Digital Temperature Controllers
E5CC/E5EC

Solutions Guide for FAQs

Using Basic Functions

Basic Setup Procedure

1. Setting the sensor type
2. Using ON/OFF control
3. Using PID control
4. Setting temperature alarms
5. Setting heater burnout alarms

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1. Setting the Sensor Type
2. Using ON/OFF Control
3. Using PID Control
4. Setting Temperature Alarms
5. Setting Heater Burnout Alarms
Introduction

This Solutions Guide is based on customer questions that were received at OMRON's Customer Support Center. It provides practical operating procedures for setting and changing the most common items: setting the sensor type, ON/OFF control, PID control, setting temperature alarms, and setting heater burnout alarms.

Keep this Guide in a convenient location onsite to help you make settings and changes.

If you are having trouble with Temperature Controller settings, this is the guidebook for you.

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Setting the Sensor Type

Select and set the sensor type (i.e., the Input Type parameter) to the set value that corresponds to the type of sensor used in the application and the required temperature range. The parameter is set to 5 (K thermocouple at −200 to 1,300 °C) by default.

### Input type | Sensor type | Input temperature setting range in °C | Input temperature setting range in °F | E5CC/E5EC set value
--- | --- | --- | --- | ---
Resistance thermometer | Pt100 | −200 to 850 °C | −300 to 1500 °F | 0
| | −199.9 to 500.0 °C | −199.9 to 900.0 °F | 1
| | 0.0 to 100.0 °C | 0.0 to 210.0 °F | 2
| JPt100 | −199.9 to 500.0 °C | −199.9 to 900.0 °F | 3
| | 0.0 to 100.0 °C | 0.0 to 210.0 °F | 4
Thermocouple | K | −200 to 1300 °C | −300 to 2300 °F | 5 (default)
| | −20.0 to 500.0 °C | 0.0 to 900.0 °F | 6
| | −100 to 850 °C | −100 to 1500 °F | 7
| J | −20.0 to 400.0 °C | 0.0 to 750.0 °F | 8
| T | −200 to 400 °C | −300 to 700 °F | 9
| | −199.9 to 400.0 °C | −199.9 to 700.0 °F | 10
| E | −200 to 600 °C | −300 to 1100 °F | 11
| L | −100 to 850 °C | −100 to 1500 °F | 12
| U | −200 to 400 °C | −300 to 700 °F | 13
| | −199.9 to 400.0 °C | −199.9 to 700.0 °F | 14
| N | −200 to 1300 °C | −300 to 2300 °F | 15
| R | 0 to 1700 °C | 0 to 3000 °F | 16
| S | 0 to 1700 °C | 0 to 3000 °F | 17
| B | 100 to 1800 °C | 300 to 3200 °F | 18
| W | 0 to 2300 °C | 0 to 3200 °F | 19
| PLII | 0 to 1300 °C | 0 to 2300 °F | 20


→ If the setting of the Input Type parameter does not agree with the connected sensor, s.err (S.ERR: Input Error) will flash on the display as shown at the left when the power supply is turned ON.

Use the procedure on page 1-2 to set the Input Type parameter correctly.
1 Setting the Sensor Type

You set this parameter in the Initial Setting Level.
The parameter is set to 5 (K thermocouple at −200 to 1,300 °C) by default.

1 Turn ON the power supply.

2 Press the (Level) Key for at least 3 seconds.

3 Set the parameter with the (Up and Down) Keys.

(When finished, press the (Level) Key for at least 1 second to return to the operation display.)
Using ON/OFF Control

The procedure to use ON/OFF control is given step by step in this section.

Step 1  Determining the Control Method

1  Select direct or reverse operation.

   The default setting is for reverse operation.

   For heating control, select reverse operation.

   For cooling control, select direct operation.

   \[\text{Heating (Reverse) Operation}\]

   \[\text{Cooling (Direct) Operation}\]

2  Adjust the hysteresis.

   With ON/OFF control, you can adjust the reset width (called the hysteresis) for heating or cooling operation. The default setting is 1.0°C.

   \[\text{Heating (Reverse) Operation}\]

   \[\text{Cooling (Direct) Operation}\]

   When the output turns OFF at the set point, the temperature will decrease. You can set the temperature width that determines when the output will turn ON again.

