Introduction

Please read through this user’s manual to ensure correct usage of the controller and keep it handy for quick reference.

Note

This user's manual (IM 05C01E12-41E) is a re-edited, A4-size version of the IM 05C01E12-01E user’s manual that is supplied along with the product shipped. Therefore, both manuals have the same contents, except for some minor differences in the cross-referenced page numbers.

• Authorised Representative in the EEA
Yokogawa Europe BV. (Address: Euroweg 2, 3825 HD Amersfoort, The Netherlands) is the Authorised Representative of Yokogawa Electric Corporation for this Product in the EEA.

• Printed Manuals
Model UT150 Temperature Controller (IM 05C01E12-01E)
UT100 Series Communication Functions (IM 05C01E12-10E)

• General Specifications
Model UT130, UT150 Temperature Controller (GS 05C01E02-01E)

Checking Package Contents

Before using the product, check that its model & suffix codes are as you ordered.

Model and Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT150</td>
<td>R</td>
<td>Relay output (time-proportional PID or on/off control)</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>Voltage pulse output (time-proportional PID)</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4 to 20mA output (continuous PID)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>No cooling output (standard type)</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>Relay output (time-proportional PID or on/off control)</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>Voltage pulse output (time-proportional PID)</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4 to 20mA output (continuous PID)</td>
</tr>
<tr>
<td>Option</td>
<td>/AL</td>
<td>Alarm outputs (2 points)</td>
</tr>
<tr>
<td></td>
<td>/HBA</td>
<td>Heater disconnection alarm (includes optional /AL function)</td>
</tr>
<tr>
<td></td>
<td>/EX</td>
<td>SP1/SP2 switching, starting of timer, and RUN/STOP switching by external contacts</td>
</tr>
<tr>
<td></td>
<td>/RET</td>
<td>PV retransmission output in 4 to 20mA</td>
</tr>
<tr>
<td></td>
<td>/RS</td>
<td>Communication function</td>
</tr>
<tr>
<td></td>
<td>/V24</td>
<td>Power Supply 24V DC / 24V AC</td>
</tr>
</tbody>
</table>

Note: When specifying the /RS option, be sure to order the required number of copies of Communication Functions User’s Manual separately.

Check the package contents against the list below.
• Temperature controller ................................................................. 1
• Mounting bracket ............................................................................. 1
• User’s manual (IM 05C01E12-01E) ...................................................... 1
When disposing of this instrument, arrange for appropriate disposal as industrial waste according to the rules of a country, the area, or a local government.
Contents

Chapter 1 Notice
Chapter 2 What is on the Front Panel?
Chapter 3 Installing the Controller
Chapter 4 Panel Cutout Dimensions and External Dimensions
Chapter 5 Wiring
Chapter 6 Hardware Specifications
Chapter 7 Key Operations
Chapter 8 Troubleshooting
Revision Record
Chapter 1

Notice

The following safety symbol is used both on the product and in this user’s manual.

![WARNING]

This symbol stands for “Handle with Care.” When displayed on the product, the operator should refer to the corresponding explanation given in the user’s manual in order to avoid injury or death of personnel and/or damage to the product. In the manual the symbol is accompanied by an explanation of the special care that is required to avoid shock or other dangers that may result in injury or loss of life.

The following symbols are used in this manual only.

![CAUTION]

Indicates that operating the hardware or software in a particular manner may lead to damage or result in system failure.

![IMPORTANT]

Draws attention to information that is essential for understanding the operation and/or features of the product.

Exemption from Responsibility

Make sure that all of the precautions are strictly adhered to. Yokogawa Electric Corporation assumes no liability for any damage resulting from use of the instrument in contradiction to the precautions. Also, Yokogawa Electric Corporation assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the instrument.
Chapter 2  What is on the Front Panel?

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. PV display (red)</td>
<td>Indicates PV (measured value) and character information such as parameter codes and error codes.</td>
</tr>
<tr>
<td>b. SP display (green)</td>
<td>Indicates SP (target setpoint) and parameter values.</td>
</tr>
<tr>
<td>c. Alarm 1 (AL1) lamp (red)</td>
<td>Lit when alarm 1 is activated.</td>
</tr>
<tr>
<td>d. Alarm 2 (AL2) lamp (red)</td>
<td>Lit when alarm 2 is activated.</td>
</tr>
<tr>
<td>e. SP2 lamp (green)</td>
<td>Lit when SP2 is being used for control operation.</td>
</tr>
</tbody>
</table>
| f. Output (OUT) display lamps (Left: orange; right: green) | Lit while control output is being output.  
  - The left (upper) lamp is lit in orange during control output of standard type.  
  - In heating/cooling control, the left (upper) lamp lights up in orange when the heating-side output is active; while the right (lower) lamp lights up in green when the cooling-side output is active. |
| g. Data change keys                                 | Changes SP and the parameter values.                                    
  - Pressing the key decreases the data value and pressing the key increases it. Holding down the key will gradually increase the speed of the change. |
| h. SET/ENT key (data registering key) (Indicated as simply the key hereafter.) | Registers the data value changed using the data change keys.     
  - Switches between operating displays or parameter setting displays sequentially.     
  - Pressing the key for 3 seconds or longer in the operating display retrieves the operating parameter setting display.     
  - Pressing the key for 3 seconds or longer in either an operating or setup parameter setting display transfers back to operating display 1. (See Page 7-4.) |
Chapter 3  Installing the Controller

WARNING
To prevent electric shock, the source of power to the controller must be turned off when mounting the controller on to a panel.

CAUTION
To install the controller, select a location where:
1. No-one may accidentally touch the terminals;
2. Mechanical vibrations are minimal;
3. Corrosive gas is minimal;
4. The temperature can be maintained at about 23°C with minimal fluctuation;
5. There is no direct heat radiation;
6. There are no resulting magnetic disturbances;
7. The terminal board (reference junction compensation element, etc.) is protected from wind;
8. There is no splashing of water; and
9. There are no flammable materials.

