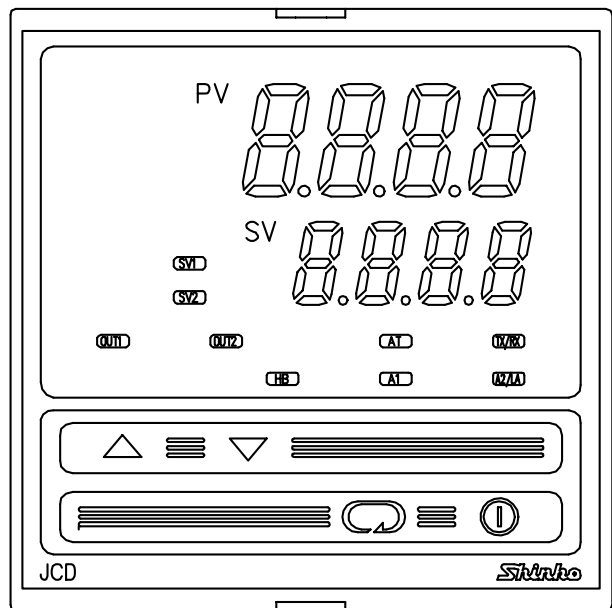
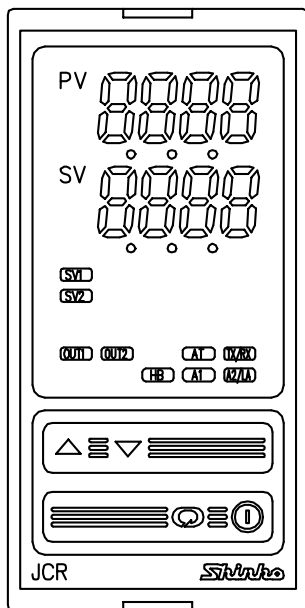


MICROCOMPUTER BASED  
DIGITAL INDICATING CONTROLLER  
**JCR-33A, JCD-33A**

INSTRUCTION MANUAL



**Shinko**

# Preface


Thank you for the purchase of our microcomputer based temperature indicating controller JCR-33A or JCD-33A. This manual contains instructions for the mounting, functions, operations and notes when operating the JCR-33A and JCD-33A. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

## Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- Specifications, external appearance of the JCR-33A and JCD-33A and the contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed within a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

## **SAFETY PRECAUTIONS (Be sure to read these precautions before using our products.)**

The safety precautions are classified into categories: "Warning" and "Caution".

Depending on circumstances, procedures indicated by  Caution may be linked to serious results, so be sure to follow the directions for usage.



### **Warning**

Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.



### **Caution**

Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.



### **Warning**

- To prevent an electric shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to instrument, parts replacement may only be undertaken by Shinko or qualified service personnel.



## **SAFETY PRECAUTIONS**

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

### **Caution with respect to Export Trade Control Ordinance**

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument.

In the case of resale, ensure that this instrument is not illegally exported.

## 1. Installation precautions



### Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change suddenly
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

**Note** • Do not install this instrument near flammable material even though the case of this instrument is made of flame resistant resin.

Avoid setting this instrument directly on flammable material.

## 2. Wiring precautions



### Caution

- Do not leave wire chips into the instrument, because they could cause fire, malfunction or inconvenience.
- Use the solderless terminal with an isolation sleeve in which an M3 screw fits when wiring the JCD-33A or JCR-33A.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw within the specified torque.  
If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor, as the input circuit may be burnt out.
- This controller has no built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller.  
(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- When using a 24V AC/DC for the power source, do not confuse the polarity when it is DC.

## 3. Running and maintenance precautions



### Caution

- It is recommended that PID auto-tuning be performed on the trial run.
- Do not touch live terminals. This may cause electric shock or problems in operation.
- Turn the power supplied to the instrument OFF when retightening the terminal and cleaning. Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.
- Use a soft, dry cloth when cleaning the instrument.  
(Alcohol based substances may cause tarnishing or defacement of the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object or press hard on them

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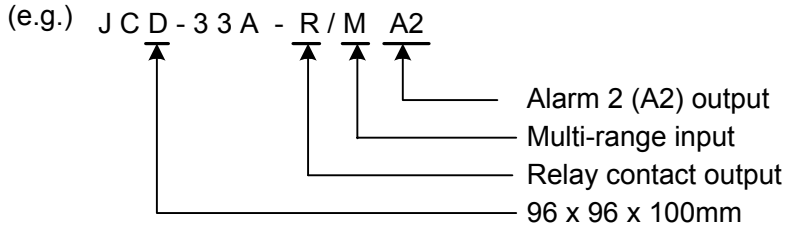
## Characters used in this manual

Indication	4	0	1	2	3	4	5	6	7	8	9	C	F
Number, °C/°F	-1	0	1	2	3	4	5	6	7	8	9	°C	°F
Indication	A	b	c	d	E	F	G	H	I	J	k	L	M
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	n	o	P	q	r	s	t	U	v	w	x	y	Z
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

# 1. Model name

## 1.1 Model name

Series name, Control output (OUT1), input and option code, etc are entered where underlined.



## Standard specifications

J C <input type="checkbox"/> - 3 3 A - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/>		
Series name	R	JCR-33A: W48 x H96 x D100mm
	D	JCD-33A: W96 x H96 x D100mm
Alarm 1 (A1)	A	Alarm action can be selected by keypad. *1
Control output (OUT1)	R	Relay contact
	S	Non-contact voltage (SSR drive)
	A	DC current
Input	M	Multi-range *2
Supply voltage	1	24V AC/DC *3

\*1: 10 types of alarm action (including No alarm action) and Energized/Deenergized can be selected by keypad.

\*2: Input types (10 thermocouple, 2 RTD, 2 DC current and 4 DC voltage types) can be selected by keypad.

\*3: 100 to 240V AC is standard specification for the supply voltage. However, when ordering 24V AC/DC, enter "1" after the input code.

## Optional specifications

Code	Name	
A2	Alarm 2 (A2) *1, *2	
W	Heater burnout Alarm *2, *3	
DR	Heating/Cooling control output (OUT2)	Relay contact output *2
DS		Non-contact voltage output *2
DA		DC current output *2
C5	Serial communication (RS-485) *4	
LA	Loop break alarm *1	
P24	Isolated power output *5	
BK	Color: Black	
TC	Terminal cover	

\*1: When A2 output and LA output are applied together, they share output terminals.

\*2: Only 2 options can be added from A2 output, Heater burnout alarm output and Heating/Cooling control output.

\*3: For DC current output type, Heater burnout alarm output cannot be added.

\*4: When Serial communication is added, SV1/SV2 external selection (standard function) does not work.

\*5: Heating/Cooling control output and Heater burnout alarm output cannot be added when Isolated power output is added.

## 1.2 Rated input

Input type	Input range		Resolution
K	-200 to 1370 °C	-320 to 2500 °F	1°C(°F)
	-199.9 to 400.0 °C	-199.9 to 750.0 °F	0.1°C(°F)
J	-200 to 1000 °C	-320 to 1800 °F	1°C(°F)
R	0 to 1760 °C	0 to 3200 °F	1°C(°F)
S	0 to 1760 °C	0 to 3200 °F	1°C(°F)
B	0 to 1820 °C	0 to 3300 °F	1°C(°F)
E	-200 to 800 °C	-320 to 1500 °F	1°C(°F)
T	-199.9 to 400.0 °C	-199.9 to 750.0 °F	0.1°C(°F)
N	-200 to 1300 °C	-320 to 2300 °F	1°C(°F)
PL-II	0 to 1390 °C	0 to 2500 °F	1°C(°F)
C(W/Re5-26)	0 to 2315 °C	0 to 4200 °F	1°C(°F)
Pt100	-199.9 to 850.0 °C	-199.9 to 999.9 °F	0.1°C(°F)
	-200 to 850 °C	-300 to 1500 °F	1°C(°F)
JPt100	-199.9 to 500.0 °C	-199.9 to 900.0 °F	0.1°C(°F)
	-200 to 500 °C	-300 to 900 °F	1°C(°F)
4 to 20mA DC	-1999 to 9999	*1, *2	1
0 to 20mA DC	-1999 to 9999	*1, *2	1
0 to 1V DC	-1999 to 9999	*1	1
0 to 5V DC	-1999 to 9999	*1	1
1 to 5V DC	-1999 to 9999	*1	1
0 to 10V DC	-1999 to 9999	*1	1

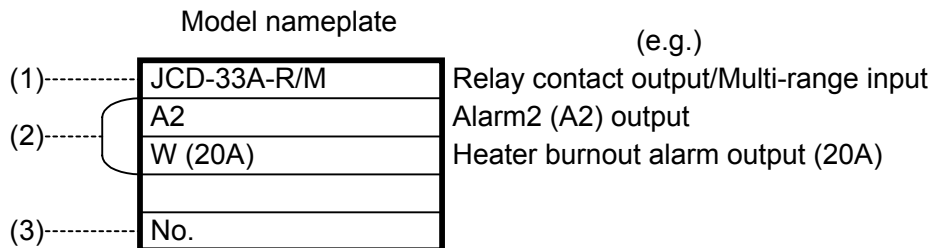
\*1: For DC input, input range and decimal point place can be changed.

\*2: Connect 50Ω shunt resistor (sold separately) between input terminals.

## 1.3 How to read the model nameplate

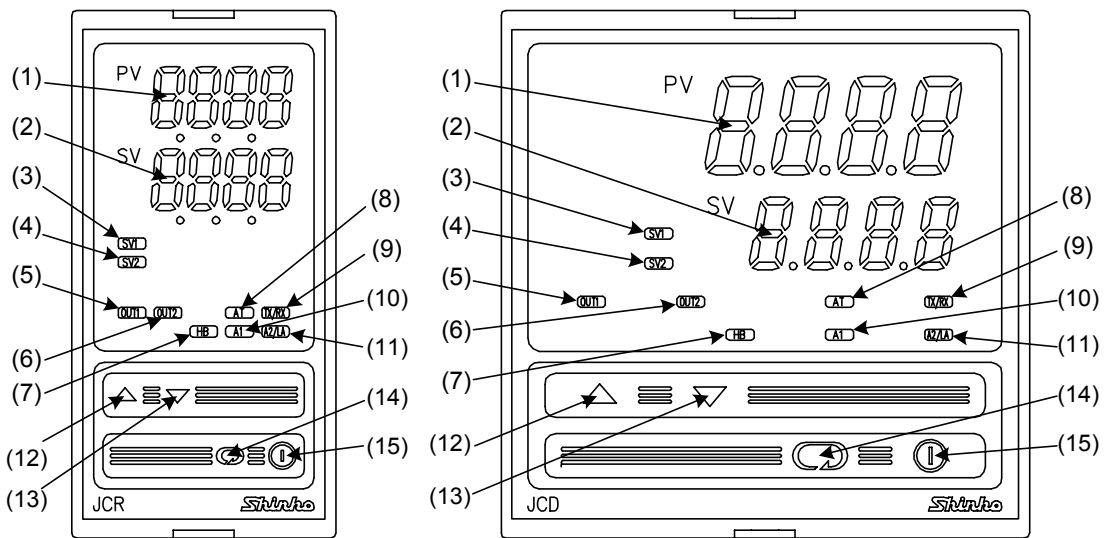
Model nameplates are attached to the case and the inner assembly.

When the supply voltage is 24V AC/DC, "1" is entered before the option code.



(1): Model name, (2): Option name, (3): Serial number

## 2. Name and functions of the sections



(Fig. 2-1)

### (1) PV display

Indicates the process variable (PV) with a red LED.

### (2) SV display

Indicates the setting value (SV) or manipulated variable (MV) with a green LED.

### (3) SV1 indicator

When SV 1 is selected, a green LED lights.

### (4) SV2 indicator

When SV 2 is selected, a yellow LED lights.

### (5) OUT1 indicator

When OUT1 or Heating output is ON, a green LED lights.

(In the case of DC current output type, it flashes in a 0.25 second cycle corresponding to the output manipulated variable.)

### (6) OUT2 indicator

When OUT2 is ON, a yellow LED lights.

(In the case of DC current output type, it flashes in a 0.25 second cycle corresponding to the output manipulated variable.)

### (7) HB indicator

When Heater burnout alarm output or Sensor burnout alarm output is ON, a red LED lights.

(When Heater burnout Alarm is added, a red LED also lights when the indication is overscale or underscale)

### (8) AT indicator

When Auto-tuning or Auto-reset is active, a yellow LED flashes.

### (9) TX/RX indicator

When Serial communication TX (transmitting) is outputted, a yellow LED lights.



(10) A1 indicator

When A1 output is ON, a red LED lights.

(11) A2/LA indicator

When A2 output or La output is ON, a red LED lights.

(12) Increase key ( $\triangle$ )

Increases numeric value of the setting value.

(13) Decrease key ( $\nabla$ )

Decreases numeric value of the setting value.

(14) Mode key ( $\odot$ )

Switches the setting mode and registers the setting value and selected value.

(Setting value and selected value are registered by pressing the mode key.)

(15) OUT/OFF key ( $\text{Ⓜ}$ )

- When OUT/OFF function is selected in the OUT/OFF key function selection, control output can be turned on or off. By pressing OUT/OFF key for approx. 1 second from any mode, control output OFF function works.  
Once the control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned OFF and ON again.  
Control output OFF function keeps working.  
To cancel the function, press the OUT/OFF key again for approx. 1 second.
- When Auto/Manual control function is selected in the OUT/OFF key function selection, automatic control starts when the power to the controller is turned on.  
If the OUT/OFF key is pressed again in this status, manual control starts.  
If the OUT/OFF key is pressed again during manual control, the control reverts to automatic one. However, Auto/Manual function can be switched only in the PV/SV display mode.



## Notice

When setting the specifications and functions of this controller, connect terminals 2 and 3 for power source first, then set them referring to “5. Setup” before performing “3. Mounting to control panel” and “4. Wiring connection”.