   When the output turns OFF at the set point, the temperature will increase. You can set the temperature width that determines when the output will turn ON again.
Step 2 Setting ON/OFF Control Parameters

1 Setting ON/OFF Control

You set this parameter in the Initial Setting Level. The parameter is set to ON/OFF control by default.

1 Turn ON the power supply.

2 Press the (Level) Key for at least 3 seconds.

   - Flashes 3 times.

   - "IN-T" will be displayed to show that the Initial Setting Level has been entered.

3 Change the parameter with the (Mode) Key.

   - "CNTL": Indicates the Control Method parameter.
   - Default setting is "ONOF": ON/OFF control.

   (If "PID" (PID control) is displayed, press the (Down) Key to change to "ONOF" (ON/OFF control).)

2 Setting Direct or Reverse Operation

You set this parameter in the Initial Setting Level. The parameter is set to reverse operation by default.

1 Change the parameter with the (Mode) Key.

   - "OREV": Indicates the Direct/Reverse Operation parameter.
   - Default setting is "OR-R" (OR-R): Reverse operation.

   - "OR-D" (OR-D): Direct operation

   (When finished, press the (Level) Key for at least 1 second to return to the operation display.)
3 Setting the Hysteresis

You set this parameter in the Adjustment Level. The parameter is set to 1.0°C by default.

1. Turn ON the power supply.
   - Operating Display
     - Press the (Level) Key for less than 1 second.

2. Change the parameter with the (Level) Key.
   - Press the (Mode) Key several times to display HYS (HYS).

3. Set the parameter with the (Up and Down) Keys.
   - Change the set value with the (Up and Down) Keys.

(When finished, press the (Level) Key to return to the operation display.)
Using PID Control

The procedure to use PID control is given step by step in this section.

Step 1  Determining the Control Method

1  Select direct or reverse operation.

The default setting is for reverse operation.

For heating control, select reverse operation.

The manipulated variable increases if the temperature is lower than the set point. The manipulated variable decreases if the temperature is higher than the set point.

For cooling control, select direct operation.

The manipulated variable increases if the temperature is higher than the set point. The manipulated variable decreases if the temperature is lower than the set point.

2  Adjust the PID constants.

You can automatically or manually set the PID constants that are used for PID control.

Adjusting the PID Constants

The suitable values of the PID constants that are used for temperature control depend on the characteristics of the controlled object.

There are three ways that you can use to set the PID constants. These are described below.

If you can allow the temperature to vary while tuning the PID constants and you need to calculate the optimum PID constants:

⇒ Use autotuning (AT).

If you know the PID constants in advance:

⇒ Set the PID constants manually.

If you cannot allow the temperature to vary and you need to automatically estimate the PID constants when the set point is changed:

With self-tuning, calculation of the PID constants is affected by changes in the temperature, such as when a heater is turned ON and OFF. The PID constants will be automatically calculated and set. If there is an external source that causes temperature changes (such as a heater turning OFF), use autotuning or set the PID constants manually.

⇒ Use self-tuning (ST).
Step 2 Setting PID Control Parameters

1 Setting PID Control

You set this parameter in the Initial Setting Level. The parameter is set to ON/OFF control by default.

1 Turn ON the power supply.

2 Press the \( \text{(Level)} \) Key for at least 3 seconds.

3 Change the parameter with the \( \text{Key}. \)

4 Change the parameter with the \( \text{Key}. \)

You cannot set the following parameters while self-tuning (ST) is enabled.

- Adjustment Level: MV Upper Limit, MV Lower Limit, SP Ramp Set Value, and SP Ramp Fall Value
- Advanced Function Setting Level: SP Ramp Time Unit

* To set these parameters, first set the \( \text{ST} \) (ST) (self-tuning) parameter in the Initial Setting Level to \( \text{OFF} \) (OFF) to disable self-tuning.

If \( \text{ONOF} \) (ON/OFF control) is displayed, press the \( \text{Key} \) to change to \( \text{PID} \) (PID control).

