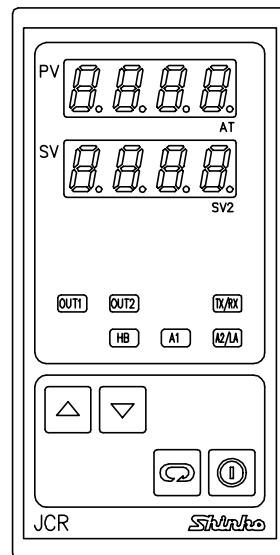
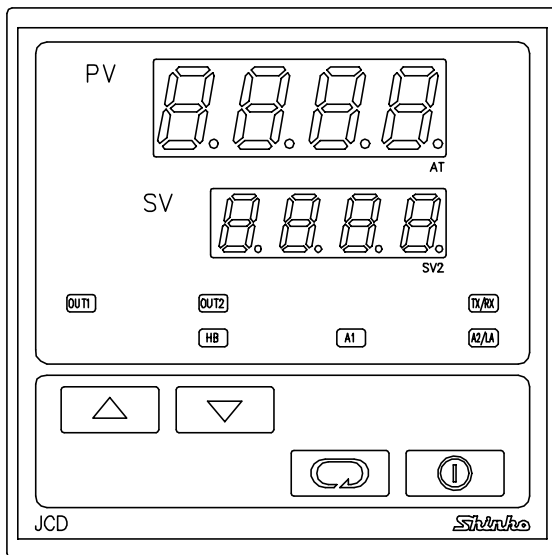


INSTRUCTION MANUAL
FOR
MICROCOMPUTER BASED
TEMPERATURE INDICATING CONTROLLER
JCD-13A, JCR-13A



Preface

Thank you for the purchase of our Microcomputer based Temperature Indicating Controllers JCD-13A or JCR-13A.

This manual contains instructions for the mounting, functions, operations and notes when operating the JCD-13A or JCR-13A.

For model confirmation and unit specifications, please read this manual carefully before starting operation.

To prevent accidents arising from the use of this controller, please ensure the operator using it receives this manual.


Notes

- This instrument should be used according to the specifications described in the manual. If it is used outside the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Specifications of the JCD-13A and JCR-13A 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.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos is not responsible 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.

SAFETY PRECAUTIONS

(Be sure to read these precautions before using our products.)

1. Installation precautions



Caution

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

Overvoltage category II, Pollution degree 2

Mount the controller in a place with:

- A minimum of dust, and an absence of corrosive gasses
- No flammable, explosive gasses
- 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
- The units away from large capacity electromagnetic switches or cables
- 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 though the case of this instrument is made of flame resisting resin.

Avoid setting this instrument directly on flammable material.

SAFETY PRECAUTIONS

(Be sure to read these precautions before using our products.)

2. Wiring precautions



Caution

- Use the solderless terminal with an insulation sleeve that fits an M3 screw when wiring the JCD-13A or JCR-13A.
- 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.



Caution

- Do not apply a commercial power source to the sensor which is 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 or fuse. It is necessary to install them near the controller.
(Recommended fuse: Time-lag fuse, Rated voltage 250V, Rated current 2A)
- It is recommended that the PID auto-tuning be performed on the trial run.

3. Running and maintenance precautions



Warning

- 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 an Electric Shock which could cause severe injury or death.
- Wipe the instrument dry using soft cloth or cotton.
(If the paint thinner is used for wiping, the instrument may be deformed or discolored.)
- The display parts are more easily damaged. Do not strike them with hard objects or press hard on them.

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1. Model names

1.1 Model names

Standard models

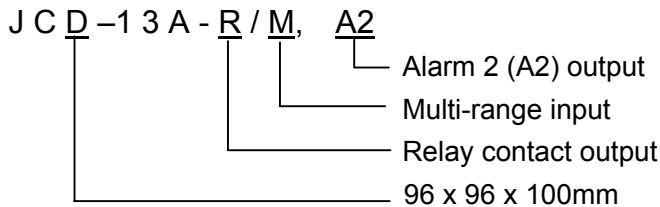
J C □ - 1 3 A - □ / □		
Series name	D	JCD-13A: W96 x H96 x D100mm
	R	JCR-13A: W48 x H96 x D100mm
Alarm 1 (A1)	A	Alarm action: selectable by key operation *1
Control output (OUT1)	R	Relay contact
	S	Non-contact voltage (for SSR drive)
	A	DC current
Input	M	Multi-range *2
	A	DC current
	V	DC voltage

*1: 10 types of alarm action (including No alarm action) and Energized/Deenergized are selectable by key operation.