# 3. Mounting to control panel

## 3.1 Site selection

This instrument is intended to be used under the following conditions (IEC61010-1):

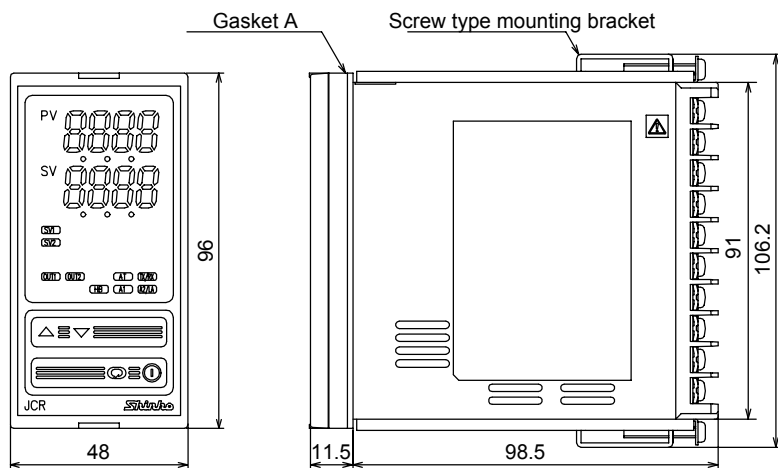
Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- (1) A minimum of dust, and an absence of corrosive gases
- (2) No flammable, explosive gases
- (3) No mechanical vibrations or shocks
- (4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change suddenly
- (5) An ambient non-condensing humidity of 35 to 85%RH
- (6) No large capacity electromagnetic switches or cables through which large current is flowing
- (7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

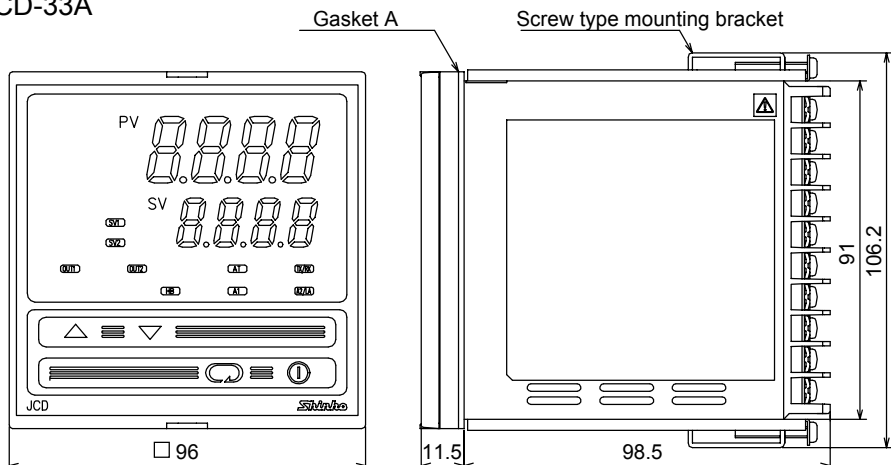
## 3.2 External dimensions

- JCR-33A



(Fig. 3.2-1)

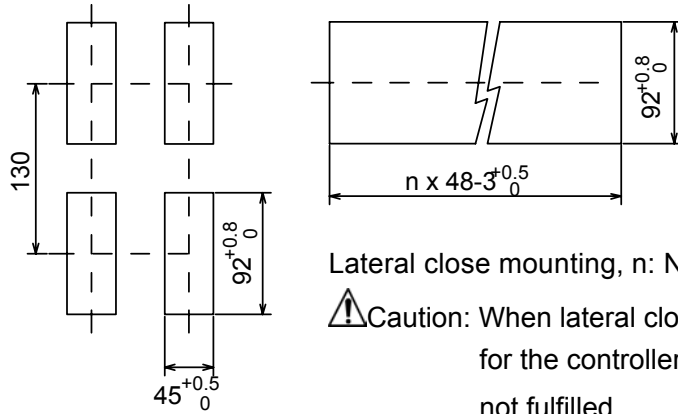
- JCD-33A



(Fig. 3.2-2)

### 3.3 Panel cutout

- JCR-33A

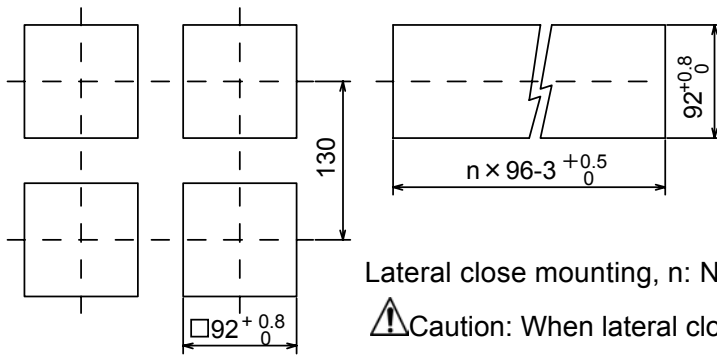


Lateral close mounting, n: Number of units mounted

⚠ Caution: When lateral close mounting is used for the controller, IP66 specification is not fulfilled.

(Fig. 3.3-1)

- JCD-33A



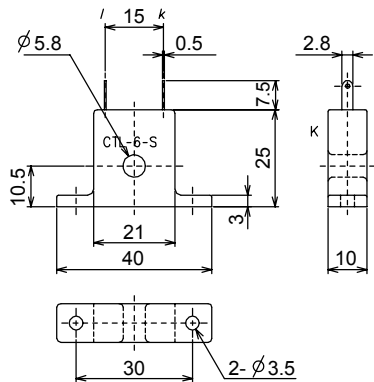
Lateral close mounting, n: Number of units mounted

⚠ Caution: When lateral close mounting is used for the controller, IP66 specification is not fulfilled.

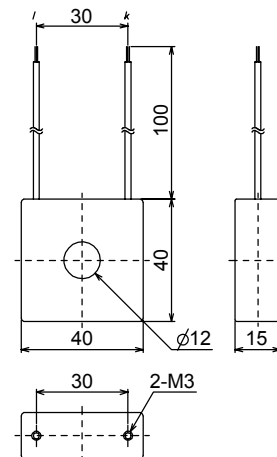
(Fig. 3.3-2)

### 3.4 CT (Current transformer) external dimensions

CTL-6S (for 5A, 10A, 20A)



CTL-12-S36-10L1 (for 50A)



(Fig. 3.4-1)

### 3.5 Mounting (both JCR-33A and JCD-33A)



## Warning

As the case is made of resin, do not use excessive force while screwing in the mounting bracket, or the case could be damaged.  
The torque is approximately 0.12N•m.

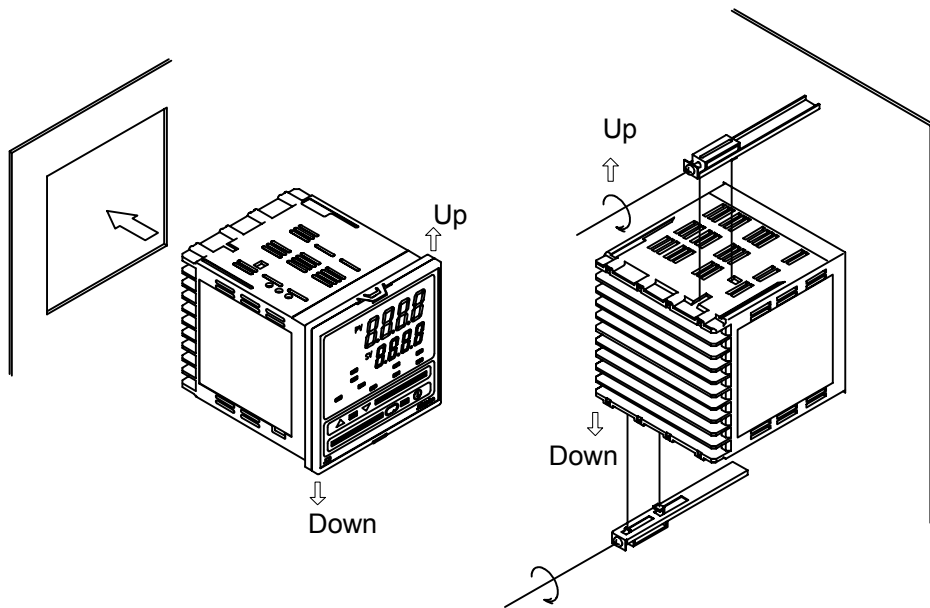
To fulfill the Dust-proof/Drip-proof IP66 specification, mount this unit vertically and check the rigidity of the panel where this unit is mounted.

If rigidity is not enough, Dust-proof/Drip-proof IP66 specification may not be guaranteed.

Mounting panel thickness: Within 1 to 15mm

Insert this unit from the front side of the panel.

Attach the mounting brackets by the holes at the top and bottom of the case and secure the controller in place with the screws.



(Fig. 3.5-1)

# 4. Wiring connection



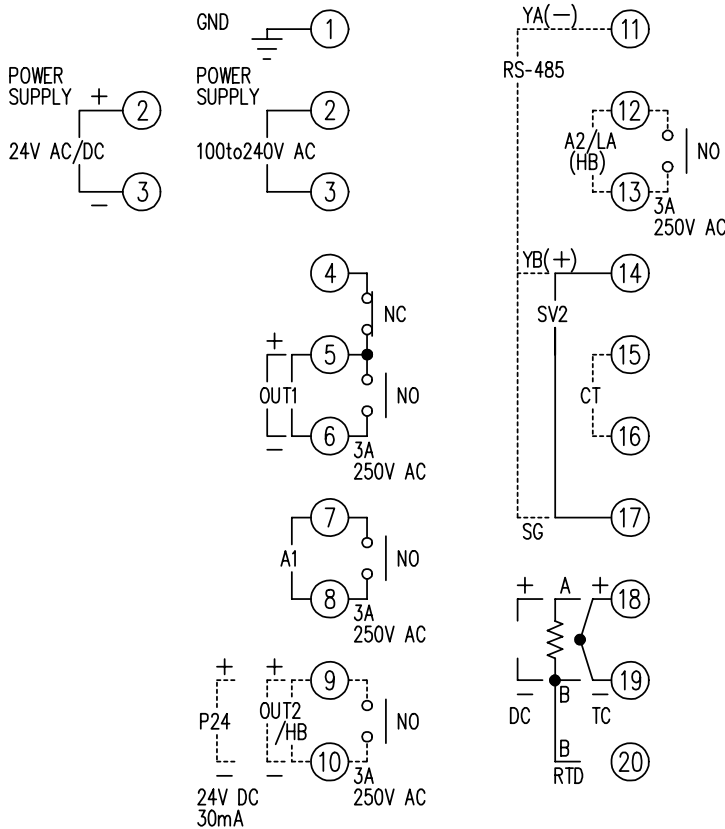
## Warning

Turn the power supply to the instrument off before wiring or checking.

Working or touching the terminal with the power switched on may result severe injury or death due to Electric Shock.

Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

### 4.1 Terminal arrangement



- OUT1  
Control output 1 (Heating)
- OUT2  
Control output 2 (Cooling)
- A1  
Alarm 1 output
- A2  
Alarm 2 output
- LA  
Loop break alarm output
- HB  
Heater burnout alarm output
- P24  
Isolated power output
- RS-485  
Serial communication (RS-485)
- SV2  
Second main setting
- CT  
CT input
- TC  
Thermocouple
- RTD  
Resistance temperature detector
- DC  
DC voltage or DC current

(Fig. 4.1-1)



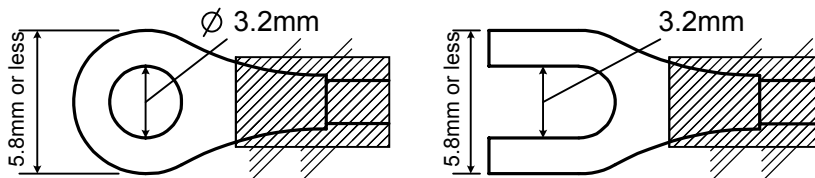
## Caution

- The terminal blocks of the JCR-33A and JCD-33A are designed to be wired from the left side.  
The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Dotted lines show options. If the option is not designated, there are no terminals.
- when A2 (option) and Heater burnout alarm (option) are applied together, use terminals 12-13 for A2, and 9-10 for Heater burnout alarm.
- When Heating/Cooling control (option) and Heater burnout Alarm (option) are applied together, use terminals 9-10 for the Heating/Cooling control and 12-13 for the Heater burnout alarm.
- When A2 (option) and LA (option) are applied, they use common output terminals.
- When Isolated power output (option) is applied, Heating/Cooling control (option) and Heater burnout Alarm (option) cannot be applied with it.

### ■ Lead wire solderless terminal

Use a solderless terminal with an isolation sleeve in which an M3 screw fits as shown below. Designate the torque 0.6N·m to 1.0N·m.

Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N·m, Max. 1.0N·m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	



(Fig. 4.1-2)

## 4.2 Wiring connection example

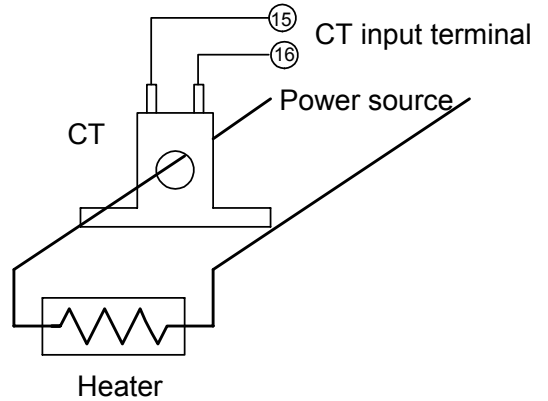


## Caution

- Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
- Use a 3-wire RTD system according to the sensor input specifications of this controller.
- This controller has no built-in power switch or fuse. It is necessary to install them in the circuit near the external controller.  
(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- When using a 24V AC/DC for the power source, do not confuse the polarity when it is DC.
- When using a relay contact output type, use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires to avoid external interference.
- Use a thick wire (1.25 to 2.0mm<sup>2</sup>) for the earth ground.