\( \text{CP} \) (CP): Default setting of control period is 20 seconds for a relay output (R) and 2 seconds for a voltage pulse output (Q).

(Refer to 2. Adjusting PID Constants on page 3-1.)
2 Setting direct or reverse operation.

You set this parameter in the Initial Setting Level. The parameter is set to reverse operation by default.

1. Change the parameter with the ( ) Key.

   - Press the (Mode) Key several times to display (OREV).
   - Change the set value with the (Up and Down) Keys.

(When finished, press the (Level) Key for at least 1 second to return to the operation display.)
 Executing Autotuning

1. Turn ON the power supply.
   - The TUNE indicator will light during autotuning.
   - When finished, press the (Level) Key to return to the operation display.

2. Change the parameter with the (Mode) Key.
   - Use the (Up and Down) Keys to select \( R_L \) (AT-2) (100% autotuning).
   - (When finished, press the (Level) Key to return to the operation display.)
   - *You can return to the Operation Level during autotuning execution.

3. Autotuning will start at \( R_L \) - 2
   - \( \text{off} \) (OFF) : Autotuning stopped (default).
   - \( R_L \) - 2 (AT-2) : 100% autotuning executed.
   - \( R_L \) - 1 (At-1) : Refer to page 3-6.

4. When the indicator goes out, autotuning is finished.
   - When the TUNE indicator goes out, autotuning is finished.
   - After Returning to Operation Level
   - (When finished, press the (Level) Key to return to the operation display.)

Press the (Level) Key for less than 1 second.
Press the (Mode) Key several times to display \( R_L \) (AT).
Setting PID Constants Manually

You set the PID constants manually in the Adjustment Level. The default settings of the PID constants are as follows: P (proportional band) = 8.0°C, I (integral time) = 233 seconds, D (derivative time) = 40 seconds.

1. Turn ON the power supply.
   - Operating Display
   - Adjustment Level
   - Press the (Level) Key for less than 1 second.

2. Change the parameter with the Key.
   - Adjustment Level
   - Press the (Mode) Key several times to display P (P).
   - P (P): Indicates the Proportional Band parameter.
   - Default setting is 8.0 (8.0°C).
   - Change the set value with the (Up and Down) Keys.

3. Change the parameter with the Key.
   - Adjustment Level
   - Press the (Mode) Key several times to display I (I).
   - I (I): Indicates the Integral Time parameter.
   - Default setting is 233 (233 seconds).
   - Change the set value with the (Up and Down) Keys.

4. Change the parameter with the Key.
   - Adjustment Level
   - Press the (Mode) Key several times to display D (D).
   - D (D): Indicates the Derivative Time parameter.
   - Default setting is 40 (40 seconds).
   - Change the set value with the (Up and Down) Keys.

(When finished, press the (Level) Key to return to the operation display.)
Problems with 100% Autotuning (AT-2)

If autotuning at 100% (AT-2) does not produce the desired results, you can also execute autotuning at 40% (AT-1).

• Autotuning at 40% (AT-1)

A 40% variation in the manipulated variable of the limit cycle is used for autotuning. Executing 40% autotuning may require more time than executing 100% autotuning (AT-2). The limit cycle timing varies according to whether the deviation (DV) at the start of autotuning execution is less than 10% FS.

![Diagram showing Deviation ≥ 10% FS and Deviation < 10% FS](image-url)
Setting Temperature Alarms

The procedure to set temperature alarms is given step by step in this section.

Step 1  Determining the Alarm Set Value

1  Selecting the Alarm Type

How To Select an Alarm Type

Consider the following three points and select the alarm type from tables on page 4-3 and 4-4.

1. In what cases do you want to output an alarm?
2. Do you need to link the alarm temperature to the set point?
3. Do you need an alarm when the power is turned ON.