Never place the controller directly on flammable items.
If the controller has to be installed close to flammable items or equipment, be sure to enclose the controller in shielding panels positioned at least 150mm away from each side. These panels should be made of either 1.43mm thick metal-plated steel plates or 1.6mm thick uncoated steel plates.

- Mount the controller at an angle within 30° from horizontal with the screen facing upward. Do not mount it facing downward.

CAUTION
Splash-proof construction is not available when the side-by-side close mounting method shown in the above figures, is chosen for any of the controllers.
Mounting the Controller

1. Affix the bracket over the back end of the controller.

2. Push the bracket to the panel, and then secure the bracket into position.

[How to remove the bracket]
To move the bracket, push down the center of the upper and lower parts of the controller softy.
The bracket is released from the latch.
Panel Cutout Dimensions and External Dimensions

Panel Cutout Dimensions

1. General Mounting

2. Side-by-side Close Mounting
   (Splash-proof construction is unavailable)

External Dimensions

Unit: mm
Chapter 5  Wiring

**WARNING**

1) Before you start wiring, turn off the power source and use a tester to check that the controller and cables are not receiving any power in order to prevent electric shock.
2) For safety, be sure to install a circuit breaker switch (of 5A and 100V AC or 220V AC, and that conforms to IEC60947) near the instrument so as to be operated easily, and clearly indicate that the device is used to de-energize the instrument.
3) Wiring should be carried out by personnel with appropriate electrical knowledge and experience.
4) For the wiring cable, the temperature rating is 60 °C or more.

**CAUTION**

1) Use a single-phase power source. If the source has a lot of noise, use an isolation transformer for the primary side and a line filter (we recommend TDK’s ZAC2205-00U product) for the secondary side. When this noise-prevention measure is taken, keep the primary and secondary power cables well apart. Since the controller has no fuse, be sure to install a circuit breaker switch (of 5A and 100V AC or 220V AC, and that conforms to IEC standards) and clearly indicate that the device is used to de-energize the controller.
2) For thermocouple input, use shielded compensating lead wires. For RTD input, use shielded wires which have low resistance and no resistance difference between the 3 wires. See the table given later for the specifications of the cables and terminals and the recommended products.
3) The control output relay cannot be replaced even though it has a limited service life (100,000 relay contacts for the resistance load). Thus, an auxiliary relay should be used so that the load can be turned on and off.
4) When using an inductive load (L) such as an auxiliary relay and solenoid valve, be sure to insert a CR filter (for AC) or diode (for DC) in parallel as a spark-rejecting surge suppressor to prevent malfunctions or damage to the relay.
5) When there is the possibility of being struck by external lightening surge, use the arrester to protect the instrument.

**IMPORTANT**

Always fix a terminal cover bracket to the UT150 controller before wiring if an optional anti-electric-shock terminal cover (part number: L4000FB) is used.

<table>
<thead>
<tr>
<th>Cable Specifications and Recommended Products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply and relay contact output</strong></td>
</tr>
<tr>
<td><strong>Thermocouple input</strong></td>
</tr>
<tr>
<td><strong>RTD input</strong></td>
</tr>
<tr>
<td><strong>Other signals</strong></td>
</tr>
</tbody>
</table>
Chapter 5 Wiring

- **Recommended Terminals**
  Use M3.5 screw-compatible crimp-on terminals with an insulating sleeve, as shown below.

**UT150 Terminal Arrangement (Standard type)**

**UT150 Terminal Arrangement (Heating/cooling type)**

*Note 1: The heater current detection input terminals (option code: /HBA) are defined as terminals 3 and 4 for a standard type and as terminals 1 and 2 for a heating/cooling type.*

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5-2  IM 05C01E12-41E
Chapter 5 Wiring

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**CAUTION**

Safety Precaution in IEC61010-1
Since the insulation provided to between relay output terminal and secondary terminal is Reinforced insulation, the connected circuit should use a safety voltage circuit to comply with IEC61010-1. (Refer to the drawing below.)

![Diagram](image)

This product

Secondary-side

Basic insulation

A safety voltage circuit

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**WARNING**

To prevent damage to the controller, never provide 100-240V AC power supply for power supply AC/DC 24V model (when "/V24" is specified).

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**CAUTION**

The (+) and (-) stand for the polarity for DC 24V power supply.

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**CAUTION**

Do not use unassigned terminals as relay terminals.
Chapter 6  Hardware Specifications

Measured Value Input

- **Input**: 1 point
- **Input type**: Universal; can be selected by software
- **Input accuracy** (at 23 ±2°C ambient temperature)
  - Thermocouple: ±2°C ±1 digit
  
  However,
  - ±4°C for thermocouple input –270 to –100°C
  - ±3°C for thermocouple input –100 to 0°C
  - ±5°C for type R and S (±9°C for 0 to 500°C)
  - ±9°C for type B (accuracy is not guaranteed for 0 to 400°C)
- **RTD**: ±1°C ±1 digit
- **Voltage**: ±0.3% ±1 digit
- **Sampling period for measured value input**: 500ms
- **Burn-out detection**: Functions for thermocouple or RTD input (burn-out upscale only; cannot be switched off)
- **Input resistance**: 1MΩ or greater for thermocouple or DC mV input. Approx. 1MΩ for DC V input
- **Maximum allowable signal source resistance**: 250Ω for thermocouple or DC mV input
- **Maximum allowable wiring resistance for RTD input**: 100Ω/wire
  
  (The resistance values of three wires must be the same.)
- **Allowable input voltage**: ±10V DC for thermocouple or mV DC input ±20V DC for DC V input
- **Noise rejection ratio**: Normal mode noise: Min. 40dB (50/60Hz) Common mode noise: Min. 120dB (Min. 90dB for DC V input)
- **Error of reference junction compensation**: ±1.5°C (at 15-35°C) ±2.0°C (at 0-50°C)

  The reference junction compensation cannot be switched off.
- **Applicable standards**: Thermocouple and resistance temperature detector JIS/IEC/DIN (ITS90)

Control Output

- **Output**: 1 point (for standard type) or 2 points (for heating/cooling type)
- **Output type**: Choose one from (1) to (3) below:
  
  (1) **Relay contact output**
      
      Contact capacity: 3A at 240V AC or 3A at 30V DC
      
      (with resistance load)

      Note: The control output relay cannot be replaced by users.