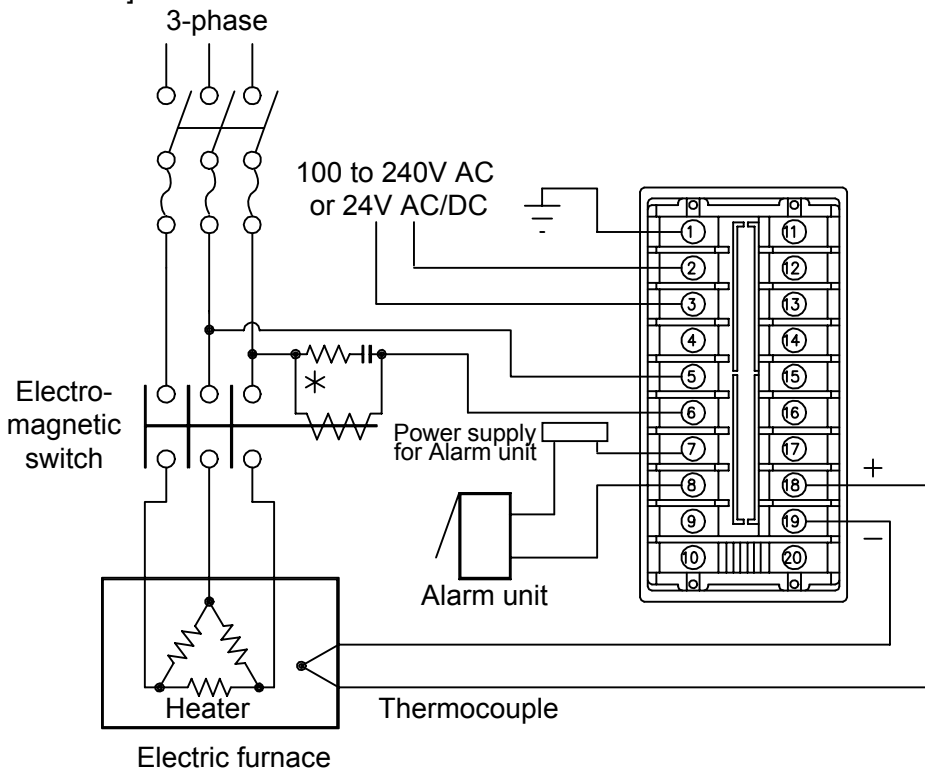
**[Heater burnout alarm output]**

- (1) **This alarm is not available for detecting heater current under phase control.**
- (2) Use current transformer (CT) provided, and pass one lead wire of heater circuit into the hole of the CT.
- (3) When wiring, keep CT wire away from any AC sources and load wires to avoid the external interference.



(Fig. 4.2-1)

**[JCR-33A-R/E]**



(Fig. 4.2-2)

\* To prevent the unit from harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

- AC or DC is available for supply voltage 24V. Do not confuse the polarity when it is DC.

## 5. Setup

For the thermocouple and RTD inputs, the sensor input characters and temperature unit are indicated on the PV display and the input range high limit value is indicated on the SV display for approximately 3 seconds after the power is turned on. (Table 5-1)

For DC input, the sensor input characters are indicated on the PV display and the scaling high limit value is indicated on the SV display for approximately 3 seconds after the power is turned on. (Table 5-1)

If any other value is set in the scaling high limit setting, the set value is indicated on the SV display.

During this time, all outputs and the LED indicators are in OFF status.

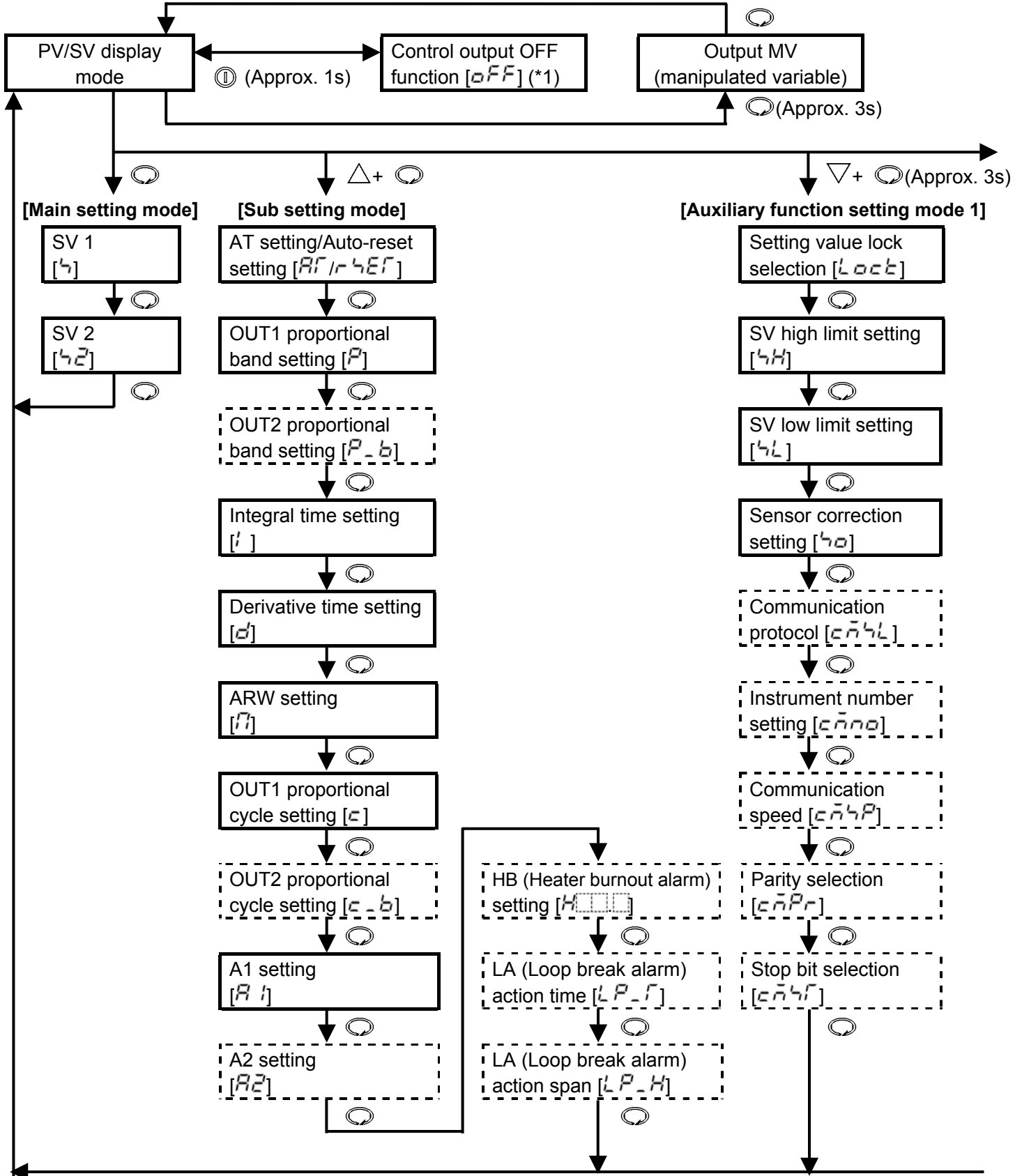
Control will then start and the input value will be indicated on the PV display and main setting value will be indicated on the SV display. While control output OFF function is working, OFF is indicated on the PV display. To cancel control output OFF function, press the OUT/OFF key for approximately 1 second.

(Table. 5-1)

Sensor input	°C		°F	
	PV display	SV display	PV display	SV display
K	k C	1370	k F	2500
	k .C	4000	k .F	7500
J	J C	1000	J F	1800
R	r C	1760	r F	3200
S	s C	1760	s F	3200
B	b C	1820	b F	3300
E	E C	800	E F	1500
T	T C	4000	T F	7500
N	n C	1300	n F	2300
PL-II	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c F	4200
Pt100	PT C	8500	PT F	9999
	PT C	850	PT F	1500
JPt100	JPTC	5000	JPTF	9000
	JPTC	500	JPTF	900
4 to 20mA DC	420A	Scaling high limit value		
0 to 20mA DC	020A			
0 to 1V DC	0 1B			
0 to 5V DC	0 5B			
1 to 5V DC	1 5B			
0 to 10V DC	0 10B			

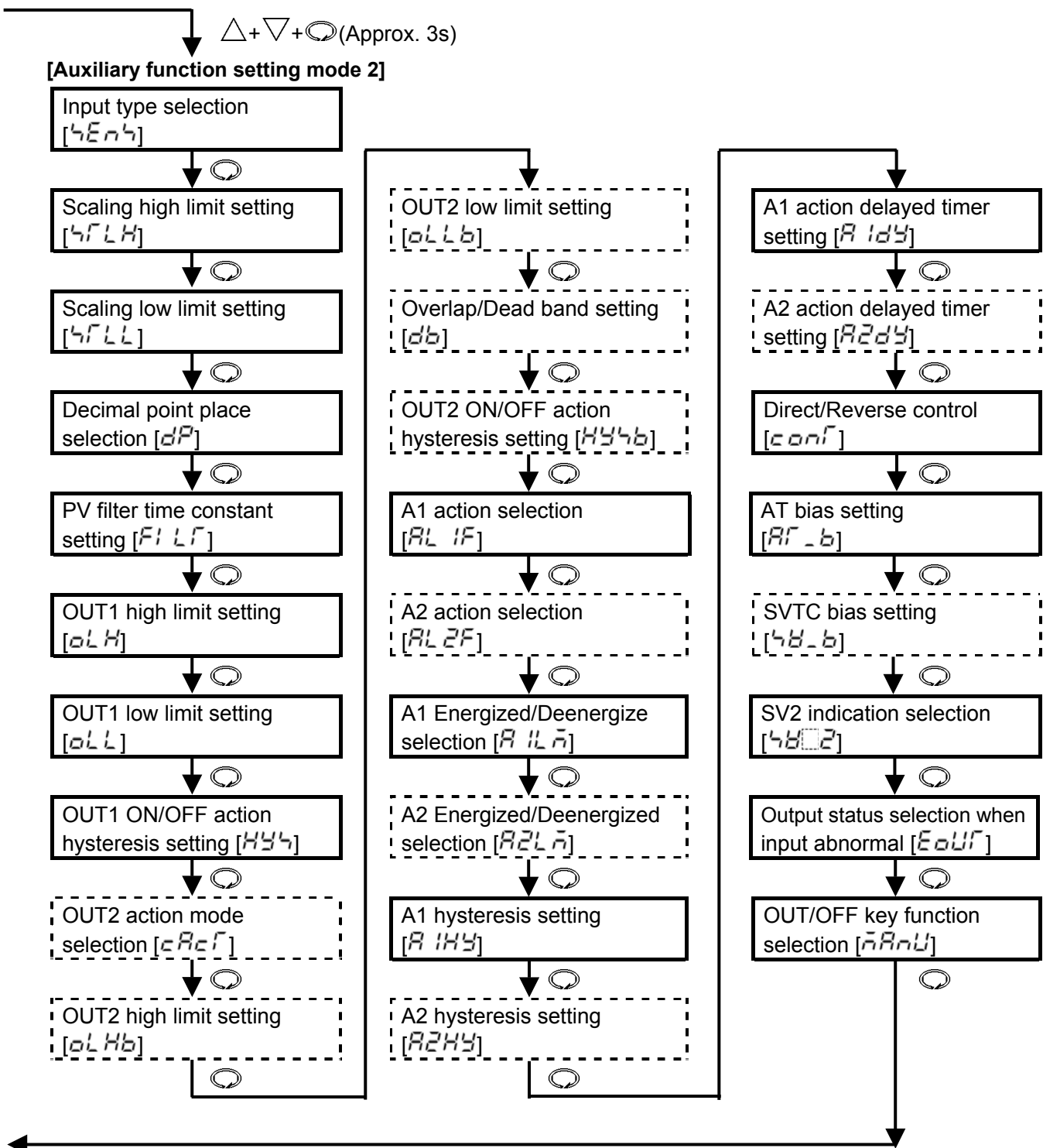


## 5.1 Operation flowchart






- $\Delta + \text{key ③}$ : Press the  $\text{key ③}$  key while holding down the  $\Delta$  key.
- $\nabla + \text{key ③}$  (Approx. 3s): Press the  $\text{key ③}$  key for approx. 3s while holding down the  $\nabla$  key.
- $\Delta + \nabla + \text{key ③}$  (Approx. 3s): Press the  $\text{key ③}$  key for approx. 3s while holding down the  $\Delta$  and  $\nabla$  keys.
- Setting items with dotted lines are optional and they appear only when the options are added.


(\*1) If Auto/Manual control function is selected during the OUT/OFF key function selection mode, and when the  $\text{key ①}$  is pressed, the control output OFF function will not work, and will change to manual control mode.



## 5.2 Main setting mode

If the  key is pressed, main setting mode is selected.

The setting value (numeric value) can be increased or decreased by pressing the  or  key.

If the  key is pressed, the setting value is registered and the controller will revert to the PV/SV display mode.



### **SV1** [


- Sets SV1.
- Setting range: SV low limit to SV high limit or  
Scaling low limit value to Scaling high limit value
- Default: 0°C


### **SV2** [

- Sets SV2.
- Setting range: SV low limit to SV high limit or  
Scaling low limit value to Scaling high limit value
- Default: 0°C

## 5.3 Sub setting mode

By pressing the  key while holding down the  key, Sub setting mode can be selected.



The  or  key increases or decreases the setting value (numeric value).

By pressing the  key, setting value is registered and the next setting item is selected.

### **AT setting/ Auto-reset setting** []

- Sets AT (Auto-tuning) or Auto-reset (offset correction).
- Auto-reset can be performed only during PD and P action.  
(Not available for PID, PI and ON/OFF action)
- Default: Both Auto-tuning and Auto-reset Cancellation

#### **[Auto-tuning]**

- If the auto-tuning performance is designated, AT indicator flashes and the controller reverts to the PV/SV display mode.
- After auto-tuning ends, AT indicator is turned off and P, I, D and ARW values are automatically set.
- During auto-tuning, none of the settings can be performed.
- If the auto-tuning is released during the process, P, I, D and ARW values revert to their former value.
- If the  key is pressed during auto-tuning, control output OFF function is activated, and if the  key is pressed again, PID auto-tuning is cancelled.

#### **[Auto-reset]**

- If the auto-reset is performed, offset correction immediately starts and the controller reverts to the PV/SV display mode.  
(The corrected value is automatically set and AT indicator flashes)
- During 4 minutes of auto-reset performing, other settings cannot be performed to prevent key misoperations.
- After auto-reset ends, AT indicator is turned off and all settings can be carried out.