- Outputting an alarm when the temperature exceeds a specific value
  - Upper-limit Alarm  →  Upper-limit Alarm

- Outputting an alarm when the temperature goes below a specific value
  - Lower-limit Alarm  →  Lower-limit Alarm

- Outputting an alarm when the temperature goes below a specific value or exceeds a specific value
  - Upper-limit Alarm  →  Lower-limit Alarm  →  Upper-limit and Lower-limit Alarm

- Outputting an alarm when the temperature is within a specific range
  - Upper-limit and Lower-limit Range Alarm  →  Upper-limit and Lower-limit Range Alarm
Setting Temperature Alarms

2. Do you need to link the alarm temperature to the set point?

- **Alarm linked to the set point**
  - If the set point is changed, the set value of the alarm will also change.
  - Set this difference.
  - Set the difference (deviation) between the set point and alarm point.

- **Alarm not linked to the set point**
  - The actual temperature at which the alarm is output is set.
  - Set the absolute temperature at which the alarm is output.

3. Do you need an alarm when the power is turned ON?

- **Alarm not required when the power is turned ON**
  - Example: Alarm point for lower-limit alarm
  - Temperature is below alarm point, but alarm output does not turn ON.

- **Alarm also required when power is turned ON**
  - Example: Alarm point for lower-limit alarm
  - Alarm output turns ON because temperature is below alarm point when power turns ON.

What Is a Standby Sequence For?

Particularly with a lower-limit alarm, the temperature is often below the alarm point when temperature control is started. In this case, an alarm would be output at the start of operation. To prevent this, a standby sequence is used to disable the first alarm.

In the default settings, the standby sequence is restarted (and the alarm is turned OFF) when operation is started, when the SP is changed, or when the alarm temperature is changed. You can change the conditions for restarting the standby sequence.

For details, refer to the *E5CC/E5EC Digital Temperature Controllers User’s Manual* (Cat. No. H174).
### Available Alarm Types

You select the alarm type according to the required conditions.

<table>
<thead>
<tr>
<th>Do you want to link the alarm temperature to the set point?</th>
<th>Do you need a standby sequence?</th>
<th>In what cases do you want to output an alarm?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Deviation</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>No Standby Sequence</td>
<td>Upper-limit and Lower-limit Alarm</td>
<td>None</td>
</tr>
<tr>
<td>Upper-limit Alarm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Lower-limit Alarm</td>
<td>Upper-limit and Lower-limit Range Alarm</td>
<td>None</td>
</tr>
<tr>
<td>Standby Sequence</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Upper-limit Alarm</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Lower-limit Alarm</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Alarm Type

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No alarm</td>
<td>Set this alarm type when you do not need an alarm.</td>
</tr>
</tbody>
</table>
| 1   | Upper-limit and Lower-limit Alarm          | ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ON ONE
## Setting Temperature Alarms

### Do you want to link the alarm temperature to the set point?
<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Standby Sequence</td>
<td>Upper-limit Alarm</td>
</tr>
<tr>
<td>No Standby Sequence</td>
<td>Lower-limit Alarm</td>
</tr>
<tr>
<td>Standby Sequence</td>
<td>Upper-limit Alarm</td>
</tr>
<tr>
<td>Standby Sequence</td>
<td>Lower-limit Alarm</td>
</tr>
</tbody>
</table>

### Do you need a standby sequence?

### In what cases do you want to output an alarm?

#### Set this number in the Temperature Controller

You use these numbers for the following Alarm Type parameters: \( R \leq 1 \) (ALT1), \( R \leq 2 \) (ALT2), \( R \leq 3 \) (ALT3), and \( R \leq 4 \) (ALT4).

Refer to page 4-6 for the procedure.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Absolute-value Upper-limit Alarm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Absolute-value Lower-limit Alarm</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Absolute-value Upper-limit Alarm with Standby Sequence</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Absolute-value Lower-limit Alarm with Standby Sequence</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Alarm value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>OFF</td>
<td>0</td>
</tr>
</tbody>
</table>

* Refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174) for information on alarm types 12 (LBA) to 19 (RSP Absolute-value Lower-limit Alarm).
What Value Is Set for an Alarm?
You set the temperature at which the alarm is output. There are two methods to set the temperature for the alarm types selected on pages 4-3 and 4-4: a deviation or an absolute temperature. Either positive or negative values can be set for the alarm value.