  (2) **Voltage pulse output**

      On voltage: 12-18V DC | load resistance: 600Ω or greater
      
      Off voltage: 0.1V DC or less | short-circuit current: approx. 30mA

  (3) **Current output**

      Output signal: 4 to 20mA
      
      Maximum load resistance: 600Ω
      
      Output accuracy: ±0.3% of span
      
      (at 23±2°C ambient temperature)

Alarm Functions

**Alarm Functions (Option Code /AL or /HBA)**

- **Alarm types**: 22 types (waiting action can be set by software):
  - PV high limit, PV low limit, Deviation high limit, Deviation low limit, De-energized on deviation high limit, De-energized on deviation low limit, Deviation high and low limits, High and low limits within deviation, De-energized on PV high limit, De-energized on PV low limit, Fault diagnosis output, FAIL output

  - Alarm output: 2 relay contacts
    
    Relay contact capacity: 1A at 240V AC or 1A at 30V DC
    
    (with resistance load)

  Note: The alarm output relays cannot be replaced by users.

**Heater Disconnection Alarm (Option Code /HBA)**

The heater disconnection alarm is available when time-proportional PID control or on/off control is selected.

- **Heater current setting range**: 1 to 80A
- **Alarm output**: 1 relay contact (The terminals are the same as those of the /AL option.)
- **On time of burn-out detection**: Min. 0.2 second
- **Sensor**: CTL-6-S-H or CTL-12-S36-8 (URD Co., Ltd.)

  To be purchased separately.

**Timer Function (Option Code /EX/AL or /EX/HBA)**

The output contact status changes when the preset time has passed since external contact (TMR) turned on.

The contact action can be selected by software from:

1. Make contact—the contact closes upon time-up.
2. Break—the contact opens upon time-up.

- **Input contact type**: See Contact Inputs below.

Retransmission Output

The retransmission output is provided only when the /RET option is specified, but is not available for the heating/cooling type.

- **Output signal**: Measured value in 4-20mA DC
- **Maximum load resistance**: 600Ω
- **Output accuracy**: ±0.3% of span (at 23±2°C ambient temperature)

Contact Inputs

The contact inputs are provided only when the /EX option is specified.

- **Functions**:
  1. Switching over two setpoints (SP1 and SP2)
  2. Starting a timer (See the Alarm Functions option.)
  3. RUN/STOP switching

  Can be selected by parameter DIS.

- **Input**: 2 points (with the shared common terminal)
- **Input type**: Non-voltage contact or transistor contact input
- **Contact capacity**: At least 12V/10mA
- **On/off judgment**: On state for 1kΩ or less; off state for 20kΩ or greater

Communication Function

The communication function is provided only when the /RS option is specified. (For details, read the user’s manual of the communications function IM 05C01E12-10E.)

**Communication Protocol**

- Personal computer link: Used for communication with a personal computer, or UT link module of the FA-M3 controller (from Yokogawa Electric Corporation).
- Ladder communication: Used for communication with a ladder communication module of the FA-M3, or a programmable controller of other manufacturers.
- MODBUS communication: Used for communication with equipment featuring the MODBUS protocol.

**Communication Interface**

- **Applicable standards**: Complies with EIA RS-485
- **Number of controllers that can be connected**: Up to 31
- **Maximum communication distance**: 1,200m
- **Communication method**: Two-wire half-duplex, start-stop synchronization, non-procedural
- **Communication speed**: 2400, 4800, or 9600 bps
Chapter 6 Hardware Specifications

Safety and EMC Standards

This instrument is classified into the Measurement Category No.1 in the following table. Do not use for the measurements in locations where the categories are No.2, No.3, and No.4.

- Safety: Compliant with IEC/EN61010-1 (CE), IEC/EN61010-2-201 (CE), IEC/EN61010-2-030 (CE), approved by CAN/CSA C22.2 No. 61010-1 (CSA), approved by UL61010-1.
- Installation category: II
- Pollution degree: 2
- Measurement category: I (CAT I) (UL, CSA) O (Other) (CE)

- EMC standards: Complies with EN 61326. The instrument continues to operate at a measuring accuracy of within ±20% of the range during tests.
- KC marking: Electromagnetic wave interference prevention standard, electromagnetic wave protection standard compliance

Power Supply and Isolation

CAUTION

Caution to comply with EMC Standards:
When operating this instrument by external power supply, use an independent power unit conforming to CE marking.

- **Power Supply**
  - Voltage: Rated at 100-240VAC (±10%) AC/DC 24V when "V24" is specified.
  - Frequency: 50 or 60Hz
  - Maximum power consumption: 80VA max (4W max.)
  - Memory: Non-volatile memory

- **Withstanding voltage**
  - Between primary terminals and secondary terminals (See notes 1 and 3.): CE: 3000 V AC for 1 minute (Between relay terminals and secondary terminals 1500 V AC for 1 minute.)
  - UL/CSA: 1500 V AC for 1 minute (Note 2)

- **Insulation resistance**
  - Between primary terminals and secondary terminals (See notes 1 and 3.): 20MΩ or more at 500V DC

Note 1: The primary terminals are the power supply terminals and relay output terminals. The secondary terminals are the analog input and output terminals, the voltage pulse output terminals, and the contact input terminals.
Note 2: The withstanding voltage is specified as 2300 V AC per minute to provide a margin of safety.
Note 3: AC/DC 24V terminals is secondary terminals.

