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Instruction  
Manual

**UT130**  
**Temperature Controllers**

IM 5C1E01-41E

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

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## ■ Checking Package Contents

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

### Model and Suffix Codes

Model	Suffix code	Description
<b>UT130</b>		Temperature controller
Control output for general-purpose temperature control (or for heating)	-R -V	Relay output (time-proportional PID or on/off control) Voltage pulse output (time-proportional PID)
Control output for cooling	N R V	No cooling output (general-purpose temperature control) Relay output (time-proportional PID) Voltage pulse output (time-proportional PID)
Option	/AL /HBA /RS	Alarm outputs (2 points) Heater disconnection alarm (includes optional /AL function) Communication function

Check the package contents against the list below.

- Temperature controller ..... 1
- Mounting bracket ..... 1
- Instruction manual (IM 5C1E01-01E) ..... 1

# 1. NOTICE

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The following safety symbol is used both on the product and in this instruction manual.

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This symbol stands for “Handle with Care.” When displayed on the product, the operator should refer to the corresponding explanation given in the instruction 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.

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The following symbols are used in this manual only.



## **IMPORTANT**

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

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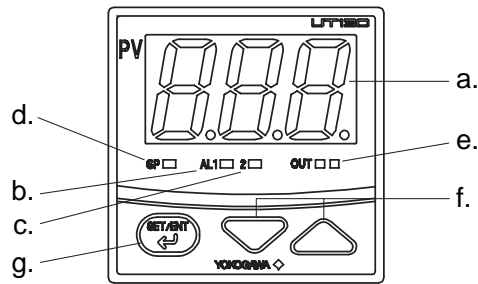
## **NOTE**







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

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## 2. WHAT IS ON THE FRONT PANEL?



	Name	Function
a.	Data display (red)	<ul style="list-style-type: none"> <li>• In the operation display, either PV (measured value) or SP (target setpoint) is indicated. Which parameter takes precedence over the other depends on the DSP parameter value.</li> <li>• In the parameter setting display, either the parameter codes or parameter value is indicated.</li> <li>• If an error occurs, the error code is displayed.</li> </ul>
b.	Alarm 1 (AL1) lamp (red)	Lit when alarm 1 is activated.
c.	Alarm 2 (AL2) lamp (red)	Lit when alarm 2 is activated.
d.	SP display lamp (orange)	<ul style="list-style-type: none"> <li>• Lit when the SP is displayed or being changed.</li> <li>• Flashes slowly (approx. once every second) when a parameter code is displayed.</li> <li>• Flashes fast when a parameter value is being changed.</li> </ul>
e.	Output (OUT) display lamps (Left: orange; right: green)	<ul style="list-style-type: none"> <li>• Lit while control output is being output.</li> <li>• The left lamp is lit in orange during general control output.</li> <li>• In heating/cooling control, the left lamp lights up in orange when the heating-side output is active; while the right lamp lights up in green when the cooling-side output is active.</li> </ul>
f.	Data change keys (Indicated as simply the  and  keys hereafter.)	<ul style="list-style-type: none"> <li>• When PV is displayed on the operation display, a press of the  key switches to the SP display.</li> <li>• When a parameter code is displayed, pressing either key once displays the parameter value (which can then be changed).</li> <li>• Changes SP and the parameter values.</li> <li>• 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.</li> </ul>
g.	SET/ENT key (data registering key) (Indicated as simply the  key hereafter.)	<ul style="list-style-type: none"> <li>• On the operation display, it switches between the PV and SP displays.</li> <li>• Registers the data value changed using the data change keys.</li> <li>• Switches between parameter setting displays sequentially.</li> <li>• Pressing the key for 3 seconds or longer in the operation display retrieves the operation parameter setting display.</li> <li>• Pressing the key for 3 seconds or longer in either an operation or setup parameter setting display transfers back to the operation display. (See Page 12.)</li> </ul>

# 3. INSTALLING THE CONTROLLER



## WARNING

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



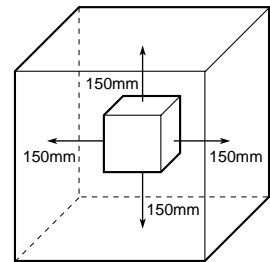
## CAUTION

To install the controller, select a location where:

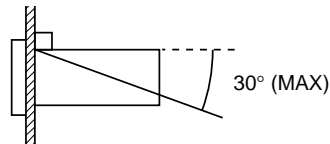
1. No-one may accidentally touch the terminals;
2. Mechanical vibrations are minimal;
3. Corrosive gas is minimal;
4. The temperature can be maintained at about 23°C with minimal fluctuation;
5. There is no direct heat radiation;
6. There are no resulting magnetic disturbances;
7. The terminal board (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.

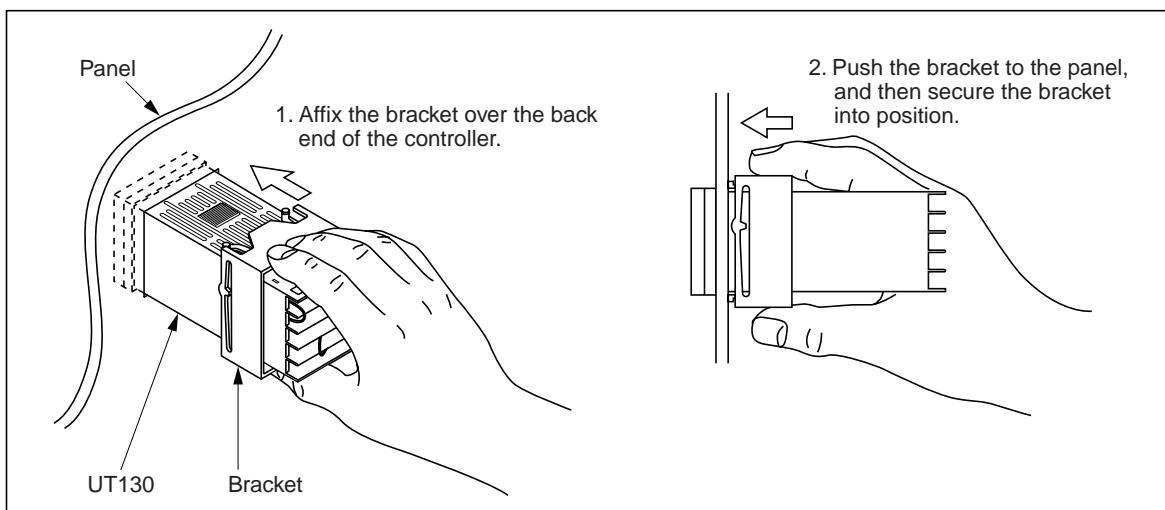
If the controller has to be installed close to flammable items or equipment, be sure to enclose the controller in shielding panels positioned at least 150mm away from each side. These panels should be made of either 1.43mm thick metal-plated steel plates or 1.6mm thick uncoated steel plates.