*2: Input types (3 thermocouple and 2 RTD types) are selectable by key operation.

Alphanumeric character to represent the functions or type is applied to the □.

[Example]



Optional code

Code	Description	
A2	Alarm 2 (A2)	
W	Heater burnout alarm	
DR	Control output (OUT2) (Heating/Cooling control output)	Relay contact
DS		Non-contact voltage
DA		DC current
C5	Serial communication (RS-485)	
LA	Loop break alarm	
BK	Color: Black	
IP	Dust-proof•Drip-proof (IP54)	
TC	Terminal cover	
BL	Screw type mounting bracket (optional for JCR-13A, included with JCD-13A)	



Caution

- 2 options out of the options [A2], [W], [DR, DS, DA] and [LA] can be applied together.
- When the option [A2] and [LA] are applied together, they use common output terminals.
- For the DC current output, the option [W] cannot be added.
- When the option [C5] is applied, setting value memory external selection cannot be used.

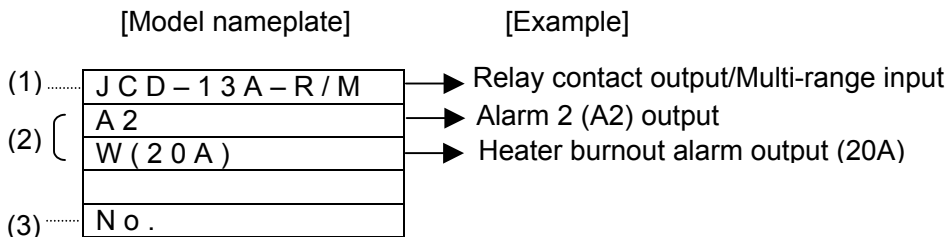
1.2 Rated scale

Input type		Scale	
Thermocouple	K	0 to 1370 °C	0 to 2500 °F
	J	0 to 1000 °C	0 to 1800 °F
	E	0 to 800 °C	0 to 1500 °F
RTD	Pt100	-200 to 850 °C	-300 to 1500 °F
		-199.9 to 850.0 °C	-199.9 to 999.9 °F
	JPt100	-200 to 500 °C	-300 to 900 °F
		-199.9 to 500.0 °C	-199.9 to 900.0 °F
DC	4 to 20mAdc	-1999 to 9999, -199.9 to 999.9 -19.99 to 99.99 or -1.999 to 9.999	
	0 to 20mAdc		
	0 to 1Vdc		
	0 to 10Vdc		

With the DC input, scale range and decimal point place are changeable.

1.3 How to indicate the model nameplate

Model nameplates are put on the case and the left side of the inner assembly.

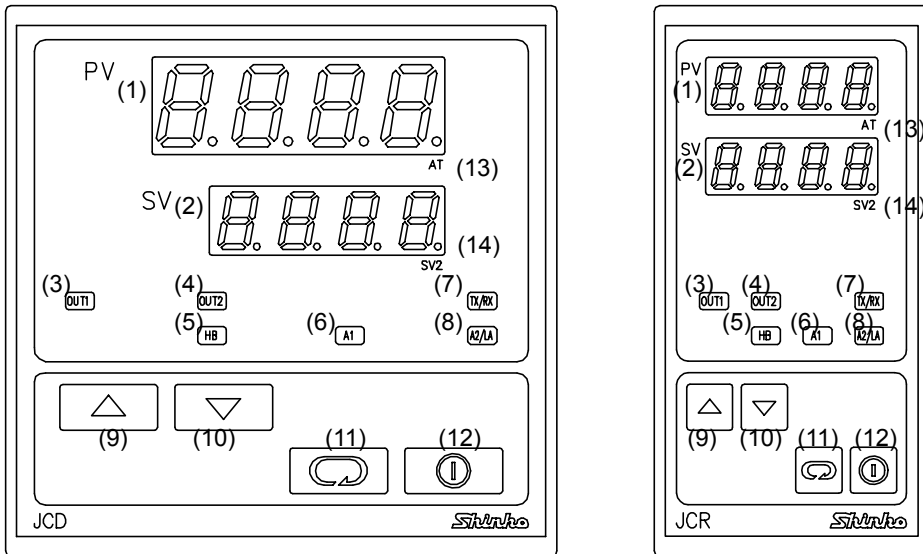


(1): Model name

(2): Option codes

(3): Instrument number (Indicated only on the internal assembly)