- **Isolation**

The bold lines below indicate reinforced insulation, and the broken line indicates functional insulation.

In case of CE conformity, alternate long and short dash line indicates basic insulation.

<table>
<thead>
<tr>
<th>No.</th>
<th>IEC/EN/CSA UL 61010-1</th>
<th>EN 61010-2-030</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.1</td>
<td>Measurement Category I</td>
<td>O (Other)</td>
<td>For measurements performed on circuits not directly connected to MAINS.</td>
</tr>
<tr>
<td>No.2</td>
<td>Measurement Category II</td>
<td>Measurement Category II</td>
<td>For measurements performed on circuits directly connected to the low voltage installation.</td>
</tr>
<tr>
<td>No.3</td>
<td>Measurement Category III</td>
<td>Measurement Category III</td>
<td>For measurements performed in the building installation.</td>
</tr>
<tr>
<td>No.4</td>
<td>Measurement Category IV</td>
<td>Measurement Category IV</td>
<td>For measurements performed at the source of the low-voltage installation.</td>
</tr>
</tbody>
</table>

- **Functional insulation**
  - In case of CE conformity, alternate long and short dash line indicates basic insulation.

- **Enforcement Conditions**

- Normal Operating Conditions
  - Warm-up time: At least 30 minutes
  - Ambient temperature: 0-50°C (40-90°F) when mounted side-by-side
  - Rate of change of temperature: 10°C/h or less
  - Ambient humidity: 20-90% RH (no condensation allowed)
  - Magnetic field: 400mA/AT/Im or less
  - Continuous vibrations of 5 to 14Hz: Amplitude of 1.2mm or less
  - Continuous vibrations of 14 to 150Hz: 4.0µm (0.5G) or less
  - Short-period vibrations: 14.7µm (1.5G) for 15 seconds or less
  - Shock: 98µm (10G) for 11 milliseconds or less
  - Mounting angle: Upward incline of up to 30 degrees; downward incline is not allowed.
  - Altitude: 2000m or less above sea level

- Maximum Effects from Operating Conditions

  1. **Temperature effects**
     - Thermocouple, DC mV and DC V input: ±2µV/V°C or ±0.02% of F.S./°C, whichever is larger
     - Resistance temperature detector: ±0.05°C/°C
     - Analog output: ±0.05% of F.S./°C

  2. **Effect from fluctuation of power supply voltage (within rated voltage range)**
     - Analog input: ±0.2µV/V or ±0.002% of F.S./V, whichever is the larger
     - Analog output: ±0.05% of F.S./V

- Transportation and Storage Conditions

  - Temperature: -25 to 70°C
  - Humidity: 5 to 95% RH (no condensation allowed)
  - Shock: Package drop height 90cm (when packed in the dedicated package)
Chapter 7  Key Operations

CAUTION
At power-on, the temperature controller displays the operation display ①, but if the input range setting remains OFF, then "IN" appears. In this case, press the  key to display the input range code you want to use, then press the  key to register it. (Refer to the flowchart on page 7-4.)

1. You can move between parameter setting displays using the  key.
2. To change the set value,
   (i) Change the display value with the  or  key (the period flashes).
   (ii) Press the  key to register the setting.
3. At the operation display ① or ②, pressing the  key for at least 3 seconds retrieves the operation parameter setting display.
4. At the operation parameter setting display, pressing the  key for at least 3 seconds transfers back to the operation display ①. Registering the key-lock parameter (LOC) to “–1” retrieves the setup parameter setting display.
5. At the setup parameter setting display, pressing the  key for at least 3 seconds transfers back to the operation display ①.

Note: If you cannot change the parameter setting value, check the key-lock parameter (LOC) setting.

UT150 Measured Input Ranges

<table>
<thead>
<tr>
<th>Input type</th>
<th>Range (°C)</th>
<th>Range code (°C)</th>
<th>Range (°F)</th>
<th>Range code (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple</td>
<td>–270 to 1370 °C</td>
<td>1</td>
<td>–300 to 2500 °F</td>
<td>31</td>
</tr>
<tr>
<td>K</td>
<td>0.0 to 600.0 °C</td>
<td>2</td>
<td>32.0 to 999.9 °F</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>0.0 to 400.0 °C</td>
<td>3</td>
<td>32.0 to 750.0 °F</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>–199.9 to 200.0 °C</td>
<td>4</td>
<td>–300 to 400 °F</td>
<td>34</td>
</tr>
<tr>
<td>J</td>
<td>–199.9 to 999.9 °C</td>
<td>5</td>
<td>–300 to 2100 °F</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>199.9 to 400.0 °C</td>
<td>6</td>
<td>–300 to 750 °F</td>
<td>36</td>
</tr>
<tr>
<td>E</td>
<td>–199.9 to 999.9 °C</td>
<td>7</td>
<td>–300 to 1800 °F</td>
<td>37</td>
</tr>
<tr>
<td>R</td>
<td>0 to 1700 °C</td>
<td>8</td>
<td>32 to 3100 °F</td>
<td>38</td>
</tr>
<tr>
<td>S</td>
<td>0 to 1700 °C</td>
<td>9</td>
<td>32 to 3100 °F</td>
<td>39</td>
</tr>
<tr>
<td>B</td>
<td>0 to 1800 °C</td>
<td>10</td>
<td>32 to 3200 °F</td>
<td>40</td>
</tr>
<tr>
<td>N</td>
<td>–200 to 1300 °C</td>
<td>11</td>
<td>–300 to 2400 °F</td>
<td>41</td>
</tr>
<tr>
<td>L</td>
<td>–199.9 to 900.0 °C</td>
<td>12</td>
<td>–300 to 1600 °F</td>
<td>42</td>
</tr>
<tr>
<td>U</td>
<td>–199.9 to 400.0 °C</td>
<td>13</td>
<td>–300 to 750 °F</td>
<td>43</td>
</tr>
<tr>
<td>Platinel 2</td>
<td>0 to 1390 °C</td>
<td>14</td>
<td>32 to 2500 °F</td>
<td>44</td>
</tr>
<tr>
<td>RTD</td>
<td>–199.9 to 850.0 °C</td>
<td>15</td>
<td>–199.9 to 999.9 °F</td>
<td>45</td>
</tr>
<tr>
<td>P100</td>
<td>0.0 to 400.0 °C</td>
<td>16</td>
<td>32.0 to 750.0 °F</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>–199.9 to 200.0 °C</td>
<td>17</td>
<td>–300 to 400 °F</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>19.9 to 99.9 °C</td>
<td>18</td>
<td>–199.9 to 999.9 °F</td>
<td>48</td>
</tr>
<tr>
<td>JP100</td>
<td>–199.9 to 500.0 °C</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC voltage</td>
<td>0 to 100 mV</td>
<td>0.0 to 100,0</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 5V</td>
<td>0.000 to 5.000</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 to 5V</td>
<td>1.000 to 5.000</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 10V</td>
<td>0.00 to 10.00</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>
WARNING