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

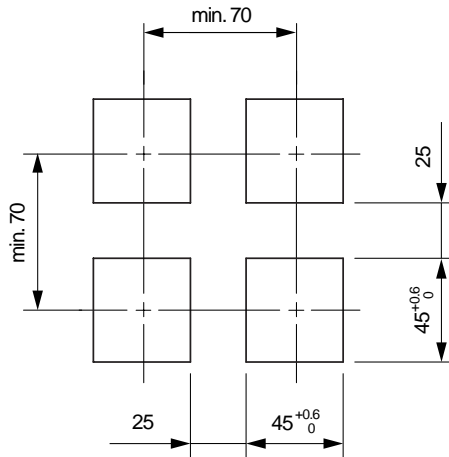


## ■ Mounting the Controller



# 4. PANEL CUTOUT DIMENSIONS AND EXTERNAL DIMENSIONS

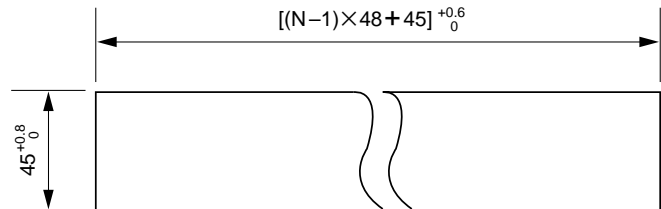
## 1. General Mounting



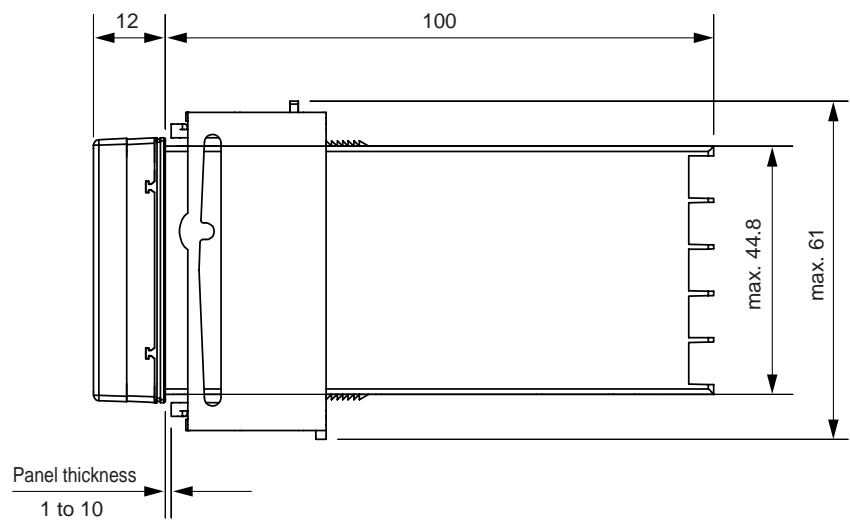
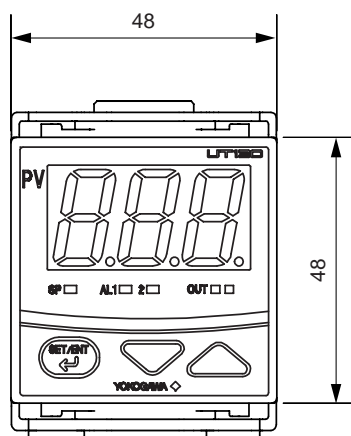
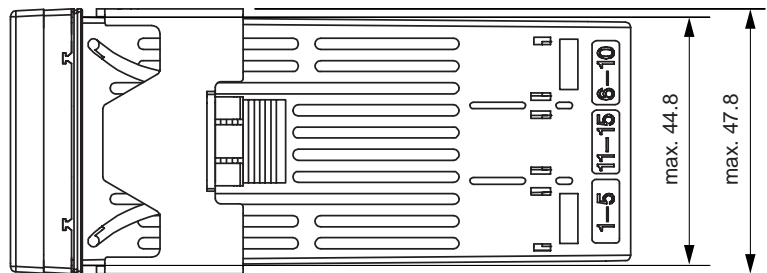
## 2. Side-by-side Close Mounting

(Splash-proof construction is unavailable)

Unit: mm



N is the number of controllers.  
If  $N \geq 5$ , then measure the actual length.



# 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 electrical shock.
- 2) Wiring should be carried out by personnel with appropriate electrical knowledge and experience.



## IMPORTANT

- 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, 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.



## NOTE

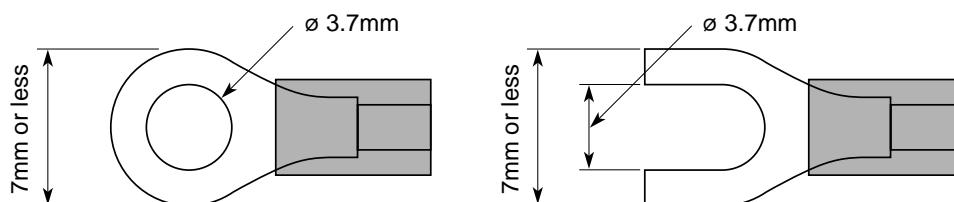
Always fix a terminal cover bracket to the UT150 controller before wiring if an optional anti-electric-shock terminal cover (part number: L4000FB) is used.

