><b>1</b></td> <td>MODBUS (RTU)</td> </tr> <tr> <td><b>2</b></td> <td>MODBUS (ASCII)</td> </tr> </table>	<b>0</b>	Toho model 100 protocol	<b>1</b>	MODBUS (RTU)	<b>2</b>	MODBUS (ASCII)																									
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<b>2</b>	MODBUS (ASCII)																																
3	<b>_Con</b>	Set the communications parameters	<b>bBn2</b>																														
		<table border="1"> <tr> <td><b>_Con</b></td> <td></td> </tr> <tr> <td>※*☆★</td> <td></td> </tr> </table> <p>BCC check</p> <table border="1"> <tr> <td>※□□□</td> <td>Type</td> </tr> <tr> <td><b>n</b>□□□</td> <td>Disable</td> </tr> <tr> <td><b>b</b>□□□</td> <td>Enable</td> </tr> </table> <p>Select a data length</p> <table border="1"> <tr> <td>□*□□</td> <td>Type</td> </tr> <tr> <td>□<b>7</b>□□</td> <td>7 bits</td> </tr> <tr> <td>□<b>B</b>□□</td> <td>8 bits</td> </tr> </table> <p>Parity check</p> <table border="1"> <tr> <td>□□☆□</td> <td>Type</td> </tr> <tr> <td>□□<b>n</b>□</td> <td>Disable</td> </tr> <tr> <td>□□<b>o</b>□</td> <td>Odd number</td> </tr> <tr> <td>□□<b>E</b>□</td> <td>Even number</td> </tr> </table> <p>Stop bit length</p> <table border="1"> <tr> <td>□□□★</td> <td>Type</td> </tr> <tr> <td>□□□<b>1</b></td> <td>1 bit</td> </tr> <tr> <td>□□□<b>2</b></td> <td>2 bits</td> </tr> </table> <ul style="list-style-type: none"> <li>• Selecting MODBUS (ASCII) enables only <b>7n2</b>, <b>7o1</b>, and <b>7E1</b> to be selected.</li> <li>• Selecting MODBUS (RTU) enables only <b>Bo2</b>, <b>Bo1</b>, and <b>BE1</b> to be selected. (The BCC check becomes inactive.)</li> </ul>	<b>_Con</b>		※*☆★		※□□□	Type	<b>n</b> □□□	Disable	<b>b</b> □□□	Enable	□*□□	Type	□ <b>7</b> □□	7 bits	□ <b>B</b> □□	8 bits	□□☆□	Type	□□ <b>n</b> □	Disable	□□ <b>o</b> □	Odd number	□□ <b>E</b> □	Even number	□□□★	Type	□□□ <b>1</b>	1 bit	□□□ <b>2</b>	2 bits	
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4	<b>_bPS</b>	Set a communications speed	<b>96</b>																														
		<table border="1"> <tr> <td><b>12</b></td> <td>1200 bps</td> </tr> <tr> <td><b>24</b></td> <td>2400 bps</td> </tr> <tr> <td><b>48</b></td> <td>4800 bps</td> </tr> <tr> <td><b>96</b></td> <td>9600 bps</td> </tr> <tr> <td><b>192</b></td> <td>19200 bps</td> </tr> </table>	<b>12</b>	1200 bps	<b>24</b>	2400 bps	<b>48</b>	4800 bps	<b>96</b>	9600 bps	<b>192</b>	19200 bps																					
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	Character	Designation	Description	Initial value				
5	<b><i>_Adr</i></b>	CH1 communications address	Setting range: 1 to 99 stations Selecting MODBUS results in 1 to 247 stations. The communications address of CH2 becomes [communications address of CH1] + 1. Setting the communications address of CH1 to [99] sets the communications address of CH2 to [A0]. CH2 has no communications address in heat-up/cooling control.	<b><i>1</i></b>				
6	<b><i>_RBL</i></b>	Response delay	Setting range: 0 to 250ms	<b><i>0</i></b>				
7	<b><i>_Mod</i></b>	Set communications mode switchover	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"></td> <td>Enable communications R</td> </tr> <tr> <td></td> <td>Enable communications RW</td> </tr> </table>		Enable communications R		Enable communications RW	<b><i>rH</i></b>
	Enable communications R							
	Enable communications RW							

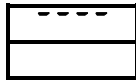
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#### 4. Transition to the blind setting mode



\*1: In the blind mode, the "on" and "oFF" are displayed under the character (SV).  
 Switch between **on** and **oFF** with the FUNC key.  
**oFF** hides the display (blind).  
 Reset the power to terminate the blind setting mode.

## 5. Other displays



Displayed when the input exceeds the upper limit for the display range.  
Displayed when the thermocouple has a wire break.

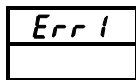
Displayed when either A, B, or b terminals has a wire break in the resistance bulb.



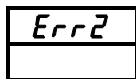
Displayed when the input goes below the lower limit for the display range.  
Displayed when the input of 1 to 5V DC and 4 to 20 mA has a wire break.



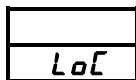
Displayed when there is a memory error.



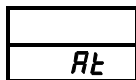
Displayed when there is an A/D conversion error.



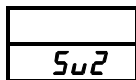
Displayed when there is an auto tuning error.



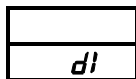
Displayed when an attempt is made to change a parameter when the keys are locked.



The system alternates between this and a usual screen during auto tuning.



Displayed when an attempt is made to change a setting during control with SV2.



Displayed when an attempt is made to change a setting assigned to a DI input.



Displayed when an attempt is made to change a setting in the control mode screen when a function key is assigned to RUN/READY.



Displayed when an attempt is made to change a setting in the control mode screen when the timer is used.