To prevent electric shock, the controller should be mounted on the panel so that you do not accidentally touch the terminals when power is being applied.

IMPORTANT

The temperature controller is shipped with the parameters set at the factory-set defaults. Check the default values against the "Parameter Lists" in the following page (P.7-5, 7-6), and change the parameter settings that need to be changed.

This section explains how to set and register parameter values. The procedure for changing SP (target setpoint) and A1 (alarm 1 setpoint) can be found on "Changing Target Setpoint (SP)" and "Changing Alarm 1 Setpoint (A1)," respectively. You can set the other parameters in the same way.

There are no setup displays for parameters specific to functions, such as the optional alarm output functions or heating/cooling control, if they were not selected at ordering.

The setting of some parameters (such as the control mode parameter CTL) determines whether the other parameters are displayed or not.

The flowchart (P.7-4) will help you understand how this works.
● Changing Target Setpoint (SP)
The following instructions assume that the controller is already receiving power.

Step 1: Confirm that the controller shows the operating display during normal operation (PV and SP are displayed on the indicators).

Step 2: Press the or key to change the displayed SP value to the required value. In this example, SP is changed to 200°C.

Step 3: Press the key once to register the setting. SP is now changed.

● Changing Alarm 1 Setpoint (A1)
(This setpoint appears only if the /AL or /HBA option is specified.)

Step 1: Confirm that the controller shows the operating display during normal operation (PV and SP are displayed on the indicators).

Step 2: To enter the operating parameter setting display, press the key for at least 3 seconds. If your controller has the /AL or /HBA option, the display for the Alarm 1 setpoint (A1) appears. {If not, control mode (CTL) appears.}

Step 3: Press the or key to change the current A1 value to a required value. In this example, A1 is changed to 200°C.

Step 4: Press the key once to register the setting. A1 is now changed. Another press of the key calls up the Alarm 2 setpoint (A2) display. To return to the operating display, press the key for at least 3 seconds.
Chapter 7  Key Operations

When measured input range code has been already set, the operating display shown below appears.

**Operating display 1**
- Measured input value (PV)
- Target setpoint (SP1 or SP2)
- Displays only for the /EX option

When measured input range code has been already set, the operating display shown below appears.

**Operating display 2**
- Press the key to move between items.
- CTL=ONF (on/off control)
- CTL=PID (PID control)
- CTL=SLF (Dynamic Auto Tune)

Press the key for at least 3 seconds.

**Operating parameter setting display**
- Displayed only for the /AL or /HBA option
- Not displayed when AL1, AL2 = 21 or 22
- Displayed only for the AL1, AL2 = 23 or 24
- Displayed only for the /HBA option when AL1 = 25

Press the key for at least 3 seconds.

**Setup parameter setting display**
- Displayed when DC voltage input range code is set
- Displayed for the /EX option
- Displayed for the /AL/EX or /HBA/EX option
- Displayed for the /RET option

**CAUTION**
- Changing certain setup parameters may automatically initialize the operating parameters. Therefore, after you change the setup parameters, always check the operating parameter settings to find out if appropriate values have been set for them. If the operating parameters have been initialized, set them to their appropriate values.

**CAUTION**
- When "In" appears, press the key to display the measured input range code you want to use, then press the key to register it. After this operation, the controller shows the operating display 1.

**CAUTION**
- When LOC=–1 , transfers to the setup parameter setting display. But if "LOC=1 or 2" is already set, the parameter value can not be changed by setting LOC=–1 only. To change the parameter value, set "LOC=0" at first (for disabling keylock), then set "LOC=–1" once again.
Parameter Lists

(1) Target Setpoint (SP) and Timer Setting 1 and 2

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Setting range and unit</th>
<th>Default</th>
<th>User setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SP value display)</td>
<td>Target setpoint</td>
<td>Minimum value (SPL) to maximum value (SPH) of target setpoint range Unit: °C/F</td>
<td>SPL</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>Timer setting 1</td>
<td>0.0 to 99.59 Unit: minutes and seconds or hours and minutes Set the timer time unit using parameter TTU.</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>Timer setting 2</td>
<td>For example, 15.25 sets 15 minutes and 25 seconds (T1 is for AL1, and T2 is for AL2)</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

(2) Operating Parameters: Parameters changed rather frequently during operation.