## ● Cable Specifications and Recommended Products

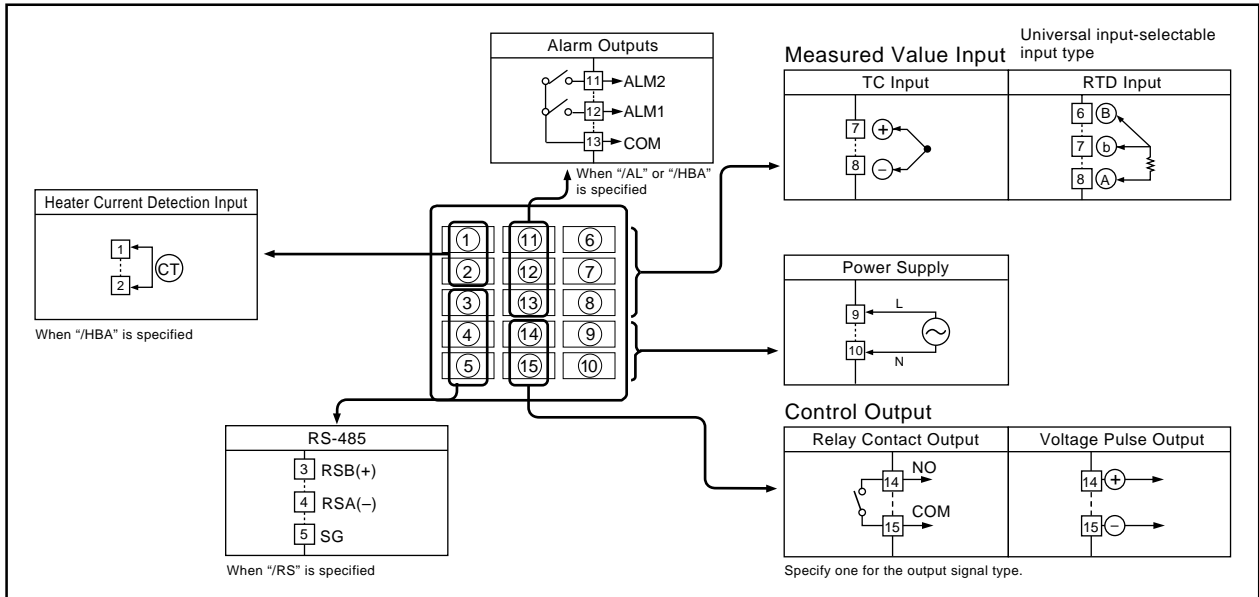
Power supply and relay contact output	600V vinyl insulated wire/cable, JIS C3307, 0.9 to 2.0mm <sup>2</sup>
Thermocouple input	Shielded compensating lead wire, JIS C1610
RTD input	Shielded wire (3-wire), UL2482 (Hitachi cable)
Other signals	Shielded wire

## ● Recommended Terminals

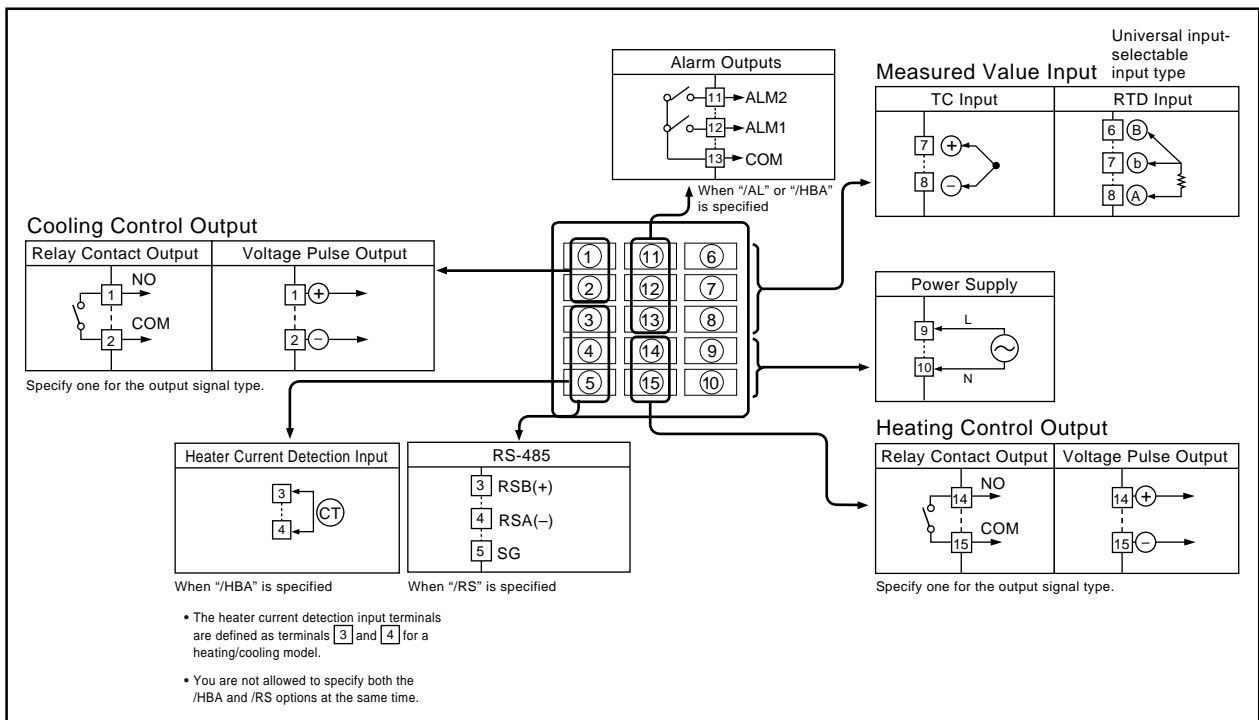
Use M3.5 screw-compatible crimp-on terminals with an insulating sleeve, as shown below.