<p><b>OUT1 proportional band setting</b> [<math>\overset{a}{P}</math>]</p> <ul style="list-style-type: none"> <li>• Sets OUT1 proportional band. ON/OFF action when set to 0 or 0.0.</li> <li>• Setting range: 0 to 1000°C (0 to 2000°F) With a decimal point: 0.0 to 999.9°C(0.0 to 999.9°F) DC input: 0.0 to 100.0%</li> <li>• Default: 10°C</li> </ul>
<p><b>OUT2 proportional band setting</b> [<math>\overset{a}{P} - \overset{b}{b}</math>]</p> <ul style="list-style-type: none"> <li>• Sets OUT2 proportional band. ON/OFF action when set to 0 or 0.0.</li> <li>• Not available when Heating/Cooling control (option) is not applied or when OUT1 is ON/OFF action</li> <li>• Setting range: 0.0 to 10.0 times (multiplying factor to OUT1 proportional band)</li> <li>• Default: 1.0 times</li> </ul>
<p><b>Integral time setting</b> [<math>\overset{I}{I}</math>]</p> <ul style="list-style-type: none"> <li>• Sets the integral time. Setting the value to 0 disables the function. (PD action)</li> <li>• Not available when OUT1 is ON/OFF action</li> <li>• Setting range: 0 to 1000 seconds</li> <li>• Default: 200 seconds</li> </ul>
<p><b>Derivative time setting</b> [<math>\overset{D}{D}</math>]</p> <ul style="list-style-type: none"> <li>• Sets the derivative time. Setting the value to 0 disables the function. (PI action)</li> <li>• Not available when OUT1 is ON/OFF action</li> <li>• Setting range: 0 to 300 seconds</li> <li>• Default: 50 seconds</li> </ul>
<p><b>ARW (Anti-reset windup) setting</b> [<math>\overset{ARW}{ARW}</math>]</p> <ul style="list-style-type: none"> <li>• Sets the anti-reset windup.</li> <li>• Available only for PID action</li> <li>• Setting range: 0 to 100%</li> <li>• Default: 50%</li> </ul>
<p><b>OUT1 proportional cycle setting</b> [<math>\overset{C}{C}</math>]</p> <ul style="list-style-type: none"> <li>• Sets OUT1 proportional cycle. Not available for ON/OFF action and DC current output type</li> <li>• <b>For the relay contact output type, if the proportional cycle time is decreased, the frequency of the relay action increases and the life of the relay contact is shortened.</b></li> <li>• Setting range: 1 to 120 seconds</li> <li>• Default: 30 seconds for Relay contact output type, 3 seconds for Non-contact voltage output type</li> </ul>
<p><b>OUT2 proportional cycle setting</b> [<math>\overset{C}{C} - \overset{b}{b}</math>]</p> <ul style="list-style-type: none"> <li>• Sets OUT2 proportional cycle. Not available for ON/OFF action and DC current output type</li> <li>• Not available when Heating/Cooling control (option) is not added or when OUT2 is ON/OFF action</li> <li>• Setting range: 1 to 120 seconds</li> <li>• Default: 30 seconds for Relay contact output type, 3 seconds for Non-contact voltage output type</li> </ul>

**A1 setting** [ $R_1$ ]

- Sets the action point of A1 output.  
Setting the value to 0 or 0.0 disables the function.  
(Excluding process high alarm and process low alarm)
- Not available when No alarm action is selected in the A1 action selection
- Setting range: Refer to (Table 5.3-1).
- Default: 0°C

**A2 setting** [ $R_2$ ]

- Sets the action point of A2 output.  
Setting the value to 0 or 0.0 disables the function.  
(Excluding process high alarm and process low alarm)
- Not available when A2 output (option) is not added or when No alarm action is selected in the A2 action selection
- Setting range and default value are the same as those of A1 setting.

**HB (Heater burnout alarm) setting** [ $H_{\square\square}$  and  $\square\square.X$  are indicated in turn.]

- Sets the heater current value for Heater burnout alarm.  
Setting the value to 0.0 disables the function.
- Available only when Heater burnout alarm (option) is added
- When OUT1 is OFF, heater current value shows the same value as when OUT1 was on.
- It is recommended to set approx. 80% of the heater current value (setting value) considering the voltage fluctuation.
- Self-holding is not available for the alarm output.
- Setting range: Rating 5A: 0.0 to 5.0A      Rating 10A: 0.0 to 10.0A  
Rating 20A: 0.0 to 20.0A      Rating 50A: 0.0 to 50.0A
- Default: 0.0A

**LA (Loop break alarm) action time setting** [ $L_P - T$ ]

- Sets the action time to assess the Loop break alarm.
- Available only when Loop break alarm (option) is added
- Setting range: 0 to 200 minutes
- Default: 0 minutes

**LA (Loop break alarm) action span setting** [ $L_P - H$ ]

- Sets the action span to assess the Loop break alarm.
- Available only when Loop break alarm (option) is added
- Setting range: 0 to 150°C (°F), however, with a decimal point 0.0 to 150.0°C (°F)  
For DC input, 0 to 1500  
(The placement of the decimal point follows the selection.)
- Default: 0°C

## [A1, A2 setting range]

(Table 5.3-1)






Alarm action	Setting range
High limit alarm	–Input span to Input span °C(°F) *1
Low limit alarm	–Input span to Input span °C(°F) *1
High/Low limits alarm	0 to Input span °C(°F) *1
High/Low limit range alarm	0 to Input span °C(°F) *1
Process high alarm	Input range low limit to Input range high limit*2
Process low alarm	Input range low limit to Input range high limit*2
High limit alarm with standby	–Input span to Input span °C(°F) *1
Low limit alarm with standby	–Input span to Input span °C(°F) *1
High/Low limits alarm with standby	0 to Input span °C(°F) *1

• When the input has a decimal point, the negative lower limit value is –199.9, and the positive higher limit value is 999.9.

\*1: For DC input, the Input span is the same as the Input range scaling span.

\*2: For DC input, Input range low (or high) limit value is the same as the Input range scaling low (or high) limit value.

### 5.4 Auxiliary function setting mode 1

In the PV/SV display mode, if the  key is pressed for approx. 3 seconds while holding down the  key, Auxiliary function setting mode 1 can be selected. The setting value can be increased or decreased by pressing the  or  key. If the  key is pressed, the setting value is registered and the next setting item is selected.

#### Setting value lock selection [*Lock*]

- Mode to lock the setting value to prevent setting errors  
The setting item to be locked depends on the designation.
  - When designating Lock, designate Lock 1, 2 or 3 after setting the necessary items in the status Unlock.
  - Be sure to select Lock 3 when changing the setting value frequently via communication function considering the life of non-volatile memory.
  - Selection item:
    - - - - (Unlock): All setting values can be changed.
    - Loc 1* (Lock 1): None of setting values can be changed.
    - Loc 2* (Lock 2): Only main setting value can be changed.
    - Loc 3* (Lock 3): All setting values except Input type selection can be changed.  
However, changed data revert to their former value after the power is turned off because they are not saved in the non-volatile memory.  
If input type is changed by communication or keypad in Lock 3 status, the input type cannot be changed, however, all items except the Proportional cycle setting and Direct/Reverse control selection revert to the default value.
- Do not change any setting item in Auxiliary function setting mode 2.  
If any item in Auxiliary function setting mode 2 is changed, it will affect other setting items such as the SV and Alarm setting.**

•Default: Unlock

#### SV high limit setting [*HH*]

- Sets SV high limit.
- Setting range: SV low limit to input range high limit value  
For DC input, SV low limit to scaling high limit value  
(The placement of the decimal point follows the selection.)
- Default: Input range high limit value or scaling high limit value

**SV low limit setting [4L]**

- Sets SV low limit.
- Setting range: Input range low limit value to SV high limit  
For DC input: Scaling low limit value to SV high limit  
(The placement of the decimal point follows the selection.)
- Default: Input range low limit value or scaling low limit value

**Sensor correction setting [4D]**

- Sets the sensor correction value.  
(Effective within the input rating value regardless of the sensor correction value)
- Setting range: -100.0 to 100.0°C(°F)  
For DC input: -1000 to 1000  
(The placement of the decimal point follows the selection.)
- Default: 0.0°C

**Communication protocol selection [c n 4L]**

- Selects communication protocol of this instrument.
- Available only when the serial communication (option) is applied
- Selection item: *no n L* (Shinko protocol)  
*n o d A* (Modbus ASCII mode)  
*n o d r* (Modbus RTU mode)
- Default: Shinko protocol

**Instrument number setting [c n n D]**

- Sets the instrument number of this unit. (The instrument number should be set individually when communicating by connecting plural instruments in serial communication, otherwise it is impossible to communicate)
- Available only when the serial communication (option) is applied
- Setting range: 0 to 95
- Default: 0

**Communication speed selection [c n 4P]**

- Selects the communication speed of this unit. (The communication speed of this unit must be equal to that of host computer, otherwise communication is impossible)
- Available only when the serial communication (option) is applied
- Selection item: *24*(2400bps), *48*(4800bps), *96*(9600bps), *192*(19200bps)
- Default: 9600bps


**Parity selection [c n P r]**


- Selects the parity of this unit.
- Not available when the serial communication (option) is not applied or when Shinko protocol is selected in the Communication protocol selection
- Selection item: *no n E* (Shinko protocol)  
*E b E n* (Modbus RTU mode)  
*o d d* (Modbus ASCII mode)
- Default: Shinko protocol

**Stop bit selection [c n 4 r]**

- Selects the stop bit of this unit.
- Not available when the serial communication (option) is not applied or when Shinko protocol is selected in the Communication protocol selection
- Selection item: *1* (1)  
*2* (2)
- Default: 1

## 5.5 Auxiliary function setting mode 2

In the PV/SV display mode, if the  key is pressed for approx. 3 seconds while holding down the  $\Delta$  and  $\nabla$  keys, Auxiliary function setting mode 2 can be selected.

The setting value can be increased or decreased by pressing the  $\Delta$  or  $\nabla$  key. If the  key is pressed, the setting value is registered and the next setting item is selected.

**If Lock 3 is selected in the Setting value lock selection, release Lock 3 to Unlock, and then change each setting value in the Auxiliary function setting mode 2.**

Input type selection [ $\text{hE n h}$ ]		
<ul style="list-style-type: none"> <li>An input type from thermocouple (10 types), RTD (2 types), DC current (2 types), DC voltage (4 types) and the unit <math>^{\circ}\text{C}/^{\circ}\text{F}</math> can be selected.</li> <li><b>When changing the input from DC voltage to other inputs, remove the sensor connected to this controller, then change for the input. If the input is changed with the sensor connected, the input circuit may be broken.</b></li> <li>Default: K (<math>-200</math> to <math>1370^{\circ}\text{C}</math>)</li> </ul>		
Input type	Input range	
K	$-200$ to $1370^{\circ}\text{C}$ : $\text{h E C}$	$-320$ to $2500^{\circ}\text{F}$ : $\text{h F}$
	$-199.9$ to $400.0^{\circ}\text{C}$ : $\text{h .C}$	$-199.9$ to $750.0^{\circ}\text{F}$ : $\text{h .F}$
J	$-200$ to $1000^{\circ}\text{C}$ : $\text{j C}$	$-320$ to $1800^{\circ}\text{F}$ : $\text{j F}$
R	$0$ to $1760^{\circ}\text{C}$ : $\text{r C}$	$0$ to $3200^{\circ}\text{F}$ : $\text{r F}$
S	$0$ to $1760^{\circ}\text{C}$ : $\text{s C}$	$0$ to $3200^{\circ}\text{F}$ : $\text{s F}$
B	$0$ to $1820^{\circ}\text{C}$ : $\text{b C}$	$0$ to $3300^{\circ}\text{F}$ : $\text{b F}$
E	$-200$ to $800^{\circ}\text{C}$ : $\text{E C}$	$-320$ to $1500^{\circ}\text{F}$ : $\text{E F}$
T	$-199.9$ to $400.0^{\circ}\text{C}$ : $\text{T C}$	$-199.9$ to $750.0^{\circ}\text{F}$ : $\text{T F}$
N	$-200$ to $1300^{\circ}\text{C}$ : $\text{n C}$	$-320$ to $2300^{\circ}\text{F}$ : $\text{n F}$
PL-II	$0$ to $1390^{\circ}\text{C}$ : $\text{PL2C}$	$0$ to $2500^{\circ}\text{F}$ : $\text{PL2F}$
C(W/Re5-26)	$0$ to $2315^{\circ}\text{C}$ : $\text{c C}$	$0$ to $4200^{\circ}\text{F}$ : $\text{c F}$
Pt100	$-199.9$ to $850.0^{\circ}\text{C}$ : $\text{PT C}$	$-199.9$ to $999.9^{\circ}\text{F}$ : $\text{PT F}$
JPt100	$-200$ to $850^{\circ}\text{C}$ : $\text{PT C}$	$-300$ to $1500^{\circ}\text{F}$ : $\text{PT F}$
Pt100	$-199.9$ to $500.0^{\circ}\text{C}$ : $\text{JPT C}$	$-199.9$ to $900.0^{\circ}\text{F}$ : $\text{JPT F}$
JPt100	$-200$ to $500^{\circ}\text{C}$ : $\text{JPT C}$	$-300$ to $900^{\circ}\text{F}$ : $\text{JPT F}$
4 to 20mA DC	$-1999$ to $9999$ : $\text{420A}$	
0 to 20mA DC	$-1999$ to $9999$ : $\text{020A}$	
0 to 1V DC	$-1999$ to $9999$ : $\text{0 1V}$	
0 to 5V DC	$-1999$ to $9999$ : $\text{0 5V}$	
1 to 5V DC	$-1999$ to $9999$ : $\text{1 5V}$	
0 to 10V DC	$-1999$ to $9999$ : $\text{0 10V}$	
Scaling high limit setting [ $\text{hFLH}$ ]		
<ul style="list-style-type: none"> <li>Sets scaling high limit value.</li> <li>Available only for the DC input</li> <li>Setting range: Scaling low limit value to Input range high limit value (The placement of the decimal point follows the selection.)</li> <li>Default: 9999</li> </ul>		