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Setting range and unit</th>
<th>Default</th>
<th>User setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Alarm 1 setpoint</td>
<td>PV alarm Unit: °C/F Setting range: minimum value to maximum value of measured input range (scale) Deviation alarm Unit: °C/F Setting range: --100 to 100% of the measured input range (scale) span Heater disconnection alarm Unit: A (ampere) Setting range: OFF(0), 1 to 80 (can be set for the alarm 1 setpoint only) Max. value of measured input range (scale) (PV alarm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Alarm 2 setpoint</td>
<td></td>
<td>Min. value of measured input range (scale) (PV alarm)</td>
<td></td>
</tr>
<tr>
<td>HC</td>
<td>Heater disconnection current measured value</td>
<td>“HC” is not a parameter to be set. The current value (0 to 80) of heater disconnection detector is displayed. Unit: A (ampere) Settings: When the display value is ——, the heater current is not being measured.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTL</td>
<td>Control mode</td>
<td>ONF(0): Off control PID(1): PID control SLF(2): Dynamic auto tune control (cannot be set for heating/cooling control)</td>
<td>SLF(2): for standard type; PID(1): for heating/cooling type</td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td>Auto-tuning</td>
<td>OFF(0): Stop auto-tuning ON(1): Start auto-tuning</td>
<td>OFF(0)</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Proportional band</td>
<td>1°C/°F to the temperature that corresponds to 100% of the measured input range (scale) span</td>
<td>5% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Integral time</td>
<td>1 to 3600 seconds; OFF(0): no integral action</td>
<td>240 seconds</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Derivative time</td>
<td>1 to 3600 seconds; OFF(0): no derivative action</td>
<td>60 seconds</td>
<td></td>
</tr>
<tr>
<td>MR</td>
<td>Manual reset</td>
<td>–100 to 100%</td>
<td>50.0% for standard type; 0.0% for heating/cooling type</td>
<td></td>
</tr>
<tr>
<td>COL</td>
<td>Cooling-side gain</td>
<td>0.01 to 9.99 times</td>
<td>1.00 times</td>
<td></td>
</tr>
<tr>
<td>DB</td>
<td>Deadband</td>
<td>PID control Unit: °C/F Setting range: --(proportional band setting) to +(proportional band setting) On/off control Unit: °C/F Setting range: --50 to +50% of measured input range (scale) span</td>
<td>0% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>HYS</td>
<td>Hysteresis for on/off control</td>
<td>0°C/°F to the temperature that corresponds to 100% of the measured input range (scale) span</td>
<td>0.5% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td>Control output cycle time</td>
<td>1 to 240 seconds</td>
<td>30 seconds</td>
<td></td>
</tr>
<tr>
<td>CTC</td>
<td>Cooling-side control output cycle time</td>
<td>1 to 240 seconds</td>
<td>30 seconds</td>
<td></td>
</tr>
<tr>
<td>SP1</td>
<td>Target setpoint 1</td>
<td>Minimum value (SPL) to maximum value (SPH) of target setpoint range Unit: °C/F</td>
<td>SPL</td>
<td></td>
</tr>
<tr>
<td>SP2</td>
<td>Target setpoint 2</td>
<td>There are also optional engineering units for voltage input.</td>
<td>SPL</td>
<td></td>
</tr>
<tr>
<td>FL</td>
<td>PV input filter</td>
<td>OFF(0), 1 to 120 seconds</td>
<td>OFF(0)</td>
<td></td>
</tr>
<tr>
<td>BS</td>
<td>PV input bias</td>
<td>–100 to 100% of measured input range (scale) span</td>
<td>0% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>LOC</td>
<td>Key lock</td>
<td>0: No key lock 1: Prevents operations from being changed except for the changing of SP in the operating display 2: Prevents all parameter changing operations –1: Set “-1” to enter the setup parameter setting display But if “LOC=1 or 2” is already set, the parameter value can not be changed by setting “LOC=1” only. To change the parameter value, set “LOC=0” at first (for disabling keylock), then set “LOC=1” once again.</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Numbers in ( ) are the parameter setpoints that apply when the communication function is used. Ex. OFF(0), ON(1)
## Chapter 7 Key Operations