## ■ UT130 Terminal Arrangement (General purpose control model)



## ■ UT130 Terminal Arrangement (Heating/cooling control model)



# 6. HARDWARE SPECIFICATIONS

## Measured Value Input

- Input: 1 point
  - Input type: Universal; can be selected by software
  - Input accuracy (at  $23 \pm 2^\circ\text{C}$  ambient temperature)
    - Thermocouple/RTD:  $\pm 2^\circ\text{C}$
- However,
- $\pm 4^\circ\text{C}$  for thermocouple input  $-200$  to  $-100^\circ\text{C}$
  - $\pm 3^\circ\text{C}$  for thermocouple input  $-100$  to  $0^\circ\text{C}$
  - $\pm 5^\circ\text{C}$  for type R and S ( $\pm 9^\circ\text{C}$  for 0 to  $500^\circ\text{C}$ )
  - $\pm 9^\circ\text{C}$  for type B (accuracy is not guaranteed for 0 to  $400^\circ\text{C}$ )
- 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:  $1\text{M}\Omega$  or greater for thermocouple or DC mV input. Approx.  $1\text{M}\Omega$  for DC V input
  - Maximum allowable load resistance:  $250\Omega$  for thermocouple or DC mV input
  - Maximum allowable wiring resistance for RTD input:  $10\Omega/\text{wire}$  (The resistance values of three wires must be the same.)
  - Allowable input voltage:  $\pm 10\text{V}$  DC for thermocouple or DC mV input
  - Noise rejection ratio: Normal mode noise: Min. 40dB (50/60Hz) Common mode noise: Min. 120dB
  - Error of reference junction compensation:  $\pm 1.5^\circ\text{C}$  (at  $15$ - $35^\circ\text{C}$ )  $\pm 2.0^\circ\text{C}$  (at  $0$ - $50^\circ\text{C}$ )
- 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 general-purpose control model) or 2 point (for heating/cooling control model)
- Output type: Choose one from (1) to (2) 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  
Off voltage: 0.1V DC or less  $\left\{ \begin{array}{l} \text{load resistance: } 600\Omega \text{ or greater} \\ \text{short-circuit current: approx. } 30\text{mA} \end{array} \right.$

## 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, Deenergized on deviation high limit, Deenergized on deviation low limit, Deviation high and low limits, High and low limits within deviation, Deenergized on PV high limit, Deenergized on PV low limit, self-diagnostic alarm, failure alarm
- 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 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 or CTL-12-S36-8 (URD Co., Ltd.) To be purchased separately.

## Communication Function

The communication function is provided only when the /RS option is specified. (For details, read the instruction manual of the communications function IM 5C1E11-10E.)

### 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

## Safety and EMC Standards

- Safety: Confirms to IEC1010-1: 1990 and EN61010-1: 1992  
Approved by CSA1010 for installation category CAT II (IEC1010-1)  
Certified for UL508 (application pending)
  - EMC standards: Complies with:
    - EN55011: Class A, Group 1 for EMI (emission)
    - EN55082-2: 1995 for EMS (immunity)
- The UT130 temperature controllers conform to the standards specified under the following conditions.
- All wires except those for the power supply and relay contact output terminals are shielded.
  - The controller does not fluctuate more than 20% even when noise is applied.

## Power Supply and Isolation

### Power Supply (Common for All Models)

Power supply	Voltage	Rated at 100-240VAC ( $\pm 10\%$ ) (universal power supply)
	Frequency	50 or 60Hz
Maximum power consumption		8VA
Memory		Non-volatile memory
Withstanding voltage	Between primary terminals and secondary terminals (See note 1.)	1500V AC for 1 minute (See note 2.)
	Insulation resistance	Between primary terminals and secondary terminals (See note 1.)

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.

### Isolation

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

● Power supply terminals	● Measured value input terminals
● Control output terminals (relay contacts)	● CT input terminals for /HBA
● Alarm output terminals (2 relay contacts)	● Internal circuit
	● Control output terminals: Voltage pulse
	● RS-485 terminals for /RS

Note: Neither the measured value input terminals, CT input terminals for the /HBA option, nor input terminals for the /EX option are isolated from the internal circuit.

## Construction, Mounting, and Wiring

- Construction: Splash-proof IP65 for front panel when not mounted side-by-side
- Casing: ABS resin and polycarbonate
- Case color: Black
- Mounting: Flush panel mounting
- Terminals: Screw terminals

## Environmental Conditions

### Normal Operating Conditions

- Warm-up time: At least 30 minutes
- Ambient temperature:  $0$ - $50^\circ\text{C}$  ( $0$ - $40^\circ\text{C}$  when mounted side-by-side)
- Rate of change of temperature:  $10^\circ\text{C}/\text{h}$  or less
- Ambient humidity: 20-90% RH (no condensation allowed)
- Magnetic field: 400AT/m or less
- Continuous vibrations of 5 to 14Hz: Amplitude of 1.2mm or less
- Continuous vibrations of 14 to 150Hz:  $4.9\text{m}/\text{s}^2$  (0.5G) or less
- Short-period vibrations:  $14.7\text{m}/\text{s}^2$  (1.5G) for 15 seconds or less
- Shock:  $147\text{m}/\text{s}^2$  (15G) 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:  $\pm 2\mu\text{V}/^\circ\text{C}$  or  $\pm 0.02\%$  of F.S./ $^\circ\text{C}$ , whichever is the larger
  - Resistance temperature detector:  $\pm 0.05^\circ\text{C}/^\circ\text{C}$
  - Analog output:  $\pm 0.05\%$  of F.S./ $^\circ\text{C}$
- (2) Effect from fluctuation of power supply voltage (within rated voltage range)
  - Analog input:  $\pm 0.2\mu\text{V}/\text{V}$  or  $\pm 0.002\%$  of F.S./V, whichever is the large
  - Analog output:  $\pm 0.05\%$  of full scale/V

### Transportation and Storage Conditions

- Temperature:  $-25$  to  $70^\circ\text{C}$
- Humidity: 5 to 95% RH (no condensation allowed)
- Shock: Package drop height 90cm (when packed in the dedicated package)

# 7. KEY OPERATIONS



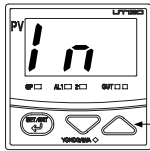
## NOTE

At power-on, the temperature controller displays the operation display, 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 below.)