<p><b>Scaling low limit setting</b> [<i>LFL</i>]</p> <ul style="list-style-type: none"> <li>• Sets scaling low limit value.</li> <li>• Available only for the DC input</li> <li>• Setting range: Input range low limit value to scaling high limit value (The placement of the decimal point follows the selection.)</li> <li>• Default: -1999</li> </ul>
<p><b>Decimal point place selection</b> [<i>dP</i>]</p> <ul style="list-style-type: none"> <li>• Selects the decimal point place.</li> <li>• Available only for DC input</li> <li>• Selection item: <i>0000</i> (No decimal point) <i>0000</i> (1 digit after the decimal point) <i>0000</i> (2 digits after the decimal point) <i>0000</i> (3 digits after the decimal point)</li> <li>• Default: No decimal point</li> </ul>
<p><b>PV filter time constant setting</b> [<i>F1 Lr</i>]</p> <ul style="list-style-type: none"> <li>• Sets PV filter time constant. However, if the setting value is too large, it affects to the control result due to the delay of response.</li> <li>• Setting range: 0.0 to 10.0 seconds</li> <li>• Default: 0.0 seconds</li> </ul>
<p><b>OUT1 high limit setting</b> [<i>oLH</i>]</p> <ul style="list-style-type: none"> <li>• Sets the high limit value for OUT1. Not available for ON/OFF action</li> <li>• Setting range: OUT1 low limit value to 100% (Relay contact output, Non-contact voltage output) OUT1 low limit value to 105% (DC current output)</li> <li>• Default: 100%</li> </ul>
<p><b>OUT1 low limit setting</b> [<i>oLL</i>]</p> <ul style="list-style-type: none"> <li>• Sets low limit value for OUT1. Not available for ON/OFF action</li> <li>• Setting range: 0% to OUT1 high limit value (Relay contact output, Non-contact voltage output) -5% to OUT1 high limit value (DC current output)</li> <li>• Default: 0%</li> </ul>
<p><b>OUT1 ON/OFF action hysteresis setting</b> [<i>H44</i>]</p> <ul style="list-style-type: none"> <li>• Sets ON/OFF action hysteresis for OUT1. Available only for ON/OFF action</li> <li>• Setting range: 0.1 to 100.0°C(°F) For DC input, 1 to 1000 (The placement of the decimal point follows the selection.)</li> <li>• Default: 1.0°C</li> </ul>
<p><b>OUT2 action mode selection</b> [<i>cAct</i>]</p> <ul style="list-style-type: none"> <li>• Selects OUT2 cooling action from air cooling, oil cooling and water cooling. Not available when Heating/Cooling control (option) is not added or when OUT2 is ON/OFF action</li> <li>• Selection item: <i>Air</i> (Air cooling, linear characteristic) <i>oil</i> (Oil cooling, 1.5th power of the linear characteristic) <i>Water</i> (Water cooling, 2nd power of the linear characteristic)</li> <li>• Default: Air cooling</li> </ul>

**OUT2 high limit setting [oLHb]**

- Sets the high limit value for OUT2.
- Not available when Heating/Cooling control (option) is not added or when OUT2 is ON/OFF action
- Setting range: OUT2 low limit value to 100% (Relay contact output, Non-contact voltage output)  
OUT2 low limit value to 105% (DC current output)
- Default: 100%

**OUT2 low limit setting [oLLb]**

- Sets the low limit value for OUT2.
- Not available when Heating/Cooling control (option) is not added or when OUT2 is ON/OFF action
- Setting range: 0% to OUT2 high limit value (Relay contact output, Non-contact voltage output)  
-5% to OUT2 high limit value (DC current output)
- Default: 0%

**Overlap band/Dead band setting [db]**

- Sets Overlap band/Dead band for OUT1 and OUT2.  
+ setting value: Dead band, -setting value: Overlap band
- Not available when Heating/Cooling control (option) is not added
- Setting range: -100.0 to 100.0°C (°F) For DC input, -1000 to 1000  
(The placement of the decimal point follows the selection.)
- Default: 0.0°C

**OUT2 ON/OFF action hysteresis setting [HYhb]**

- Sets ON/OFF hysteresis for OUT2.
- Available only when Heating/Cooling control (option) is added
- Setting range: 0.1 to 100.0°C(°F)  
For DC input, 1 to 1000 (The placement of the decimal point follows the selection.)
- Default: 1.0°C

**A1 action selection [ALIF]**

- Selects A1 action.
- Selection item:

No alarm action	: ----	Process high alarm	: AH
High limit alarm	: H	Process low alarm	: rAH
Low limit alarm	: L	High limit alarm with standby	: H u
High/Low limits alarm	: HL	Low limit alarm with standby	: L u
High/Low limit range alarm:	u d	High/Low limits alarm with standby:	HL u
- Default: No alarm action

**A2 action selection [ALZF]**

- Selects A2 action.
- Available only when A2 (option) is added
- Selection item, default value are the same as those of A1 action selection.

**A1 action Energized/Deenergized selection [AILn]**

- Selects A1 action Energized/Deenergized.
- Not available when No alarm action is selected in the A1 action selection
- Selection item: nOnL (Energized)  
rEBL (Deenergized)
- Default: Energized

<p><b>A2 action Energized/Deenergized selection</b> [<i>A2L n</i>]</p> <ul style="list-style-type: none"> <li>• Selects Energized or Deenergized for A2 action.</li> <li>• Not available when No alarm action is selected in the A2 action selection or when A2 (option) is not added</li> <li>• Selection item and default value are the same as those of A1 action Energized/Deenergized selection.</li> </ul>
<p><b>A1 hysteresis setting</b> [<i>A1H3</i>]</p> <ul style="list-style-type: none"> <li>• Sets A1 hysteresis.</li> <li>• Not available when No alarm action is selected in the A1 action selection</li> <li>• Setting range: 0.1 to 100.0°C(°F) For DC input, 1 to 1000 (The placement of the decimal point follows the selection.)</li> <li>• Default: 1.0°C</li> </ul>
<p><b>A2 hysteresis setting</b> [<i>A2H3</i>]</p> <ul style="list-style-type: none"> <li>• Sets A2 hysteresis.</li> <li>• Not available when No alarm action is selected in the A2 action selection or when A2 (option) is not added</li> <li>• Setting range and default value are the same as those of A1 hysteresis setting.</li> </ul>
<p><b>A1 action delayed timer setting</b> [<i>A1d3</i>]</p> <ul style="list-style-type: none"> <li>• Sets the action delayed timer for A1. When setting time has passed after the input enters the alarm output range, the alarm is activated.</li> <li>• Not available if No alarm action is selected in the A1 action selection</li> <li>• Setting range: 0 to 9999 seconds</li> <li>• Default: 0 seconds</li> </ul>
<p><b>A2 action delayed timer setting</b> [<i>A2d3</i>]</p> <ul style="list-style-type: none"> <li>• Sets the action delayed timer for A2. When setting time has passed after the input enters the alarm output range, the alarm is activated.</li> <li>• Not available if No alarm action is selected in the A2 action selection or if A2 (option) is not applied</li> <li>• Setting range and default value are the same as those of A1 action delayed timer setting.</li> </ul>
<p><b>Direct/Reverse action selection</b> [<i>CONF</i>]</p> <ul style="list-style-type: none"> <li>• Selects Reverse (Heating) or Direct (Cooling) action.</li> <li>• Selection item: <i>HEAT</i> (Reverse), <i>COOL</i> (Direct)</li> <li>• Default: Reverse (Heating)</li> </ul>
<p><b>AT bias setting</b> [<i>AT - b</i>]</p> <ul style="list-style-type: none"> <li>• Sets the bias value when PID auto-tuning is performing.</li> <li>• Not available for the DC input</li> <li>• Setting range: 0 to 50°C(0 to 100°F) With a decimal point, 0.0 to 50.0°C(0.0 to 100.0°F)</li> <li>• Default: 20°C</li> </ul>
<p><b>SVTC bias setting</b> [<i>SV - b</i>]</p> <ul style="list-style-type: none"> <li>• Control desired value adds SVTC bias value to the value received by the SVTC command.</li> <li>• Available only when the serial communication (option) is added</li> <li>• Setting range: Converted value of <math>\pm 20\%</math> of the rated value or <math>\pm 20\%</math> of the scaling span (DC input) (The placement of the decimal point follows the selection.) However, the negative minimum value is -1999, -199.9, -19.9 or -1.999.</li> <li>• Default: 0</li> </ul>

**SV2 indication selection [482]**

- Selects whether SV2 is indicated or not.
- Available only when serial communication (Option) is added
- Selection item: *ON*(Indication), *OFF*(No indication)
- Default: Indication

**Output status selection when input abnormal [EOL]**

- Selects output status when input is disconnected.  
Available only for DC current output type with DC inputs
- Selection item: *OFF*(Output OFF), *ON*(Output ON)
- Default: Output OFF

**OUT/OFF key function selection [ANL]**

- Selects the OUT/OFF key function.
- Selection item: *OFF*(OUT/OFF function), *ANL*(Auto/Manual control function)
- Default: OUT/OFF function

**[Sensor correction function]**

This corrects the input value from the sensor. When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controlled location. When controlling with plural controllers, sometimes the temperatures measured (input value) do not concur with the same setting value due to difference in sensor accuracy or dispersion of load capacities. In such a case, the control can be set at the desired temperature by adjusting the input value of sensors. However, it is effective within the input rating range regardless of the sensor correction value.

**[Loop break alarm]**

The alarm will be activated when the PV (process variable) does not **rise** as much as the span or greater within the time it takes to assess the loop break alarm after the MV (manipulated variable) has reached 100% or the output high limit value.

The alarm will also be activated when the PV (process variable) does not **fall** as much value as the span or greater within the time it takes to assess loop break alarm after the MV (manipulated variable) has reached 0% or the output low limit value.

When the control action is Direct (Cooling), read “**fall**” for “**rise**” and vice versa.

**[SV1/SV2 external selection]**

SV1 or SV2 can be selected by the external operation.

Terminals between 14 and 17 open: SV1 can be selected.

Terminals between 14 and 17 closed: SV2 can be selected.

SV1 or SV2 cannot be changed during setting mode or PID auto-tuning.

**[Energized/Deenergized]**

When alarm action Energized is selected, the alarm output (between terminals 7-8, or 12-13) is conducted (ON) while the alarm output indicator is lit.

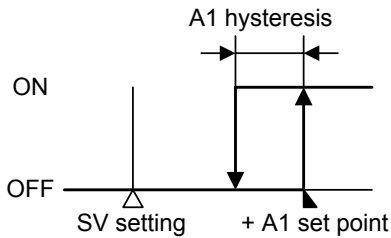
The alarm output is not conducted (OFF) while the alarm output indicator is not lit.

See (Fig. 5.5-1).

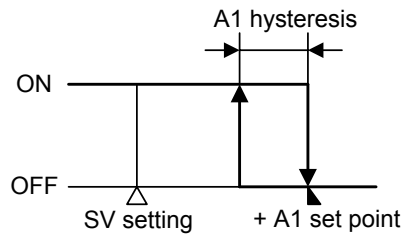
When alarm action Deenergized is selected, the alarm output (between terminals 7-8, or 12-13) is not conducted (OFF) while the alarm output indicator is lit.

The alarm output is conducted (ON) while the alarm output indicator is not lit.

See (Fig. 5.5-2).



**High limit alarm (when Energized is set)**  
(Fig. 5.5-1)



**High limit alarm (when Deenergized is set)**  
(Fig. 5.5-2)

## 5.6 Control output OFF function

### Control output OFF function [OFF]

- A function to pause the control action or turn the control output of the unused instrument of the plural units OFF even if the power to the instrument is supplied. [OFF] is indicated on the PV display while the function is working.
- Pressing the  $\text{Ⓢ}$  key for approx. 1 second from any mode turns the control output OFF. Pressing the  $\text{Ⓢ}$  key again for approx. 1 second cancels the control output OFF function.
- Once the control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned OFF and ON again. To cancel the function, press the  $\text{Ⓢ}$  key again for approx. 1 second.

## 5.7 Auto/Manual control function

### PV/SV display mode (Manual control)

- To use manual control function, Auto/Manual control function must be selected in the OUT/OFF key function selection. First, press the  $\text{Ⓢ}$  key. Control can be performed by increasing or decreasing the output manipulated variable (MV) using the  $\triangle$  or  $\nabla$  key.
- The 1st decimal point from the right on the SV display flashes.
- By pressing the  $\text{Ⓢ}$  key again, the mode reverts to the PV/SV display (automatic control) mode. Whenever the power to the controller is turned on, automatic control starts.
- If control action is switched from automatic to manual and vice versa, balanceless-bumpless function works to prevent sudden change of manipulated variable.
- If Auto/Manual control function is selected, control output OFF function is disabled.

## 5.8 Output manipulated variable indication

### Output manipulated variable indication

- Output manipulated variable is indicated on the SV display by pressing the  $\text{Ⓢ}$  key for approx. 3 seconds in the PV/SV display mode. While output manipulated variable is being indicated, the 1st decimal point from the right on the SV display flashes at a cycle of every 0.5 second. When the  $\text{Ⓢ}$  key is pressed again, the mode reverts to the PV/SV display.

## 6. Running

After the controller has been mounted to the control panel and wiring is completed, it can be started in the following manner.

### (1) Turn the power supply to the JCR-33A, JCD-33A ON.

For thermocouple and RTD inputs, for approx. 3 seconds after the power is switched ON, sensor input character and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display.

See (Table 6-1).

For the DC input, for approx. 3 seconds after the power is switched ON, sensor input character is indicated on the PV display, and the scaling high limit value is indicated on the SV display. See (Table 6-1).

However, if the scaling high limit value has been changed in the Scaling high limit setting, the changed value is indicated on the SV display.

(During this time, all outputs and the LED indicators are in OFF status)

After that, the process variable is indicated on the PV display, and SV1 or SV2 is indicated on the SV display and the control starts.

(When the Control output OFF function is working, [OFF] is indicated on the PV display)

(Table 6-1)

Sensor input	°C		°F	
	PV display	SV display	PV display	SV display
K	k C	1370	k F	2500
	k C	4000	k F	7500
J	j C	1000	j F	1800
R	r C	1760	r F	3200
S	s C	1760	s F	3200
B	b C	1820	b F	3300
E	e C	800	e F	1500
T	t C	4000	t F	7500
N	n C	1300	n F	2300
PL-II	PL2C	1390	PL2F	2500
C (W/Re5-26)	c C	2315	c F	4200
Pt100	Pt C	8500	Pt F	999.9
	Pt C	850	Pt F	1500
JPt100	JPt C	5000	JPt F	9000
	JPt C	500	JPt F	900
4 to 20mA DC	420A	Scaling high limit value		
0 to 20mA DC	020A			
0 to 1V DC	0 1A			
0 to 5V DC	0 5A			
1 to 5V DC	1 5A			
0 to 10V DC	0 10A			

### (2) Input each setting value.

Input each setting value, referring to "5. Setup".

### (3) Turn the load circuit power ON.

Starts the control action so as to keep the controlled object at the main setting value.

# 7. Action explanation

## 7.1 OUT1 action

	Heating (reverse) action			Cooling (direct) action		
Control action						
R/□	<p>Cycle action is performed according to deviation.</p>			<p>Cycle action is performed according to deviation.</p>		
S/□	<p>Cycle action is performed according to deviation.</p>			<p>Cycle action is performed according to deviation.</p>		
A/□	<p>Changes continuously according to deviation.</p>			<p>Changes continuously according to deviation.</p>		
Indicator (OUT1) Green						

: Acts ON (lit) or OFF (unlit).