### (3) Setup Parameters : Parameters rarely changed in normal use after once having been set.

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Setting range and unit</th>
<th>Default</th>
<th>User setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>Measured input type</td>
<td>1 to 23, 31 to 48 (See input range code list.)&lt;br&gt;OFF(0): No input (If no input type is specified at the time of ordering, you must set the input type.)</td>
<td>OFF(0), or the input range code specified with order</td>
<td></td>
</tr>
<tr>
<td>DP</td>
<td>Decimal point position of measured input</td>
<td>0: No decimal place (nnn) (Displayed at voltage input)&lt;br&gt;1: One decimal place (nn.n)&lt;br&gt;2: Two decimal places (nn.nn)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RH</td>
<td>Maximum value of measured input scale</td>
<td>(RL + 1) to 9999 (Displayed at voltage input)</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td>Minimum value of measured input scale</td>
<td>–1999 to (RH – 1) (Displayed at voltage input)</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>SPH</td>
<td>Maximum value of target setpoint range</td>
<td>(SPL+1°C) to the maximum value of the measured input range (scale) ; Unit: °C/°F</td>
<td>Maximum value of measured input range (scale)</td>
<td></td>
</tr>
<tr>
<td>SPL</td>
<td>Minimum value of target setpoint range</td>
<td>Minimum value of measured input range (scale) to SPL–1°C Unit: °C/°F</td>
<td>Minimum value of measured input range (scale)</td>
<td></td>
</tr>
<tr>
<td>UPR</td>
<td>Setpoint ramp-up-rate</td>
<td>OFF(0) or a value from the minimum to the maximum value of the measured input range (scale)</td>
<td>OFF(0)</td>
<td></td>
</tr>
<tr>
<td>DNR</td>
<td>Setpoint ramp-down-rate</td>
<td>Unit: °C/min or °C/hour, °F/min or °F/hour&lt;br&gt;Set the ramp-rate time unit using parameter TMU.</td>
<td>OFF(0)</td>
<td></td>
</tr>
<tr>
<td>TMU</td>
<td>Setpoint ramp-rate time unit</td>
<td>0 : °C or °F / hour &lt;br&gt;1 : °C or °F / min</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>DIS</td>
<td>DI-function selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOT</td>
<td>Output in STOP mode</td>
<td>In STOP mode by contact input, fixed control output can be generated.&lt;br&gt;0 : 0%&lt;br&gt;1 : 100%</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TDU</td>
<td>Timer time unit</td>
<td>0 : hour.minute&lt;br&gt;1 : minute.second</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RTH</td>
<td>Maximum value of retransmission output</td>
<td>Temperature input : Within measured input range&lt;br&gt;Voltage input : RTL+1digit to max. value of measured input (scale)(RTL)&lt;br&gt;Min. value of measured input (scale)(RTL) to RTH-1digit&lt;br&gt;However, RTL&lt;RTH</td>
<td>Maximum value of measured input range (scale)</td>
<td></td>
</tr>
<tr>
<td>RTL</td>
<td>Minimum value of retransmission output</td>
<td>Minimum value of measured input range (scale)</td>
<td>Minimum value of measured input range (scale)</td>
<td></td>
</tr>
<tr>
<td>AL1</td>
<td>Alarm 1 type</td>
<td>OFF(0) or a value from 1 to 22 (see the table of alarm function list), and either 23 or 24 (if the timer function [EX option] is included), and 25 (if the heater disconnection function [HBA option] is included)</td>
<td>1 (PV high limit alarm)</td>
<td></td>
</tr>
<tr>
<td>AL2</td>
<td>Alarm 2 type</td>
<td>OFF(0) or a value from 1 to 22 (see the table of alarm function list), and either 23 or 24 (if the timer function [EX option] is included)</td>
<td>2 (PV low limit alarm)</td>
<td></td>
</tr>
<tr>
<td>HY1</td>
<td>Alarm 1 hysteresis</td>
<td>0 to 100% of measured input range (scale) span Unit: °C/°F</td>
<td>0.5% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>HY2</td>
<td>Alarm 2 hysteresis</td>
<td>0 to 100% of measured input range (scale) span Unit: °C/°F</td>
<td>0.5% of measured input range (scale) span</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>SUPER function</td>
<td>ON(1): Uses the SUPER function&lt;br&gt;OFF(0): Does not use SUPER function&lt;br&gt;Note: Not displayed when on/off control</td>
<td>OFF(0)</td>
<td></td>
</tr>
<tr>
<td>DR</td>
<td>Direct/reverse action</td>
<td>0: Reverse action&lt;br&gt;1: Direct action&lt;br&gt;Note: Not displayed for heating/cooling type</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PSL</td>
<td>Protocol selection</td>
<td>0: PC-link communication&lt;br&gt;1: PC-link communication with sum check&lt;br&gt;2: Ladder communication&lt;br&gt;3: MODBUS in ASCII mode&lt;br&gt;4: MODBUS in RTU mode</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ADR</td>
<td>Controller address</td>
<td>1 to 99&lt;br&gt;However, the number of controllers that can be connected per host device is 31 at the maximum.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BPS</td>
<td>Baud rate</td>
<td>2.4(0): 2400 bps&lt;br&gt;4.8(1): 4800 bps&lt;br&gt;9.6(2): 9600 bps</td>
<td>9.6(2)</td>
<td></td>
</tr>
<tr>
<td>PRI</td>
<td>Parity</td>
<td>NON(0): Disabled&lt;br&gt;EVN(1): Even parity&lt;br&gt;ODD(2): Odd parity</td>
<td>EVN(1)</td>
<td></td>
</tr>
<tr>
<td>STP</td>
<td>Stop bit</td>
<td>1 or 2 bits</td>
<td>1 bit</td>
<td></td>
</tr>
<tr>
<td>DLT</td>
<td>Data length</td>
<td>7 or 8 bits&lt;br&gt;8 bits when ladder, MODBUS (RTU)&lt;br&gt;7 bits when MODBUS (ASCII)</td>
<td>8 bits</td>
<td></td>
</tr>
</tbody>
</table>
## Alarm Function List

<table>
<thead>
<tr>
<th>Alarm type</th>
<th>Action</th>
<th>Alarm type code</th>
<th>Alarm type</th>
<th>Action</th>
<th>Alarm type code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No alarm</td>
<td></td>
<td>OFF</td>
<td>De-energized on</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>deviation low limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV high limit</td>
<td></td>
<td>1</td>
<td>Deviation high and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>low limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV low limit</td>
<td></td>
<td>2</td>
<td>Deviation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>within-high- and -low-limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviation high limit</td>
<td></td>
<td>3</td>
<td>Deviation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>within-high- and -low-limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviation low limit</td>
<td></td>
<td>4</td>
<td>De-energized on PV high limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>De-energized on PV low limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>De-energized on deviation high limit</td>
<td></td>
<td>5</td>
<td>De-energized on deviation high limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault diagnosis output</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAIL output</td>
<td>The contact is closed at input</td>
<td>22</td>
<td>Break timer function</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>output</td>
<td></td>
<td>The output contact opens when the timer setting has passed since the contact was closed. Then, the output contact closes immediately when external contact is opened.</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The output contact is opened in the following events:</td>
<td>25</td>
<td>Heater disconnection alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Program error</td>
<td></td>
<td>The controller starts measuring the current from the heater disconnection detector when 100 milliseconds have passed after turning on the output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- A/D converter error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- ROM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- RAM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- EEPROM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- power failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The contact is closed at input</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The output contact is opened in the following events:</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Program error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- A/D converter error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- ROM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- RAM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- EEPROM error</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- power failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The output contact opens when the timer setting has passed since the contact was closed. Then, the output contact closes immediately when external contact is opened.</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Waiting action**

The waiting action is effective in the following cases where:
- The power is turned on
- SP is changed
- SP number is switched
- The alarm type is changed

**Note:** The alarms numbered 1 to 10 have no waiting action, while alarms 11 to 20 have a waiting action. The waiting action turns off the PV and deviation alarms that occur from the start of the control operation until a stable state is reached.
### Description of Parameters

This section describes the parameter functions specific to the UT150 temperature controller.

(The functions described in other sections of this manual and the general functions are not discussed.)