- (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, 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. 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.

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

**NOTE**

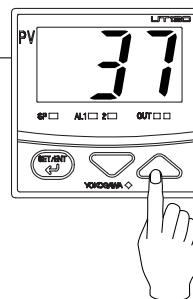


When “In” appears, press the key to display the input range code you want to use, then press the key to register it. After this operation, the controller shows the operation display.

### ● UT130 Input Ranges

Input type	Range (°C)	Range code (°F)	Range (°F)	Range code (°F)
Thermocouple	K	-199 to 999°C	-199 to 999°F	31
		0 to 600°C	32 to 999°F	32
		0 to 400°C	32 to 750°F	33
	J	-199 to 200°C	-199 to 400°F	34
	T	-199 to 999°C	-199 to 999°F	35
	E	-199 to 400°C	-199 to 750°F	36
RTD	Pt100	-199 to 999°C	-199 to 999°F	37
		-199 to 200°C	-199 to 400°F	38
	L	-199 to 900°C	-199 to 999°F	42
	U	-199 to 400°C	-199 to 750°F	43
	Pt100	-199 to 850°C	-199 to 999°F	45
		0 to 400°C	32 to 750°F	46
		-199 to 200°C	-199 to 400°F	47
-19.9 to 99.9°C		-199 to 999°F	48	
JPt100	-199 to 500°C	-199 to 999°F	19	

For example, to select thermocouple type E (°F), set the range code to 37.





## **WARNING**

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

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## **NOTE**

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The temperature controller is shipped with the parameters set at the factory-set defaults. Check the default values against the “Parameter List” in the following page (P.13, 14), and change the parameter settings that need to be changed.

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The following 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.12) will help you understand how this works.**

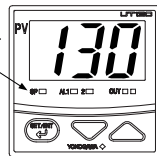
## ■ Changing Target Setpoint (SP)

The following instructions assume that the controller is already receiving power.



### Step 1:

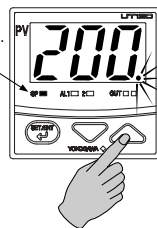
Confirm that the controller shows the operation display during normal operation. (See note 1)

If the controller displays PV, press the  key once to display SP.




### Step 2:

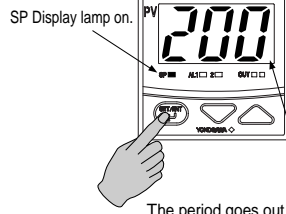
Press the  or  key to change the displayed SP value to the required value. In this example, SP is changed to 200°C.



The period flashes while the value is being changed.

### Step 3:

Press the  key once to register the setting.



The period goes out.

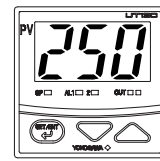
- Note 1: The operation display shows either PV or SP. You can find out which data is displayed by the SP display lamp status.
- OFF: PV display of operation display
  - ON: SP display of operation display
  - Slow flashing: Parameter code is displayed.
  - Quick flashing: Parameter value is displayed.

## ■ Changing Alarm 1 Setpoint (A1)


(This setpoint appears only if the /AL or /HBA option is specified.)

### Step 1:

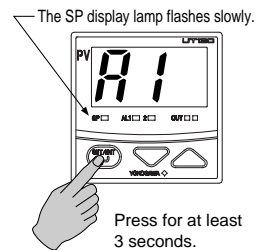
Confirm that the controller shows the operation display during normal operation. (See note 1)



### Step 2:


To enter the operation parameter setting display, press the  key for at least 3 seconds.

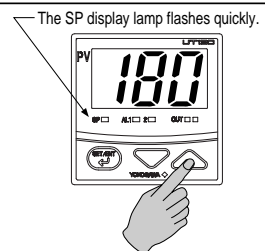
(If your controller has the /AL or /HBA option, the display for the Alarm 1 setpoint (A1) appears. (If not, control mode (CTL) appears.)





Press for at least 3 seconds.

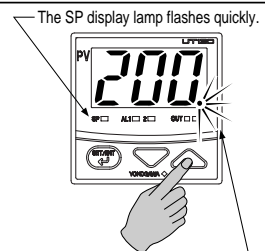
### Step 3:

Press the  key once to display the current A1 value.



### Step 4:

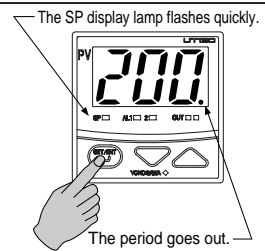
Press the  or  key to change the displayed A1 value. In this example, A1 is changed to 200°C.



The period flashes while the value is being changed.



### Step 5:


Press the  key once to register the setting.