● Setting Deviations from the Set Point
  • Setting an Upper-limit Alarm (Alarm Type 2)
    Example: Alarm Value = 20
    ![Diagram](image1)
    Set point: 100°C
    Alarm ON 120°C or higher
    Example: Alarm Value = -20
    ![Diagram](image2)
    Set point: 100°C
    Alarm ON 80°C or higher
  • Setting a Lower-limit Alarm (Alarm Type 3)
    Example: Alarm Value = 20
    ![Diagram](image3)
    Set point: 100°C
    Alarm ON 80°C or lower
    Example: Alarm Value = -20
    ![Diagram](image4)
    Set point: 100°C
    Alarm ON 120°C or lower
  • Setting an Upper-limit Lower-limit Alarm (Alarm Type 1)
    Example: Alarm upper limit = 30, alarm lower limit = 20
    ![Diagram](image5)
    Alarm lower limit: 20°C
    Alarm upper limit: 30°C
    Set point: 100°C
    Alarm ON 80°C or lower
    Alarm ON 130°C or higher

● Setting Absolute Temperatures
  • Setting an Absolute-value Upper-limit Alarm (Alarm Type 8)
    The alarm output will turn ON when the alarm value is exceeded regardless of the value of the set point.
    Example: Alarm Value = 100
    ![Diagram](image6)
    Alarm ON 100°C or higher
  • Setting an Absolute-value Lower-limit Alarm (Alarm Type 9)
    The alarm output will turn ON when the temperature is below the alarm value regardless of the value of the set point.
    Example: Alarm Value = 100
    ![Diagram](image7)
    Set point: 100°C
    Alarm ON 100°C or lower

*There is no upper-limit lower-limit alarm that can be set with absolute values.*
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Setting Temperature Alarms

Step 2  Setting Alarm Parameters

1  Setting the Alarm Type

You set this parameter in the Initial Setting Level. The parameter is set to 2 (Upper-limit Alarm) by default.

1  Turn ON the power supply.

2  Press the Key for at least 3 seconds.

3  Change the parameter with the Key.

4  Set the parameter with the Keys.

Set the alarm type number that you selected on page 4-3.

If required, use the (Mode) Key and the (Up and Down) Keys to repeat steps 3 and 4 and set alarm type numbers for RLTL (ALT2) (Alarm 2), RLTL (ALT3) (Alarm 3), and RLLH (ALT4) (Alarm 4). (The number of alarms that is supported depends on the model of Temperature Controller. Some of the alarm parameters may not be displayed.)

When finished, press the (Level) Key for at least 1 second to return to the operation display.

* If the Controller is equipped with HB and HS alarm detection, the Alarm 1 Type is not displayed for the default settings. To use alarm 1, set the output assignment to alarm 1.
2 Setting the Alarm Value

You set the alarm value in the Operation Level. The following procedure continues on from the procedure to set the Alarm Type parameter (Initial Setting Level).

1 Press the  (Level) Key for at least 1 second.

2 Change the parameter with the  Key.

**Setting Alarm Type 2, 3, 6, 7, 8, 9, 10, or 11 (Upper-limit Alarms and Lower-limit Alarms)**

- Press the  (Mode) Key several times to display RL - i (AL-1).

**Setting Alarm Type 1, 4, or 5 (Upper-limit and Lower-limit Alarms or Upper-limit and Lower-limit Range Alarms)**

- Press the  (Mode) Key several times to display RL H (AL1H).
Setting Temperature Alarms

**3. Set the alarm value with the (Up and Down) Keys.**

**Setting Alarm Type 2, 3, 6, 7, 8, 9, 10, or 11 (Upper-limit Alarms and Lower-limit Alarms)**

Example:
Alarm Value 1 = Upper-limit Alarm: 30°C

Alarm Value 1: 30, \( RL \cdot L \) (AL-1)

Alarm upper limit 1: 30, \( RL \cdot H \) (AL1H)

Alarm lower limit 1: 20, \( RL \cdot L \) (AL1L)