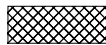
## 7.2 Heater burnout alarm action (option)

Heater burnout alarm action		
Heater burnout alarm output		
Indicator (HB) red		

When the Heating/Cooling control (option) is applied, terminals 12 and 13 are used for the Heater burnout alarm.

### 7.3 OUT1 ON/OFF action

	Heating (reverse) action		Cooling (direct) action	
Control action				
R/□				
S/□				
A/□				
Indicator (OUT1) Green				

 : Acts ON (lit) or OFF (unlit).



### 7.4 OUT2 (Heating/Cooling control) action (option)

Control action	<p>ON ——— Heating action ——— Heating P-band ——— (Cooling P-band) ——— ON          OFF - - - - - (Cooling action) - - - - - OFF          SV setting</p>		
R/□	<p>Cycle action is performed according to deviation.</p>		
DR	<p>Cycle action is performed according to deviation.</p>		
S/□	<p>Cycle action is performed according to deviation.</p>		
DS	<p>Cycle action is performed according to deviation.</p>		
A/□	<p>Changes continuously according to deviation.</p>		
DA	<p>Changes continuously according to deviation.</p>		
Indicator (OUT1) Green	<p>Lit Unlit</p>		
Indicator (OUT2) Yellow	<p>Unlit Lit</p>		



: Acts ON (lit) or OFF (unlit).

————— : Represents Heating control action.

- - - - - : Represents Cooling control action.

# When setting Dead band

Control action			
R/□	<p>Cycle action is performed according to deviation.</p>		
DR	<p>Cycle action is performed according to deviation.</p>		
S/□	<p>Cycle action is performed according to deviation.</p>		
DS	<p>Cycle action is performed according to deviation.</p>		
A/□	<p>Changes continuously according to deviation.</p>		
DA	<p>Changes continuously according to deviation.</p>		
Indicator (OUT1) Green			
Indicator (OUT2) Yellow			

: Acts ON (lit) or OFF (unlit).

————— : Represents Heating control action.

- - - - - : Represents Cooling control action.

**When setting Overlap band with Relay contact output.**

Control action	
R/□	<p>Cycle action is performed according to deviation.</p>
DR	<p>Cycle action is performed according to deviation.</p>
Indicator (OUT1) Green	
Indicator (OUT2) Yellow	

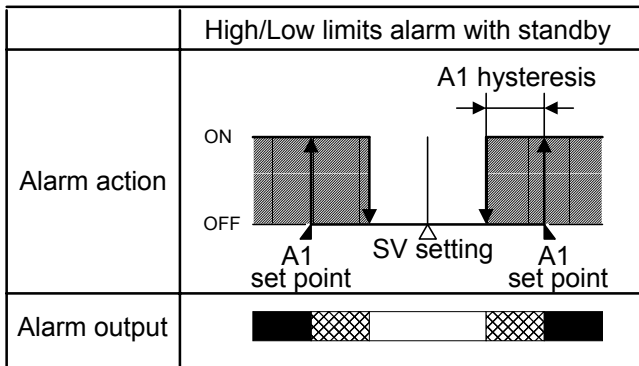
: Acts ON (lit) or OFF (unlit).

————— : Represents Heating control action.

- - - - - : Represents Cooling control action.

## 7.5 A1 and A2 actions

	High limit alarm	Low limit alarm
Alarm action		
Alarm output		
	High/Low limits alarm	High/Low limit range alarm
Alarm action		
Alarm output		
	Process high alarm	Process low alarm
Alarm action		
Alarm output		
	High limit alarm with standby	Low limit alarm with standby
Alarm action		
Alarm output		



: A1 output terminals 7 and 8 are connected.

: A1 output terminals 7 and 8 are connected or disconnected.

: A1 output terminals 7 and 8 are disconnected.

: Standby functions.

For A2 output, use terminals 12 and 13.

A1 and A2 indicators light up when their output terminals are connected, and goes out when their output terminals are disconnected.

## 7.6 SV1/SV2 external selection action

	SV1	SV2				
SV1/SV2 external selection	<p>The diagram shows two terminals, 14 and 17, connected to a common point. Terminal 14 is connected to a switch that is currently open, and terminal 17 is connected to a switch that is currently closed.</p>	<p>The diagram shows two terminals, 14 and 17, connected to a common point. Terminal 14 is connected to a switch that is currently closed, and terminal 17 is connected to a switch that is currently open.</p>				
Indicator Green	<table border="0"> <tr> <td> SV1 Lit</td> <td> SV2 Unlit</td> </tr> </table>	SV1 Lit	SV2 Unlit	<table border="0"> <tr> <td> SV1 Unlit</td> <td> SV2 Lit</td> </tr> </table>	SV1 Unlit	SV2 Lit
SV1 Lit	SV2 Unlit					
SV1 Unlit	SV2 Lit					

If the serial communication is applied, this function is disabled.

# 8. Control action explanations

## 8.1 PID

### (1) Proportional band (P)

Proportional action is the action which the control output varies in proportion to the deviation between the setting value and the processing temperature.

If the proportional band is narrowed, even if the output changes by a slight variation of the processing temperature, better control results can be obtained as the offset decreases.

However, if the proportional band is narrowed too much, even slight disturbances may cause variation in the processing temperature, control action changes to ON/OFF action and the so-called hunting phenomenon occurs.

Therefore, when the processing temperature comes to the balanced position near the setting value and a constant temperature is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

## (2) Integral time (I)

Integral action is used to eliminate offset. When the integral time is shortened, the returning speed to the setting point is accelerated. However, the cycle of oscillation is also accelerated and the control becomes unstable.

## (3) Derivative time (D)

Derivative action is used to restore the change in the processing temperature according to the rate of change. It reduces the amplitude of overshoot and undershoot width.

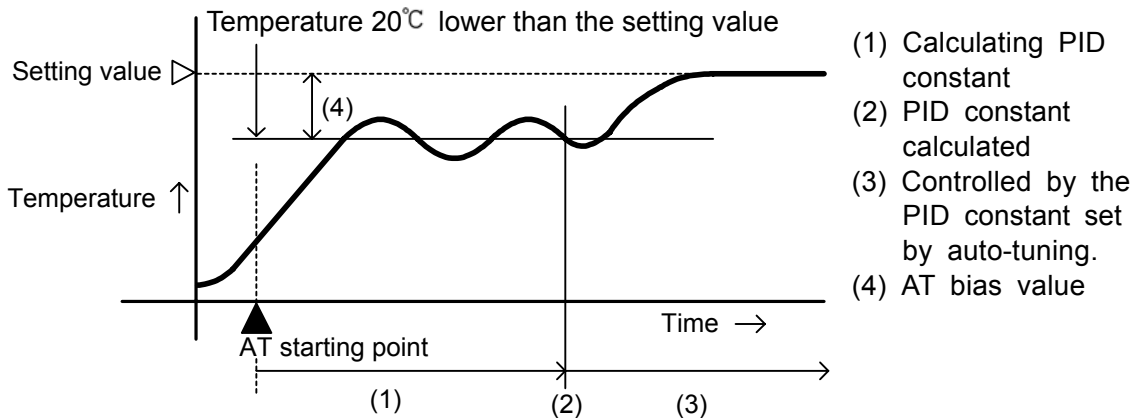
If the derivative time is shortened, restoring value becomes small, and if the derivative time is extended, an excessive returning phenomenon may occur and the control system may oscillate.

## 8.2 PID auto-tuning of this controller

In order to set each value of P, I, D and ARW automatically, the auto-tuning process should be made to obtain an optimal value.

### (1) In the case of large difference between the setting value and processing temperature as the temperature is rising.

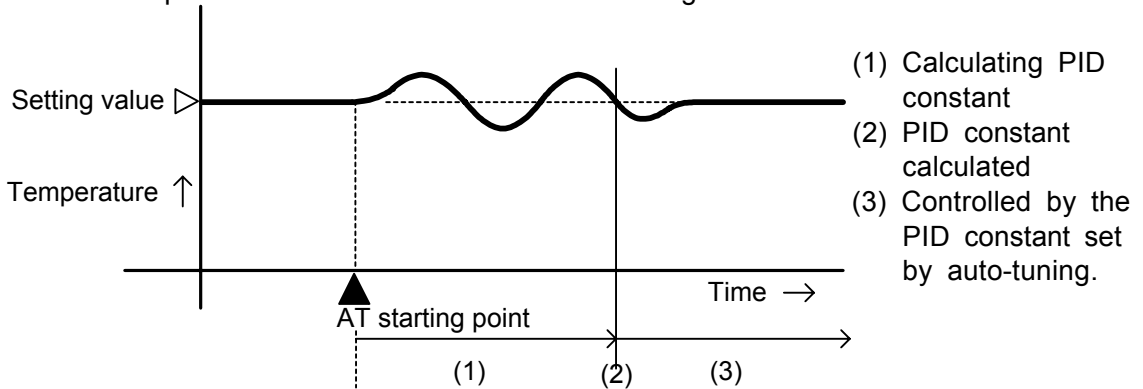
When AT bias is set to 20°C, the AT process will fluctuate at the temperature 20°C lower than the setting value.



(Fig. 8.2-1)

### (2) When the control is stable or when control temperature is within $\pm 20^\circ\text{C}$ of setting value.

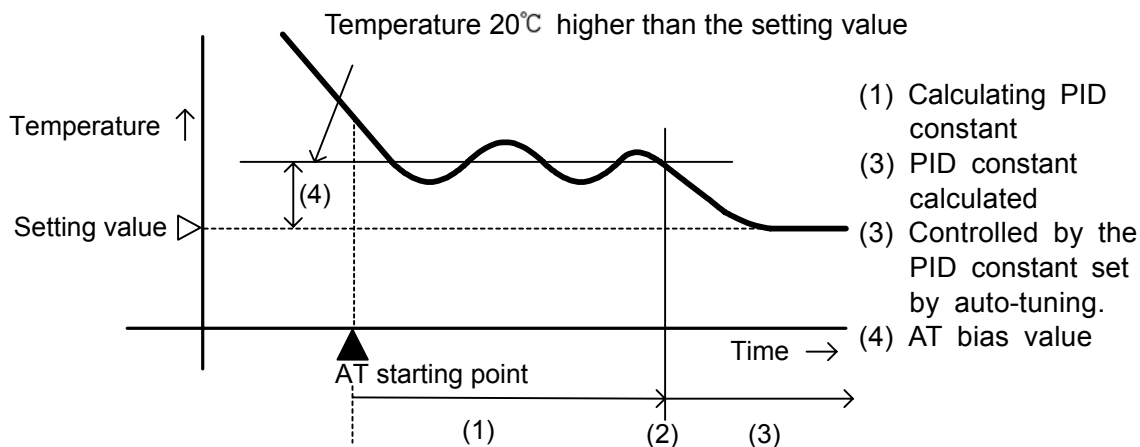
The AT process will fluctuate around the setting value.



(Fig. 8.2.2)

**(3) In the case of a large difference between the setting value and processing temperature as the temperature is falling**

When AT bias is set to 20°C, the AT process will fluctuate at the temperature 20°C higher than the setting value.



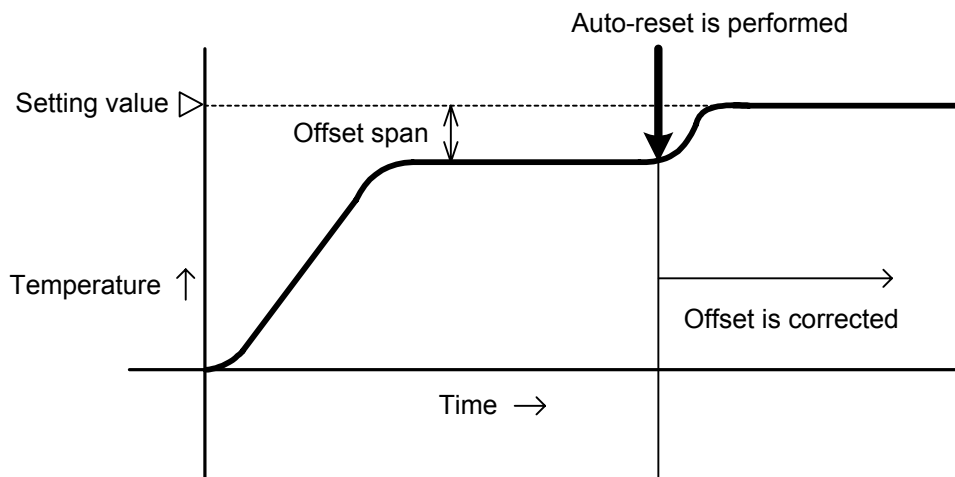
(Fig. 8.2-3)

**8.3 Auto-reset (offset correction)**

Auto-reset is performed to correct the offset at the point at which PV indication is stabilized within the proportional band during the PD action.

Since the corrected value is internally memorized, it is not necessary to perform the auto-reset again as long as the process is the same.

However, when the proportional band is set to 0, the corrected value is cleared.



(Fig. 8.3-1)

# 9. Specifications

## 9.1 Standard specifications

**Mounting method** : Flush

**Setting method** : Membrane sheet key

### Display

JCR-33A PV display: Red LED 4 digits, character size, 11.2 x 5.4 (H x W)mm

SV display: Green LED 4 digits, character size, 11.2 x 5.4 (H x W)mm

JCD-33A PV display: Red LED 4 digits, character size, 18 x 8 (H x W)mm

SV display: Green LED 4 digits, character size, 12.6 x 6(H x W)mm

### Accuracy (Setting, indication)

Thermocouple : Within  $\pm 0.2\%$  of input range full scale  $\pm 1$ digit or within  $\pm 2^\circ\text{C}$  ( $4^\circ\text{F}$ ), whichever is greater

However, R, S inputs, 0 to  $200^\circ\text{C}$  (0 to  $400^\circ\text{F}$ ): Within  $\pm 6^\circ\text{C}$  ( $12^\circ\text{F}$ )

B input, 0 to  $300^\circ\text{C}$  (0 to  $600^\circ\text{F}$ ): Accuracy is not guaranteed.