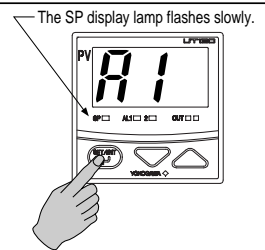


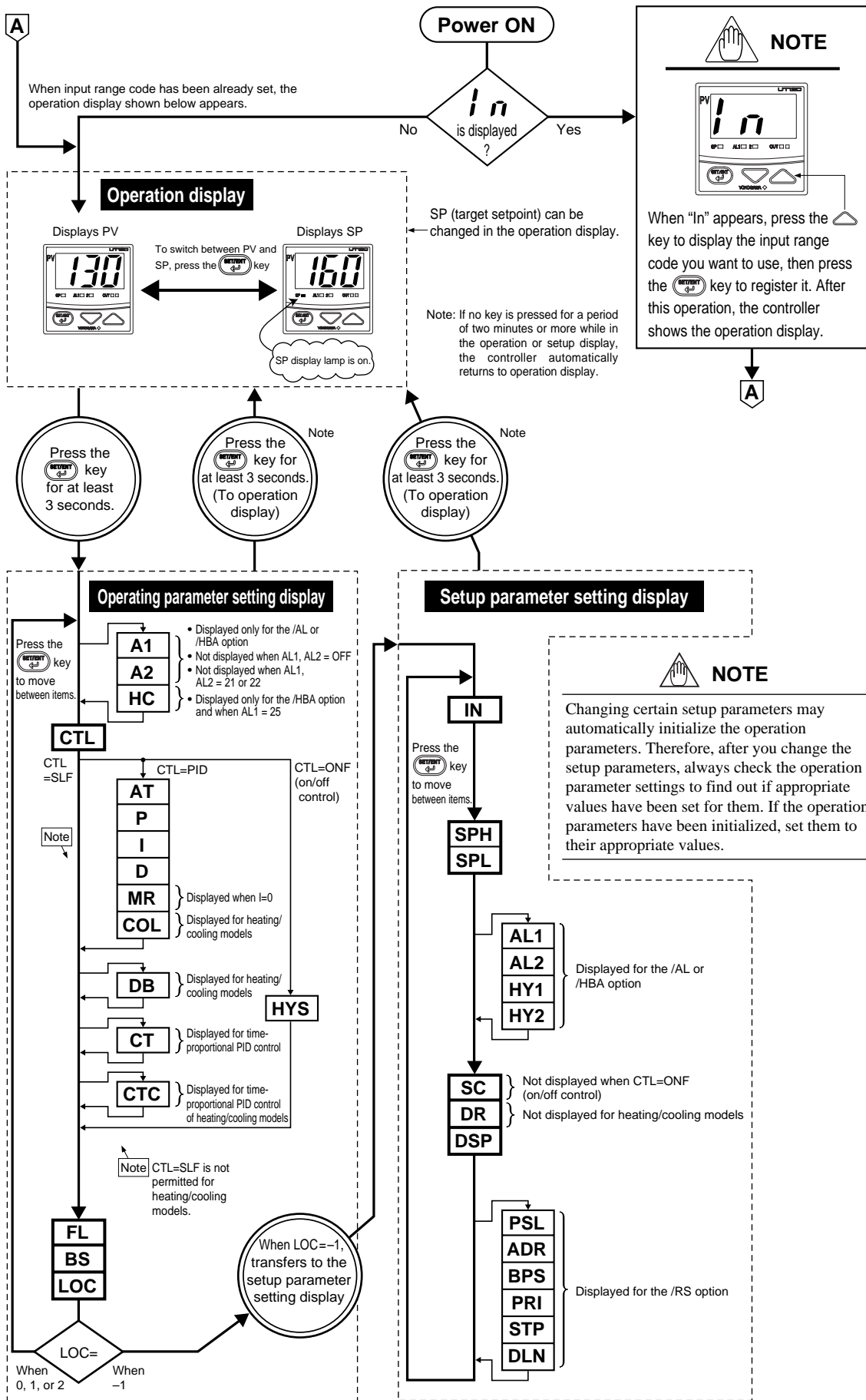
The period goes out.

### Step 6:

To return to the display at step 2, press the  key once again. Another press of the  key calls up the Alarm 2 setpoint display.

To return to the operation display, press the  key for at least 3 seconds.





## ■ Parameter Lists

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

Code	Name	Setting range and unit	Default	User setting
(SP value display)	Target setpoint	Minimum value (SPL) to maximum value (SPH) of target setpoint range Unit: °C	SPL	

### (2) Operating Parameters

Code	Name	Setting range and unit	Default	User setting
A1 <i>A1</i>	Alarm 1 setpoint	<ul style="list-style-type: none"> <li>■ PV alarm Unit: °C/°F Setting range: minimum value to maximum value of measurement range</li> <li>■ Deviation alarm Unit: °C/°F Setting range: -100 to 100% of the measurement range span</li> </ul>	Max. value of measurement range (PV alarm)	
A2 <i>A2</i>	Alarm 2 setpoint	<ul style="list-style-type: none"> <li>■ Heater burnout alarm Unit: A (ampere) Setting range: OFF, 1 to 80 (can be set for the alarm 1 setpoint only)</li> </ul>	Min. value of measurement range (PV alarm)	
HC <i>HC</i>	Heater current measured value	“HC” is not a parameter to be set. The current value (0 to 80) of heater burnout detector is displayed. Unit: A (ampere) Settings: When the display value is ---, the heater current is not being measured.		
CTL <i>CTL</i>	Control mode	ONF: On/off control PID: PID control SLF: Dynamic auto tune control (cannot be set for heating/cooling control)	SLF for general; PID (for heating/cooling control)	
AT <i>At</i>	Auto-tuning	OFF: Stop auto-tuning ON: Start auto-tuning	OFF	
P <i>P</i>	Proportional band	1°C/°F to the temperature that corresponds to 100% of the measurement range span	5% of measurement range span	
I <i>I</i>	Integral time	1 to 999 seconds; 0: no integral action	240 seconds	
D <i>d</i>	Derivative time	1 to 999 seconds; 0: no derivative action	60 seconds	
MR <i>mr</i>	Manual reset	-100 to 100%	50.0%; 0.0% for heating/cooling models	
COL <i>COL</i>	Cooling-side gain	0.01 to 9.99 times	1.00 times	
DB <i>db</i>	Deadband	<ul style="list-style-type: none"> <li>■ PID control Unit: °C/°F Setting range: -(proportional band setting) to +(proportional band setting)</li> <li>■ On/off control Unit: °C/°F Setting range: -50 to +50% of measurement range span</li> </ul>	3% of measurement range span	
HYS <i>HYS</i>	Hysteresis for on/off control	0°C/°F to the temperature that corresponds to 100% of the measurement range span	0.5% of measurement range span	
CT <i>CT</i>	Cycle time of control output	1 to 240 seconds	30 seconds	
CTC <i>CTC</i>	Cycle time of cooling-side control output	1 to 240 seconds	30 seconds	
FL <i>FL</i>	Input filter	OFF, 1 to 120 seconds	2 seconds	
BS <i>bs</i>	PV bias	-100 to 100% of measurement range span	0% of instrument range span	
LOC <i>LoL</i>	Key lock	0: No key lock 1: Prevents operations from being changed except for the changing of SP in the operation display 2: Prevents all parameter changing operations -1: Set to enter the setup parameter setting display	0	