**Setting Alarm Type 1, 4, or 5 (Upper-limit and Lower-limit Alarms or Upper-limit and Lower-limit Range Alarms)**

Example:
Alarm Upper Limit 1 = 30°C,
Alarm Lower Limit 1 = 20°C

Alarm upper limit 1: 30, \( RL \cdot H \) (AL1H)

Alarm lower limit 1: 20, \( RL \cdot L \) (AL1L)

If required, use the (Mode) Key and the (Up and Down) Keys to repeat steps 2 and 3 and set the alarm values for \( RL \cdot L \) \( RL \cdot 2 \) (AL-2) (Alarm Value 2, \( RL \cdot 2 \) (AL-3) (Alarm Value 3, \( RL \cdot 4 \) (AL-4) (Alarm Value 4, \( RL \cdot 2H \) (AL2H) (Alarm Upper Limit 2), \( RL \cdot 2L \) (AL2L) (Alarm Lower Limit 2), \( RL \cdot 3H \) (AL3H) (Alarm Upper Limit 3), \( RL \cdot 3L \) (AL3L) (Alarm Lower Limit 3), \( RL \cdot 4H \) (AL4H) (Alarm Upper Limit 4), and \( RL \cdot 4L \) (AL4L) (Alarm Lower Limit 4).

(The number of alarms that is supported depends on the model of Temperature Controller. Some of the alarm parameters may not be displayed.)

(When finished, press the (Mode) Key to return to the operation display.)
What Is Alarm Hysteresis?
The alarm hysteresis is the difference between the temperature where the alarm output turns ON and the temperature where it turns OFF.
The default setting is 0.2°C

- Setting Hysteresis for an Upper-limit Alarm (Alarm Type 2)
  Example: Hysteresis = 1
  ![Diagram](Diagram1)
  \[
  \text{Alarm hysteresis: } 1°C \\
  \text{Alarm ON 100°C or higher}
  \]
  If the temperature decreases, the alarm output will turn OFF at 99°C.

- Setting Hysteresis for a Lower-limit Alarm (Alarm Type 3)
  Example: Hysteresis = 1
  ![Diagram](Diagram2)
  \[
  \text{Alarm hysteresis: } 1°C \\
  \text{Alarm ON 100°C or lower}
  \]
  If the temperature increases, the alarm output will turn OFF at 101°C.

- Setting Hysteresis for an Upper-limit Lower-limit Alarm (Alarm Type 1)
  Example: Hysteresis = 1
  ![Diagram](Diagram3)
  \[
  \text{Alarm hysteresis: } 1°C \\
  \text{Alarm ON 80°C or lower}
  \]
  If the temperature increases, the alarm output will turn OFF at 81°C.

  \[
  \text{Alarm ON 120°C or higher}
  \]
  If the temperature decreases, the alarm output will turn OFF at 119°C.

Note: The same hysteresis is used for the upper and lower limits of an upper-limit and lower-limit alarm and an upper-limit and lower-limit range alarm.
2 Setting the Hysteresis

You set this parameter in the Initial Setting Level. The parameter is set to 0.2°C by default.

1. Turn ON the power supply.

2. Press the [Level] Key for at least 3 seconds.

3. Change the parameter with the [Mode] Key.

4. Set the parameter with the [Up and Down] Keys.

If required, use the [Mode] Key and the [Up and Down] Keys to repeat steps 3 and 4 and set the hysteresis for $RLH1$ (ALH1), $RLH2$ (ALH2), $RLH3$ (ALH3), and $RLH4$ (ALH4) (Alarm 1 Hysteresis, Alarm 2 Hysteresis, Alarm 3 Hysteresis, and Alarm 4 Hysteresis).

(The number of alarms that is supported depends on the model of Temperature Controller. Some of the alarm parameters may not be displayed.)

When finished, press the [Level] Key for at least 1 second to return to the operation display.)
Reversing Outputs

You can reverse the status of an auxiliary output (alarm output) before it is actually output. With the default setting, the output will be ON when the alarm is ON and OFF when the alarm is OFF (NO: Close in Alarm).

You can change the setting so that the output will be ON when the alarm is OFF and OFF when the alarm is ON (NC: Open in Alarm).