K, J, E, T, N inputs, less than  $0^\circ\text{C}$  ( $32^\circ\text{F}$ ): Within  $\pm 0.4\%$  of input range full scale  $\pm 1$ digit

RTD : Within  $\pm 0.1\%$  of input range full scale  $\pm 1$ digit or within  $\pm 1^\circ\text{C}$  ( $2^\circ\text{F}$ ), whichever is greater

DC Voltage and Current:

Within  $\pm 0.2\%$  of input range full scale  $\pm 1$ digit

### Rated input

Input type	Input range		Resolution
K	-200 to $1370^\circ\text{C}$	-320 to $2500^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
	-199.9 to $400.0^\circ\text{C}$	-199.9 to $750.0^\circ\text{F}$	$0.1^\circ\text{C}(\text{F})$
J	-200 to $1000^\circ\text{C}$	-320 to $1800^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
R	0 to $1760^\circ\text{C}$	0 to $3200^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
S	0 to $1760^\circ\text{C}$	0 to $3200^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
B	0 to $1820^\circ\text{C}$	0 to $3300^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
E	-200 to $800^\circ\text{C}$	-320 to $1500^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
T	-199.9 to $400.0^\circ\text{C}$	-199.9 to $750.0^\circ\text{F}$	$0.1^\circ\text{C}(\text{F})$
N	-200 to $1300^\circ\text{C}$	-320 to $2300^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
PL-II	0 to $1390^\circ\text{C}$	0 to $2500^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
C(W/Re5-26)	0 to $2315^\circ\text{C}$	0 to $4200^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
Pt100	-199.9 to $850.0^\circ\text{C}$	-199.9 to $999.9^\circ\text{F}$	$0.1^\circ\text{C}(\text{F})$
	-200 to $850^\circ\text{C}$	-300 to $1500^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
JPt100	-199.9 to $500.0^\circ\text{C}$	-199.9 to $900.0^\circ\text{F}$	$0.1^\circ\text{C}(\text{F})$
	-200 to $500^\circ\text{C}$	-300 to $900^\circ\text{F}$	$1^\circ\text{C}(\text{F})$
4 to 20mA DC	-1999 to 9999 *1 *2		1
0 to 20mA DC			
0 to 1V DC	-1999 to 9999 *1		1
0 to 5V DC			
1 to 5V DC			
0 to 10V DC			

\*1: For DC input, input range and decimal point place are changeable.

\*2:  $50\Omega$  Shunt resistor (sold separately) must be connected between input terminals.



**Input sampling period** : 0.25 seconds

**Input**

- Thermocouple : K, J, R, S, B, E, T, N, PL-II, C (W/Re5-26)  
External resistance, 100 $\Omega$  or less,  
however, for B, 40 $\Omega$  or less
- RTD : Pt100, JPt100, 3-wire system  
Allowable input lead wire resistance, 10 $\Omega$  or less per wire
- DC current : 0 to 20mA DC, 4 to 20mA DC  
Input impedance, 50 $\Omega$   
[50 $\Omega$  Shunt resistor (sold separately) must be connected  
between input terminals]  
Allowable input current 50mA or less  
[If 50 $\Omega$  Shunt resistor (sold separately) is used]
- DC voltage : 0 to 1V DC  
Input impedance, 1M $\Omega$  or greater  
Allowable input voltage 5V or less  
Allowable signal source resistance 2k $\Omega$  or less  
0 to 5V DC, 1 to 5V DC, 0 to 10V DC,  
Input impedance, 100k $\Omega$  or greater  
Allowable input voltage 15V or less  
Allowable signal source resistance 100 $\Omega$  or less

**Control output (OUT1)**

- Relay contact : 1a1b  
Control capacity, 3A 250V AC (resistive load)  
1A 250V AC (inductive load  $\cos\phi=0.4$ )  
Electrical life, 100,000 times
- Non-contact voltage : 12 $\frac{+2}{0}$ V DC maximum 40mA (short circuit protected)  
Four units can be connected in parallel if Shinko SSR  
(SA-200 series) is used.
- DC current : 4 to 20mA DC  
Load resistance, maximum 550 $\Omega$

**A1 output**

- When A1 action is set as energized, the alarm action point is set by  $\pm$ deviation from the main setting (except Process value alarm).  
When the input is out of the range, the output turns ON or OFF (in the case of High/Low limit range alarm).  
When the alarm action is set as deenergized, the output acts conversely.  
Setting accuracy : The same as the Indicating accuracy  
Action : ON/OFF action  
Hysteresis : Thermocouple and RTD inputs, 0.1 to 100.0 $^{\circ}$ C ( $^{\circ}$ F)  
DC current and DC voltage inputs, 1 to 1000  
(The placement of the decimal point follows the selection)
- Output : Relay contact 1a  
Control capacity, 3A 250V AC (resistive load)  
Electrical life, 100,000 times

**Control action**

- PID action (with auto-tuning function)
- PI action: When derivative time is set to 0
- PD action (with auto-reset function): When integral time is set to 0
- P action (with auto-reset function): When integral and derivative times are set to 0
- ON/OFF action

OUT1 proportional band (P):

Thermocouple, 0 to 1000°C (0 to 2000°F)  
 RTD, 0.0 to 999.9°C (0.0 to 999.9°F)  
 DC current and voltage, 0.0 to 100.0%  
 (ON/OFF action when set to 0°C(°F), 0.0°C(°F) or 0.0%)

Integral time (I) : 0 to 1000s (off when set to 0)

Derivative time (D) : 0 to 300s (off when set to 0)

OUT1 proportional cycle : 1 to 120s (Not available for DC current output type)

ARW : 0 to 100%

OUT1 hysteresis : Thermocouple and RTD inputs, 0.1 to 100.0°C (°F)  
 DC current and voltage inputs, 1 to 1000  
 (The placement of the decimal point follows the selection)

**SV1/SV2 external selection:** SV1 and SV2 can be selected by external contact.

Contact open between terminals 14 and 17 : SV1

Contact closed between terminals 14 and 17: SV2

Contact current: 6mA

**Supply voltage** : 100 to 240V AC 50/60Hz, 24V AC/DC 50/60Hz

**Allowable voltage fluctuation range**

100 to 240V AC : 85 to 264V AC

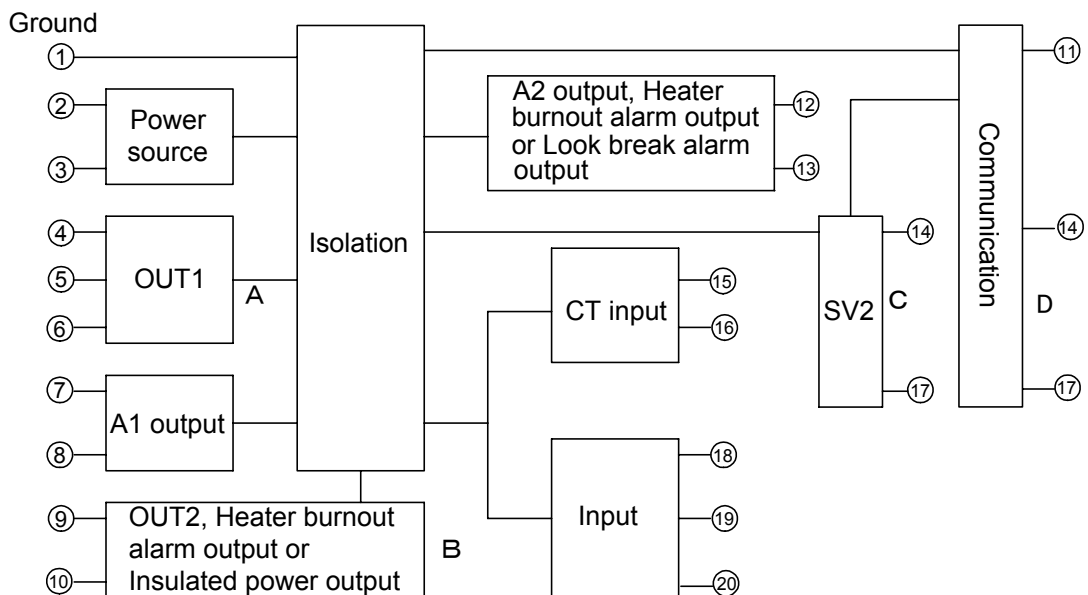
24V AC/DC : 20 to 28V AC/DC

**Ambient temperature:** 0 to 50°C (32 to 122°F)

**Ambient humidity** : 35 to 85%RH (no condensation)

**Power consumption** : Approx. 8VA or 8W

**Circuit Isolation configuration**



- When OUT1 is non-contact voltage or DC current output type and OUT2 is Non-contact voltage or DC current output type, A is not isolated from B.
- When OUT1 is non-contact voltage or DC current output type, A is not isolated from C, and A is not isolated from D. When OUT2 is non-contact voltage or DC current output type, B is not isolated from C, and B is not isolated from D.

**Isolation resistance**

10MΩ or greater at 500V DC for other combinations except the above mentioned

### Dielectric strength

- Between input terminal and ground terminal, 1.5kV AC for 1 minute
- Between input terminal and power terminal, 1.5kV AC for 1 minute
- Between output terminal and ground terminal, 1.5kV AC for 1 minute
- Between output terminal and power terminal, 1.5kV AC for 1 minute
- Between power terminal and ground terminal, 1.5kV AC for 1 minute

**Weight** : JCR-33A (approx. 250g), JCD-33A, (approx. 370g)

**External dimension** : JCR-33A, 48 x 96 x 100mm (W x H x D)  
 JCD-33A, 96 x 96 x 100mm (W x H x D)

**Material** : Case, Flame resistant resin

**Color** : Case, Light gray

**Drip-proof/Dust-proof**: IP66 for the front face

### Attached functions

[Sensor correction function]

[Setting value lock function]

[Input abnormality indication]

Output selection when input abnormal	Contents and Indication	Output status			
		OUT1		OUT2	
		Direct action	Reverse action	Direct action	Reverse action
ON	Overscale Measured value has exceeded Indication range high limit value. "----" flashes.	ON (20mA) or OUT1 high limit value	OFF(4mA) or OUT1 low limit value	OFF(4mA) or OUT2 low limit value	ON(20mA) or OUT2 high limit value
OFF		OFF (4mA) or OUT1 low limit value			
ON	Underscale Measured value has dropped below Indication range low limit value. "----" flashes.	OFF (4mA) or OUT1 low limit value	ON (20mA) or OUT1 high limit value	ON (20mA) or OUT2 high limit value	OFF(4mA) or OUT2 low limit value
OFF			OFF(4mA) or OUT1 low limit value		

[Output status selection when input abnormal] is available only for DC input and DC current output type. For other inputs and outputs except for DC input and DC current output, the output status will be the same as when OFF is selected during [Output status selection when input abnormal].

For manual control, the preset manipulated variable (MV) is outputted.

Input	Input range	Indication range	Control range
K, T	-199.9 to 400.0°C	-199.9 to 450.0°C	-205.0 to 450.0°C
	-199.9 to 750.0°F	-199.9 to 850.0°F	-209.0 to 850.0°F
Pt100	-199.9 to 850.0°C	-199.9 to 900.0°C	-210.0 to 900.0°C
	-200 to 850°C	-210 to 900°C	-210 to 900°C
	-199.9 to 999.9°F	-199.9 to 999.9°F	-211.0 to 1099.9°F
	-300 to 1500°F	-318 to 1600°F	-318 to 1600°F
JPt100	-199.9 to 500.0°C	-199.9 to 550.0°C	-206.0 to 550.0°C
	-200 to 500°C	-207 to 550°C	-207 to 550°C
	-199.9 to 900.0°F	-199.9 to 999.9°F	-211.0 to 999.9°F
	-300 to 900°F	-312 to 1000°F	-312 to 1000°F

Indication range and Control range for thermocouple inputs other than the above:  
 Input range low limit value -50°C (100°F) to Input range high limit value +50°C (100°F)

• **DC input**

**Indication range** : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]

However, if the input value is out of the range –1999 to 9999, the PV display flashes “- - - -” or “- - - -”.

**Control range** : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]

• **DC input disconnection:** When DC input is disconnected, PV display flashes

“- - - -” for 4 to 20mA DC and 1 to 5V DC inputs, and  
“- - - -” for 0 to 1V DC input.

For 0 to 20mA DC, 0 to 5V DC and 0 to 10V DC inputs, the PV display indicates the corresponding value for which 0mA or 0V is inputted.

**[Burnout]**

When the thermocouple or RTD input is burnt out, OUT1 is turned off (for DC current output type, OUT1 low limit value) and the PV display flashes “- - - -”.

**[Self-diagnosis]**

The CPU is monitored by a watchdog timer, and when any abnormal status is found on the CPU, the controller is switched to warm-up status.

**[Automatic cold junction temperature compensation]**(Thermocouple input type)

This detects the temperature at the connecting terminal between thermocouple and the instrument, and always maintains it on the same status as when the reference junction is located at 0°C [32°F].

**[Power failure countermeasure]**

The setting data is backed up in non-volatile IC memory.

**[Warm-up indication]**

With thermocouple and RTD inputs, for approx. 3 seconds after the power is switched ON, sensor input character and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display. With the DC input, for approx. 3 seconds after the power is switched ON, sensor input character is indicated on the PV display, and scaling high limit value is indicated on the SV display.

(However, if the scaling high limit value has been changed in the Scaling high limit setting, the changed value will be indicated on the SV display.)

**[Auto/Manual control selection]**

If Auto/Manual control function is selected during OUT/OFF key function selection, automatic control can be switched to manual control and vice versa by pressing the OUT/OFF key.

When the control action is changed from automatic to manual control and vice versa, the balanceless-bumpless function works to prevent sudden change of the MV (manipulated variable).

When the control action is changed from automatic to manual control, the 1st decimal point from the right on the SV display flashes.

The MV (manipulated variable) on the SV display can be increased or decreased by pressing the  $\Delta$  or  $\nabla$  keys and the control is performed.

(When the power supply to the instrument is turned on, automatic control starts)

<b>Accessories:</b> Instruction manual	1 copy
Screw type mounting bracket	1 set
CT (current transformer)	
CTL-6S	1 piece [when option W(5A, 10A, 20A) is added]
CTL-12-S36-10L1	1 piece [when option W(50A) is added]
Terminal cover, JCR-33A	1 piece (when the option TC is added)
JCD-33A	2 pieces (when the option TC is added)

## 9.2 Optional specifications

### Alarm 2 (option code: A2)

When A2 action is set as Energized, the alarm action point is set by  $\pm$ deviation from OUT1 setting (except Process value alarm).

When the input exceeds the range, the output turns ON or OFF (in the case of High/Low limit range alarm).