### (3) Setup Parameters

Code	Name	Setting range and unit	Default	User setting
IN <i>ln</i>	Input type	1 to 7, 12, 13, 15 to 19 (See input range code list.) OFF: No input (If no input type is specified at the time of ordering, you must set the input type.)	OFF, or the input range code specified with order	
SPH <i>SPH</i>	Maximum value of target setpoint range	(SPL value +1°C) to the maximum value of the measurement range; Unit: °C	Maximum value of measurement range	
SPL <i>SPL</i>	Minimum value of target setpoint range	Minimum value of measurement range to (SPH -1°C) Unit: °C	Minimum value of measurement range	
AL1 <i>AL1</i>	Alarm 1 type	OFF, 1 to 22 (See the alarm function list.) 25 (for the heater burnout alarm /HBA option only)	PV high limit alarm	
AL2 <i>AL2</i>	Alarm 2 type	OFF, 1 to 22 (See the alarm function list.)	PV low limit alarm	
HY1 <i>HY1</i>	Alarm 1 hysteresis	0 to 100% of measurement range span Unit: °C	0.5% of measurement range span	
HY2 <i>HY2</i>	Alarm 2 hysteresis			
SC <i>SC</i>	SUPER function	ON: Uses the SUPER function OFF: Does not use SUPER function Note: Not displayed when on/off control	OFF	
DR <i>dr</i>	Direct/reverse action	0: Reverse action 1: Direct action Note: Not displayed on heating/cooling models	0	
DSP <i>dSP</i>	Priority of PV/SP display	0: Displays PV 1: Displays target setpoint (SP)	0	
PSL <i>PSL</i>	Protocol selection	0: PC-link communication 1: PC-link communication with sum check 2: Ladder communication 3: Modbus in ASCII mode 4: Modbus in RTU mode	0	
ADR <i>Adr</i>	Controller address	1 to 99 However, the number of controllers that can be connected per host device is 31 at the maximum.	1	
BPS <i>bPS</i>	Baud rate	2.4: 2400 bps 4.8: 4800 bps 9.6: 9600 bps	9.6	
PRI <i>Pr1</i>	Parity	NON: Disabled EVN: Even parity ODD: Odd parity	EVN	
STP <i>STP</i>	Stop bit	1 or 2 bits	1 bit	
DLN <i>dLn</i>	Data length	7 or 8 bits • 8 bits when ladder, MODBUS (RTU) • 7 bits when MODBUS (ASCII)	8 bits	

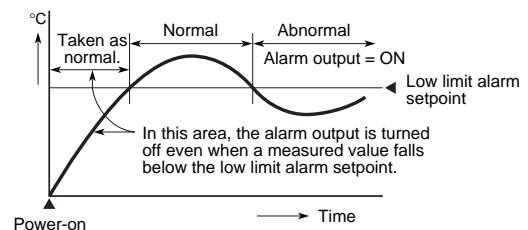
## Alarm Function List

Alarm type	Action (“Opn” and “Cls” indicate that the relay contact is opened and closed; “(on)” and “(off)” indicate that the lamp is on and off; and white triangles indicate temperature control setpoints.)	Alarm type code		Alarm type	Action (“Opn” and “Cls” indicate that the relay contact is opened and closed; “(on)” and “(off)” indicate that the lamp is on and off; and white triangles indicate temperature control setpoints.)	Alarm type code	
		Closed contact during alarm	Open contact during alarm			Closed contact during alarm	Open contact during alarm
No alarm		OFF					
PV high limit		1 11 (See note.)		Deenergized on deviation low limit		6 16 (See note.)	
PV low limit		2 12 (See note.)		Deviation high and low limit		7 17 (See note.)	
Deviation high limit		3 13 (See note.)		Deviation within-high-and-low-limit		8 18 (See note.)	
Deviation low limit		4 14 (See note.)		Deenergized on PV high limit		9 19 (See note.)	
Deenergized on deviation high limit		5 15 (See note.)		Deenergized on PV low limit		10 20 (See note.)	
Self-diagnostics alarm	The contact is closed at input burnout.	21		Heater disconnection alarm		25	
Failure alarm	The output contact is opened in the following events: <ul style="list-style-type: none"> <li>• Program error</li> <li>• ROM error</li> <li>• RAM error</li> <li>• power failure</li> <li>• A/D converter error</li> <li>• RJC error</li> <li>• EEPROM error</li> </ul>	22					

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.

Waiting action



## ■ Description of Parameters

This section describes the parameter functions specific to the UT130 temperature controllers.  
(The functions described in other sections of this manual and the general functions are not discussed.)