1. Go to the Advanced Function Setting Level.
   - Refer to Moving to the Advanced Function Setting Level page 4-14 for the procedure to enter the Advanced Function Setting Level.

2. Change the parameter with the Key.
   - Press the (Mode) Key several times to display \( Sb_{1N} \) (SB1N).
   - \( Sb_{1N} \) (SB1N): Indicates the Auxiliary Output 1 Open in Alarm parameter.
   - Default setting is \( \text{N-O} \) (N-O): Close in Alarm

3. Set the parameter with the Keys.
   - Change between Open in Alarm and Close in Alarm with the \( \text{Up and Down} \) Keys.
   - \( \text{N-O} \) (N-O): Close in Alarm
   - \( \text{N-C} \) (N-C): Open in Alarm

If required, use the (Mode) Key and the (Up and Down) Keys to repeat steps 2 and 3 and set Open in Alarm or Close in Alarm for \( Sb_{2N} \) (SB2N) (Auxiliary Output 2 Open in Alarm), \( Sb_{3N} \) (SB3N) (Auxiliary Output 3 Open in Alarm), and \( Sb_{4N} \) (SB4N) (Auxiliary Output 4 Open in Alarm). (The number of auxiliary outputs that is supported depends on the model of Temperature Controller. Some of the auxiliary output parameters may not be displayed.)

(When finished, press the (Level) Key for at least 1 second to return to the Initial Setting Level.)

### Alarm Latch

You set a latch for an alarm output. If an alarm latch is enabled, the alarm, once it turns ON, will remain ON regardless of the present temperature until it is cleared by turning OFF the power, pressing the PF Key, or using an event input.

1. **Go to the Advanced Function Setting Level.**
   - Refer to Moving to the Advanced Function Setting Level page 4-14 for the procedure to enter the Advanced Function Setting Level.
   - Press the (Mode) Key several times to display \textit{\text{a1lt}} (A1LT). Press the (Mode) Key several times to display \textit{\text{a1lt}} (A1LT).
   - Change between ON and OFF with the (Up and Down) Keys.

2. **Change the parameter with the Keys.**
   - Change between ON and OFF with the (Up and Down) Keys.
   - If required, use the (Mode) Key and the (Up and Down) Keys to repeat steps 2 and 3 and set ON/OFF for \textit{\text{a2lt}} (A2LT) (Alarm 2 Latch), \textit{\text{a3lt}} (A3LT) (Alarm 3 Latch), and \textit{\text{a4lt}} (A4LT) (Alarm 4 Latch). (The number of alarms that is supported depends on the model of Temperature Controller. Some of the alarm parameters may not be displayed.)

3. **Set the parameter with the Keys.**
   - Change between ON and OFF with the (Up and Down) Keys.

*(When finished, press the (Level) Key for at least 1 second to return to the Initial Setting Level.)*

**Alarm ON Delay and Alarm OFF Delay**

Alarm ON Delay: You can delay the time when the output actually turns ON from when the alarm status turns ON.

Alarm OFF Delay: You can delay the time when the output actually turns OFF from when the alarm status turns OFF.

The value is entered in units of seconds.

1. **Go to the Advanced Function Setting Level.**

   Refer to *Moving to the Advanced Function Setting Level* page 4-14 for the procedure to enter the Advanced Function Setting Level.

2. **Change the parameter with the  (Mode) Key.**

   Press the  (Mode) Key several times to display  (A1ON).

3. **Set the parameter with the  (Up and Down) Keys.**

   Change the set value with the  (Up and Down) Keys.

   - Alarm 1 ON Delay: 10 seconds (example)

To set the Alarm OFF Delay parameter, follow the same procedure as for the Alarm ON Delay parameter. If required, use the  (Mode) Key and the  (Up and Down) Keys to repeat steps 2 and 3 and set the ON/OFF delays for  (A2ON) (Alarm 2 ON Delay),  (A3ON) (Alarm 3 ON Delay),  (A4ON) (Alarm 4 ON Delay),  (A1OF) (Alarm 1 OFF Delay),  (A2OF) (Alarm 2 OFF Delay),  (A3OF) (Alarm 3 OFF Delay), and  (A4OF) (Alarm 4 OFF Delay). (The number of alarms that is supported depends on the model of Temperature Controller. Some of the alarm parameters may not be displayed.)