When the alarm action is set as Deenergized, the output acts conversely.

When option A2 is added, one more option Heater burnout alarm or Heating/Cooling control can be added.

Setting accuracy: The same as the Indicating accuracy

Action : ON/OFF action

Hysteresis : For thermocouple and RTD inputs, 0.1 to 100.0°C (°F)

For DC current and voltage inputs, 1 to 1000

(The placement of the decimal point follows the selection)

Output : Relay contact, 1a

Control capacity, 3A 250V AC (resistive load)

Electrical life, 100,000 times

### Heater burnout alarm (option code: HB)

Watches the heater current with CT (current transformer), and detects the heater burnout.

Heater burnout alarm is activated when sensor is burnt out or when indication is overscale or underscale.

When the option Heater burnout alarm is applied, one more option A2 output or Heating/Cooling control can be added.

This option cannot be applied to DC current output type.

Heater rated current: 5A, 10A, 20A, 50A, Must be specified

Setting accuracy : Within  $\pm 5\%$  of heater rated current

Action : ON/OFF action

Output : Relay contact 1a

Control capacity, 3A 250V AC (resistive load)

Electrical life, 100,000 times

### Heating/Cooling control (option code: DR, DS, DA)

When the option Heating/Cooling control is added, one more option A2 output or Heater burnout alarm can be added.

OUT2 proportional band : 0.0 to 10.0 times OUT1 proportional band  
(ON/OFF action when set to 0.0)

OUT2 integral time : The same as that of OUT1

OUT2 derivative time : The same as that of OUT1

OUT2 proportional cycle : 1 to 120 seconds

Overlap band/Dead band:

For thermocouple and RTD inputs,  $-100.0$  to  $100.0^\circ\text{C}$  (°F)

For DC current and voltage inputs,  $-1000$  to  $1000$

(The placement of the decimal point follows the selection)

OUT2 ON/OFF action hysteresis

For thermocouple and RTD inputs, 0.1 to  $100.0^\circ\text{C}$  (°F)

For DC current and voltage inputs, 1 to 1000

(The placement of the decimal point follows the selection)

Output Relay contact output 1a

Control capacity, 3A 250V AC (resistive load)

1A 250V AC (inductive load  $\cos\phi=0.4$ )

Electrical life, 100,000 times

Non-contact voltage output

$12^{\pm 2}\text{V}$  DC maximum 40mA (short circuit protected)

DC current output, 4 to 20mA DC

Load resistance, maximum  $550\Omega$

OUT2 action mode selection function:

One cooling mode can be selected by the keypad from the following.

Air cooling (Linear characteristic)

Oil cooling (1.5th power of the linear characteristic)

Water cooling (2nd power of the linear characteristic)

### Serial communication (option code: C5)

When this option is added, SV1/SV2 external selection function is disabled.

The following operations can be carried out from the external computer.

(1) Reading and setting of SV, PID values and each setting value

(2) Reading of PV and action status (3) Change of the functions

Cable length : Maximum communication distance 1.2km

Cable resistance: Within 50Ω (Terminator is not necessary or 120Ω or greater on one side.)

Communication line : Based on EIA RS-485

Communication method : Half-duplex communication start stop synchronous

Communication speed : 2400, 4800, 9600, 19200bps (Selectable by key)

Parity : Even, Odd and No (Selectable by key)

Stop bit : 1 and 2 (Selectable by key)

Data format

Communication protocol	Shinko protocol	Modbus ASCII	Modbus RTU
Start bit	1	1	1
Data bit	7	7	8
Parity	Even	Selection (Even)	Selection (No)
Stop bit	1	Selection (1)	Selection (1)

Data bit is automatically changed depending on the selection of communication protocol. ( ): Basic setting value

### Digital external setting:

Receives digital setting value from Shinko programmable controller (with option SVTC).

(It is necessary to set the Setting value lock function to Lock 3 for the JCR and JCD.)

When the data from Shinko programmable controller is out of the SV high limit or SV low limit, the JCR or JCD ignores the value, and performs the control at the SV high limit or SV low limit.

### Loop break alarm (option code: LA)

Detects the breaking status on the loop such as heater burnout, sensor burnout or actuator trouble.

The output terminals will be common if the options [LA] and [A2] are applied together.

Setting range : Loop break alarm action time, 0 to 200minutes

Loop break alarm action span, 0 to 150°C(°F), 0.0 to 150.0°C(°F),

For DC input, 0 to 1500 (The placement of the decimal point follows the selection)

Output : Relay contact 1a, 3A 250V AC (Resistive load)

Electrical life, 100,000 times

### Isolated power output (option code: P24)

Output voltage: 24±3V DC (when load current is 30mA)

Ripple voltage: Within 200mV (when load current is 30mA)

Maximum load current: 30mA

### Color Black (option code: BK)

Front panel frame and case: Black

### Terminal cover (option code: TC)

Electrical shock protecting terminal cover

### Designated specifications

- Range : Shipped as designated range.
- Alarm action : Shipped as designated alarm action (A1, A2).
- Heating/Cooling control mode: Shipped as designated output and cooling mode.
- Control action : Shipped as designated control action (e.g. PD action).
- Hysteresis : Shipped as designated hysteresis.

## 10. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power of the controller.



### Warning

**Turn the power supply to the instrument off before wiring or checking. Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.**

#### 10.1 Indication

Problem	Presumed cause and solution
The PV display is indicating [OFF].	<ul style="list-style-type: none"> <li>• Control output OFF function is working. Press the OUT/OFF key for approx. 1 second to release the function.</li> </ul>
[----] is flashing on the PV display.	<ul style="list-style-type: none"> <li>• The thermocouple, RTD and DC voltage (0 to 1V DC) input may be burnt out. Replace each sensor.               <p><b>How to check whether the sensor is burnt out</b></p> <p>[Thermocouple] If the input terminal of the instrument is shorted, and if approximate room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.</p> <p>[RTD] If approx. 100Ω resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if a value around 0°C (32°F) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.</p> <p>[DC voltage (0 to 1V DC)] If the input terminal of the instrument is shorted, and if scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected.</p> </li> <li>• Check whether the input terminal of thermocouple, RTD or DC voltage (0 to 1V DC) is securely mounted to the instrument terminal. Ensure that the sensor terminals are securely connected to the instrument input terminals.</li> </ul>

<b>Problem</b>	<b>Presumed cause and solution</b>
<p>[- - - -] is flashing on the PV display.</p>	<ul style="list-style-type: none"> <li>• The input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) may be disconnected. Replace the input signal wire. <b>How to check whether the input signal wire is disconnected</b> [DC voltage (1 to 5V DC)] If the input to the input terminal of this controller is 1V DC and if scaling low limit value is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected. [DC current (4 to 20mA DC)] If the input to the input terminal of this controller is 4mA DC and scaling low limit value is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected.</li> <li>• Check whether the input signal wire of DC voltage (1 to 5V DC) and DC current (4 to 20mA DC) is securely connected to the input terminal of this controller. Ensure that they are wired properly.</li> <li>• Check whether the polarity of thermocouple or compensating lead wire is correct.</li> <li>• Check whether codes (A, B, B) of the RTD agree with the controller terminal. Ensure that they are wired properly.</li> </ul>
<p>The value set during the Scaling low limit setting remains on the PV display.</p>	<ul style="list-style-type: none"> <li>• Check whether the input signal wire for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) is disconnected. <b>How to check whether the input signal wire is disconnected</b> [DC voltage (0 to 5V DC, 0 to 10V)] If the input to the input terminal of this controller is 1V DC and if a value corresponding to 1V DC is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected. [DC current (0 to 20mA DC)] If the input to the input terminal of this controller is 1mA DC and if a value corresponding to 1mA DC is indicated, the controller is likely to be operating normally, however, the input signal wire may be disconnected.</li> <li>• Check whether the input lead wire terminals for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) are securely connected to the instrument input terminals.</li> </ul>
<p>The indication of PV display is abnormal or unstable.</p>	<ul style="list-style-type: none"> <li>• Check whether the sensor input and temperature unit (°C or °F) setting are correct. Set the sensor input and the temperature unit properly.</li> <li>• Sensor correcting value is unsuitable. Set it to a suitable value.</li> <li>• Sensor specification is improper. Set the sensor specification properly.</li> <li>• AC may be leaking into the sensor circuit. Use an ungrounded type sensor.</li> <li>• There may be equipment that interferes with or makes noise near the controller. Keep equipment that interferes with or makes noise away from the controller.</li> </ul>



<b>Problem</b>	<b>Presumed cause and solution</b>
PV display flashes [Err i].	Internal memory is defective. Please contact our main office or dealers.

## 10.2 Key operation

<b>Problem</b>	<b>Presumed cause and solution</b>
Settings (main setting value, P, I, D, proportional cycle, alarm, etc.) are impossible. The values do not change by the $\triangle$ or $\nabla$ key.	<ul style="list-style-type: none"> <li>Setting value lock (Lock 1 or Lock 2) is designated. Release the lock designation.</li> <li>During PID auto-tuning or auto-reset. Cancel auto-tuning. Auto-reset ends in 4 minutes after started.</li> </ul>
The setting indication does not change within the input range even if the $\triangle$ or $\nabla$ key is pressed, and values cannot be set.	<ul style="list-style-type: none"> <li>SV high limit or low limit may be set at the point where the value does not change. Set it to a suitable value during Auxiliary function setting mode 1.</li> </ul>

## 10.3 Control

<b>Problem</b>	<b>Presumed cause and solution</b>
Process variable (temperature) does not rise.	<ul style="list-style-type: none"> <li>The sensor is out of order. Replace the sensor.</li> <li>Check whether sensor or actuator is securely connected to the input or output terminals of the instrument.</li> <li>Ensure that the wiring of sensor and actuator are correct.</li> </ul>
If the control output remains in an ON status.	<ul style="list-style-type: none"> <li>OUT1 low limit value is set to 100% or greater in Auxiliary function setting mode 2. Set it to a suitable value.</li> </ul>
If the control output remains in an OFF status.	<ul style="list-style-type: none"> <li>OUT1 high limit value is set to 0% or less in Auxiliary function setting mode 2. Set it to a suitable value.</li> </ul>

For all other malfunctions, please make inquiries at our agency or us.

# 11. Character table

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## [Main setting mode]

Character	Setting item	Default value	Data
<i>SV</i>	SV1	0°C	
<i>SV2</i>	SV2	0°C	

## [Sub setting mode]

Character	Setting item	Default value	Data
<i>AT</i>	AT setting	Cancellation	
<i>AR</i>	Auto-reset setting		
<i>P</i>	OUT1 proportional band setting	10°C	
<i>P<sub>b</sub></i>	OUT2 proportional band setting	1.0 times	
<i>I</i>	Integral time setting	200s	
<i>d</i>	Derivative time setting	50s	
<i>ARW</i>	ARW setting	50%	
<i>c</i>	OUT1 proportional cycle setting	30s or 3s	
<i>c<sub>b</sub></i>	OUT2 proportional cycle setting	30s or 3s	
<i>A1</i>	A1 setting	0°C	
<i>A2</i>	A2 setting	0°C	
<i>H</i>	HB (Heater burnout alarm) setting	0.0A	
<i>LP<sub>r</sub></i>	LA (Loop break alarm) action time setting	0 minutes	
<i>LP<sub>H</sub></i>	LA (Loop break alarm) action span setting	0°C	

## [Auxiliary function setting mode 1]

Character	Setting item	Default value	Data
<i>Lock</i>	Setting value lock selection	Unlock	
<i>SH</i>	SV high limit setting	Input range high limit value	
<i>SL</i>	SV low limit setting	Input range low limit value	
<i>So</i>	Sensor correction setting	0.0°C	
<i>cn<sub>SL</sub></i>	Communication protocol selection	Shinko protocol	
<i>cn<sub>no</sub></i>	Instrument number setting	0	
<i>cn<sub>SP</sub></i>	Communication speed selection	9600bps	
<i>cn<sub>Pr</sub></i>	Parity selection	Even	
<i>cn<sub>St</sub></i>	Stop bit selection	1	

**[Auxiliary function setting mode 2]**

Character	Setting item	Default value	Data
4En4	Sensor selection	K: -200 to 1370°C	
4FLH	Scaling high limit setting	9999	
4FLl	Scaling low limit setting	-1999	
dP	Decimal point place selection	No decimal point	
FILF	PV filter time constant setting	0.0 seconds	
oLH	OUT1 high limit setting	100%	
oLL	OUT1 low limit setting	0%	
H44	OUT1 ON/OFF action hysteresis	1.0°C	
cRcF	OUT2 action mode selection	Air cooling	
oLHb	OUT2 high limit setting	100%	
oLLb	OUT2 low limit setting	0%	
db	Overlap band/Dead band setting	0.0°C	
H44b	OUT2 ON/OFF action hysteresis	1.0°C	
ALIF	A1 action selection	No alarm action	
AL2F	A2 action selection	No alarm action	
A1Lā	A1 action Energized/Deenergized	Energized	
A2Lā	A2 action Energized/Deenergized	Energized	
A1H4	A1 hysteresis setting	1.0°C	
A2H4	A2 hysteresis setting	1.0°C	
A1d4	A1 action delayed timer setting	0 seconds	
A2d4	A2 action delayed timer setting	0 seconds	
conF	Direct (Cooling)/Reverse (Heating) action	Reverse (Heating) action	
AT_b	AT bias setting	20°C	
48_b	SVTC bias setting	0	
482	SV2 indication selection	Indication	
EoUF	Output status selection when input abnormal	Output OFF	
āRāU	OUT/OFF key function selection	OUT/OFF function	

\*\*\*\*\* Inquiry \*\*\*\*\*

For any inquiries about this unit, please contact our agency or the shop where you purchased the unit after checking the following.

- [Example]
- Model ----- JCD-33A-R/M
  - Input type ----- K
  - Option ----- A2, C5
  - Serial number ----- No. xxxxxx

In addition to the above, please let us know the details of the malfunction, if any, and the operating conditions.

**SHINKO TECHNOS CO.,LTD.**  
**OVERSEAS DIVISION**

Reg. Office : 1-2-48, Ina, Minoo, Osaka, Japan

Mail Address : P.O.Box 17, Minoo, Osaka, Japan

URL : <http://www.shinko-technos.co.jp>

E-mail : [overseas@shinko-technos.co.jp](mailto:overseas@shinko-technos.co.jp)

Tel : 81-72-721-2781

Fax: 81-72-724-1760

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