Parameter	Function	Parameter	Function
<b>CTL</b>	<p>Control mode</p> <p>Select one from the following:</p> <ul style="list-style-type: none"> <li>a. Dynamic auto tune control (SLF) (See note)</li> <li>b. PID control (PID)</li> <li>c. On/off control</li> </ul> <p>Note: Dynamic auto tune control is not available for heating/cooling control.</p> <p>Read the section in Page 17 to find out more about dynamic auto tune control.</p>	<b>PV bias</b>	<p>This function adds a bias value to the measured input value, and the result is used for display and control computation.</p> $\boxed{\text{PV value inside the controller}} = \boxed{\text{measured input value}} + \boxed{\text{PV bias}}$
<b>MR</b>	<p>Manual reset</p> <p>You can set this parameter only for control without an integral action (when registered as CTL=PID and I=0). 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.</p>	<b>BS</b>	<p>Maximum/minimum value of target setpoint range</p> <p>Using the SPH and SPL parameters, you can limit the setting range of the target setpoint (SP) within the measured input range.</p> <p>This function prevents SP from being mistakenly set at too large or too small a value (beyond the setting range).</p>
<b>COL</b>	<p>Cooling-side gain</p> <p>For heating/cooling control, you can set the ratio between the cooling-side output and heating-side output.</p> <p>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.</p>	<b>SPH, SPL</b>	
<b>DB</b>	<p>Deadband</p> <p>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.</p> <ol style="list-style-type: none"> <li>1. When the deadband of a heating/cooling model is positive (Proportional band [P] control)</li> <li>2. When both the heating and cooling sides are under on-off control</li> </ol>	<b>HYS1, HYS2</b>	<p>Hysteresis for alarm 1 and 2</p> <p>The alarms are output as relay outputs. Since a relay has a limited life, excessive on/off actions will shorten the life of the alarm. To prevent this, you can set a hysteresis band to prevent excessive on/off actions for both alarm 1 and alarm 2.</p>
<b>HYS</b>	<p>Hysteresis for on/off control</p> <p>For on/off control (CTL=ONF), you can set a hysteresis band around the on/off point (SP) to prevent chattering.</p>	<b>SC</b>	<p>SUPER function selection</p> <p>The SUPER function is effective in the following cases:</p> <ul style="list-style-type: none"> <li>a. An overshoot must be suppressed.</li> <li>b. The rise-up time needs to be shortened.</li> <li>c. The load often varies.</li> <li>d. SP is changed frequently.</li> </ul> <p>Note 1: The SUPER function will not work when on/off control is selected, or I or D constants is set at 0 in PID control.</p> <p>Note 2: For some types of systems, the SUPER function may not be so useful. If this is the case, turn off the function.</p>
<b>CT CTC</b>	<p>Cycle time of control output</p> <p>The cycle time is the period of on/off repetitions of a relay or voltage pulse output in time proportional PID control. The ratio of the ON time to the cycle time is proportional to the control output value.</p>	<b>DSP</b>	<p>PV/SP display priority</p> <p>Since the UT130 controller has a single data indicator, you can give display priority to either PV or SP. The data which has the priority will be displayed on the data indicator upon power-on or when the operation display is resumed from a parameter setting display using the  key (by pressing for at least 3 seconds).</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Displays PV</p> </div> <div style="text-align: center;"> <p>Displays SP</p> </div> </div> <p>To switch the display between PV and SP, press the  key.</p>
<b>FL</b>	<p>Input filter</p> <p>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 FB sets the time constant. If a larger time constant is set, the filter can remove more noise.</p>		

## ■ 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:

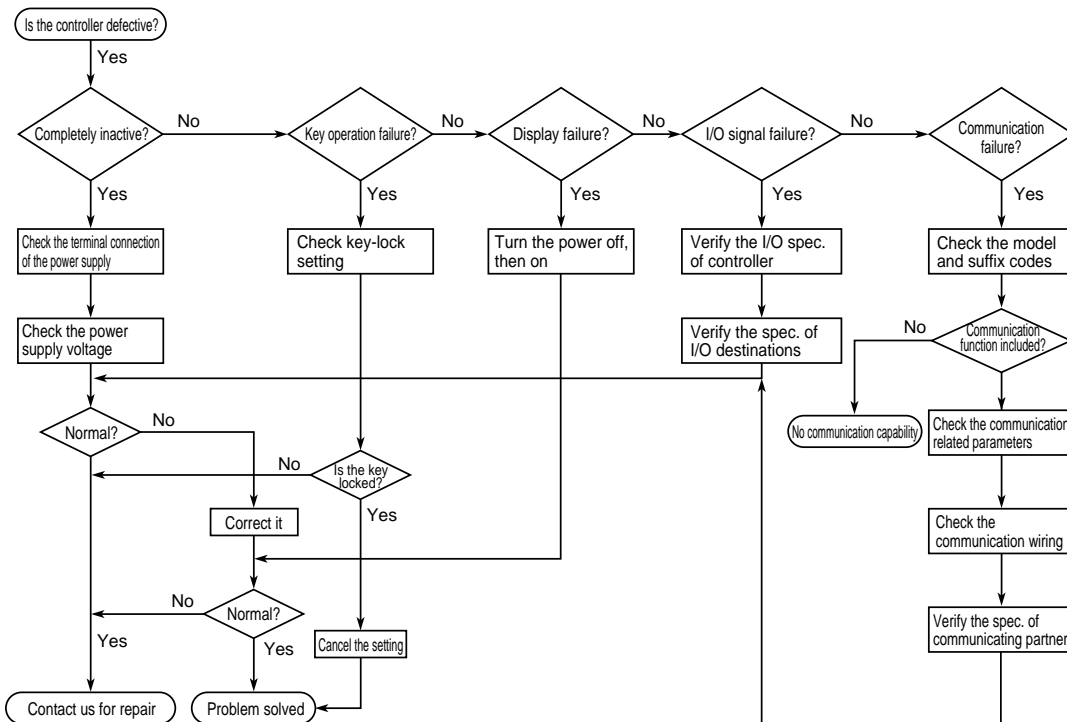
- Set the parameter CTL at PID.
- Set the PID constants at the factory-set defaults ( $P = (\text{upper range-limit} - \text{lower range-limit}) \times 5\%$ ;  $I = 240 \text{ sec.}$ ; and  $D = 60 \text{ sec.}$ )
- Set the parameter CTL at SLF.

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.

---

# 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.

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

(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.

Display	Error content	Display	Error content
Unknown (at power-on)	CPU failure	Flashing "Err" (at power-on)	RAM or ROM failure
All extinguished (at power-on)	Power source failure	Flashing "Err" (during operation)	A/D converter failure, RJC failure, or EEPROM failure
"Err" (at power-on)	Calibration abnormal		

## ■ When Power Failure Occurred during Operation

- Momentary power failures of less than 20msec. have no effect on the controller operation (i.e., normal operation continues).
- For power failures longer than 20msec, 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)
  - Parameter settings: Maintained
  - Auto-tuning: Canceled



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World Wide Web. site at  
[http://www.yokogawa.co.jp/MCC/Welcome\\_e.htm](http://www.yokogawa.co.jp/MCC/Welcome_e.htm)

**NOTICE**

- Before using the product, read the instruction manual carefully to ensure proper operation.

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Represented by :

Note: This instruction manual (IM 5C1E01-41E) is a re-edited, A4-size version of the IM 5C1E01-01E instruction 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.