*(When finished, press the  (Level) Key for at least 1 second to return to the Initial Setting Level.)*

*For details, refer to the *E5CC/E5EC Digital Temperature Controllers User’s Manual* (Cat. No. H174).*
Setting Temperature Alarms

Alarm Parameter Setting Levels

- **Power ON**
- **Operation Level**
  - **One Alarm Value**
  - **Two Alarm Values**
- **Initial Setting Level**
  - **Alarm Parameter Setting Levels**
  - **Moving to the Advanced Function Setting Level**

1. Move from the Operation Level to the Protect Level. (Press mode key once.)
2. Display the Initial Setting/Communications Protect parameter.
3. Change the set value to 0.
4. Move from the Protect Level to the Operation Level to the Initial Setting Level.
5. Display the Move to Advanced Function Setting Level parameter.
6. Set the set value to -169 (-169 will appear in 5 seconds.).
7. The Controller will enter the Advanced Function Setting Level. **CIC**: (INIT) will be displayed.

- **Advanced Function Setting Level**
  - **Auxiliary Output 1**
  - **Auxiliary Output 2**
  - **Auxiliary Output 3**
  - **Alarm 1 Latch**
  - **Alarm 2 Latch**
  - **Alarm 3 Latch**

Press **Key** for at least 3s.

Press **Key** for at least 1s.

Press **Key** for at least 1s.
Setting Heater Burnout Alarms

The procedure to output heater burnout alarms is given step by step in this section. A heater burnout alarm operates by detecting the heater current with a current transformer (CT). If the detected current is less than the specified heater burnout detection current even though the control output is ON, a heater burnout will be assumed and an alarm will be output. A heater burnout alarm can be used only with a Controller that supports HS and HB alarm detection.

**Detecting the Heater Burnout Current**

- **SSR**
- **CT**
- **Heater burnout alarm:**
  - E5CC/E5EC
  - Turns ON if the heater current is below the set value of the heater burnout detection current.

1. **Confirm that the heater burnout alarm is enabled.**
   - Confirm that the HB ON/OFF parameter in the Advanced Function Setting Level is set to ON (enabled).
   - The default setting is ON.

   ![Advanced Function Setting Level](image)

   - **HbU (HBU):** Indicates the HB ON/OFF parameter.
   - Default setting is **ON:** Enabled.

   - If **OFF** is displayed, press the (Up) Key to change to **ON** to enable the heater burnout alarm.

   Refer to Moving to the Advanced Function Setting Level page 4-14 for the procedure to enter the Advanced Function Setting Level.

2. **Check the destination of the output.**
   - With the default setting, the HB alarm is output on auxiliary output 1.
   - For a Controller that supports HB and HS alarm detection, a heater alarm (HA) is assigned in advance to auxiliary output 1. An OR of the HB and HS alarms will be output. To assign an OR of alarms 1 to 4 and an HB alarm, assign the Integrated Alarm Assignment (ALMA).

   ![Advanced Function Setting Level](image)

   - **Sub1 (SUB1):** Indicates the Auxiliary Output 1 Assignment parameter.
   - Default setting is **HA** (Heater alarm).
Set the heater burnout current to treat as a heater burnout.

Set the Heater Burnout Detection 1 parameter in the Adjustment Level to the heater current to treat as a heater burnout.

You set this parameter in the Adjustment Level. The parameter is set to 0.0 A by default.

**Reference**

Calculate the heater burnout detection current as follows:

\[
\text{Heater burnout detection current} = \frac{\text{Normal current} + \text{Heater burnout current}}{2}
\]

Example: Using Three 200-V, 1-kW Heaters Connected in Parallel

Here, the normal heater current is 15 A, and the heater current for a burnout is 10 A.

\[
\text{Heater burnout detection current} = \frac{15\text{A} + 10\text{A}}{2} = \frac{25\text{A}}{2} = 12.5\text{A}
\]
In the interest of product improvement, specifications are subject to change without notice.