#### Parameter | Function
--- | ---
Control mode | Select one from the following:
  a. Dynamic auto tune control (SLF) (See note)
  b. PID control (PID)
  c. On/off control (ONF)
  
  Note: Dynamic auto tune control is not available for heating/cooling control.
  
  Read the section below this table to find out more about dynamic auto tune control.

**CT** | **Function**
--- | ---
| Manual reset | You can set this parameter only for control without an integral action (when registered as CT=PID and I=OFF). The controller outputs the manual reset (MR) value when PV=SP. For example, if you set MR=50%, the controller outputs (OUT) 50% when PV=SP.

**COL** | **Function**
--- | ---
| Cooling-side gain | For heating/cooling control, you can set the ratio between the cooling-side output and heating-side output.
  
  For example, if you set COL=2.0 and the heating-side output is 10% at a certain deviation (SP-PV), then the cooling-side output will be 20% when the cooling-side also reaches that deviation.

**DB** | **Function**
--- | ---
| Deadband | You can only set a deadband for heating/cooling control. In a positive deadband, there are neither heating-side nor cooling-side outputs. In a negative deadband, there are both heating-side and cooling-side outputs, which overlap each other.

#### Parameter | Function
--- | ---
| PV input filter | This function should be used when the PV display value may fluctuate greatly, for example, when the measured input signal contains noise. The filter is of the first-order lag type, and FL sets the time constant. If a larger time constant is set, the filter can remove more noise.

**FL** | **Function**
--- | ---
| 2-seconds filter | 10-seconds filter

| Parameter | Function
--- | ---
| Control mode | Select one from the following:
  a. Dynamic auto tune control (SLF) (See note)
  b. PID control (PID)
  c. On/off control (ONF)
  
  Note: Dynamic auto tune control is not available for heating/cooling control.
  
  Read the section below this table to find out more about dynamic auto tune control.

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#### Parameter | Function
--- | ---
| PV input filter | This function should be used when the PV display value may fluctuate greatly, for example, when the measured input signal contains noise. The filter is of the first-order lag type, and FL sets the time constant. If a larger time constant is set, the filter can remove more noise.

**FL** | **Function**
--- | ---
| 2-seconds filter | 10-seconds filter
What is Dynamic Auto Tune Control?

Dynamic auto tune control is one of the features offered by the temperature controller.

When the controller is turned on or the process variable (PV) starts “hunting”, this mode of control monitors the behavior of the PV and/or OUT (control output value) to automatically determine the optimum PID constants. This means that the PID constants may be changed automatically. If this is not desirable for your system, operate the controller in the normal “PID control”.

If you want to automatically determine the PID constants at the initial startup of the controller, first define the target setpoint variable (SP) and then turn the controller off once and then back on again. Do not use dynamic auto tune control for a system where there is interference or continual disturbances.

IMPORTANT

To use dynamic auto tune control,

(1) be sure to turn on the final control element, such as a heater, before starting the control, and
(2) make sure the controlled loop is a closed loop.

If you do not follow these precautions, improper PID constants may be written into the controller. If this occurs, carry out the following:

• Set the parameter CTL at PID.
• Set the PID constants at the factory-set defaults \( P = (\text{upper range-limit} – \text{lower range-limit}) \times 5\%; \ I = 240 \sec; \; \text{and} \; D = 60 \sec \) .
• Set the parameter CTL at SLF.

If the control still doesn’t work properly, stop using the dynamic auto tune control function. Change the parameter CTL setting to PID and execute auto-tuning to obtain the PID constants.
Chapter 8  Troubleshooting

In the event of an abnormality, perform the following checks as outlined by the flowchart.

Error Display during Operation

(1) If the controller displays one of the following, carry out the appropriate remedy for the particular error.

<table>
<thead>
<tr>
<th>Display</th>
<th>Error content</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P.Er</strong></td>
<td>The parameter is abnormal</td>
<td>Check the settings of all the parameters and set them at their proper values.</td>
</tr>
<tr>
<td><strong>B.o</strong></td>
<td>Input burnout</td>
<td>Check the sensor wiring and correct it.</td>
</tr>
<tr>
<td><strong>OOO</strong></td>
<td>PV over-scale (PV exceeds its effective range.)</td>
<td>Check the input type and range settings and correct them.</td>
</tr>
<tr>
<td><strong>UUU</strong></td>
<td>PV under-scale (PV falls below its effective range.)</td>
<td>Check the communication-related parameters</td>
</tr>
<tr>
<td>Flashing period on PV display</td>
<td>Communication failure (for /RS option only)</td>
<td>Press any key to stop the flashing.</td>
</tr>
</tbody>
</table>

(2) The controller needs to be repaired if any of the indications in the table below appear. In these cases, do not try to repair the controller yourself. Order a new controller or contact us for repair.

<table>
<thead>
<tr>
<th>Display</th>
<th>Error content</th>
<th>Error content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown (at power-on)</td>
<td>CPU failure</td>
<td>Flashing “Err” (at power-on)</td>
</tr>
<tr>
<td>All extinguished (at power-on)</td>
<td>Power source failure</td>
<td>Flashing “Err” (during operation)</td>
</tr>
<tr>
<td>“Err” (at power-on)</td>
<td>Calibration abnormal</td>
<td></td>
</tr>
</tbody>
</table>

When Power Failure Occurred during Operation

- Momentary power failures of less than 20ms (or less than 1ms when “V24” is specified) have no effect on the controller operation (i.e., normal operation continues).
- For power failures longer than 20ms (or longer than 1ms when “V24” is specified), however the status will be as follows.
  (The controller action at power recovery is the same as at power-on.)
  - Alarm action: Continues (but alarms with a waiting action enter the waiting state once)
  - Setting parameters: Maintained
  - Auto-tuning: Canceled
Revision Record

Title : Model UT150 Temperature Controller

Nov. 2000  1st Edition   Newly published
Mar. 2001  2nd Edition   Correct
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