2. Name and functions of the sections



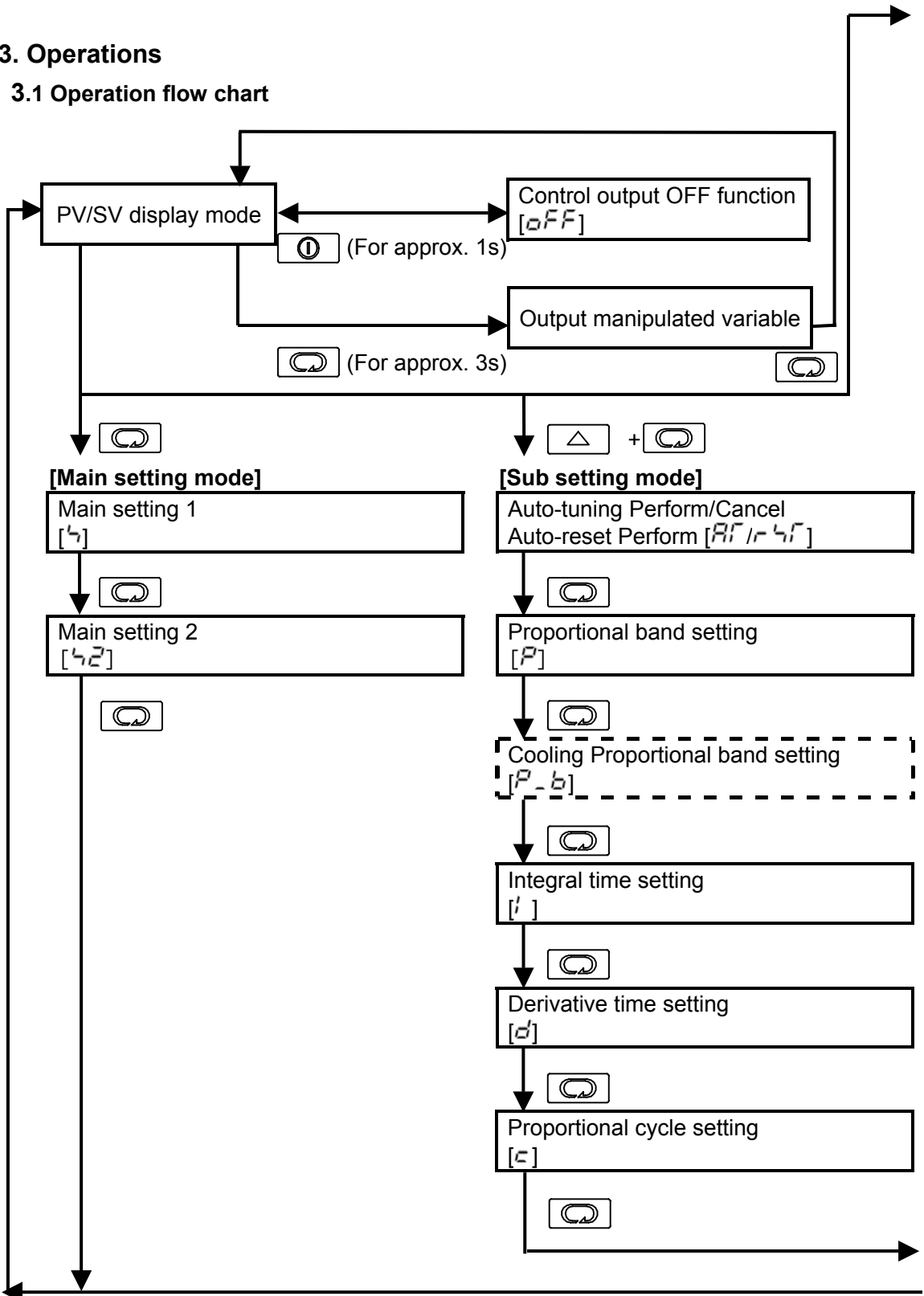
[Fig. 2-1]

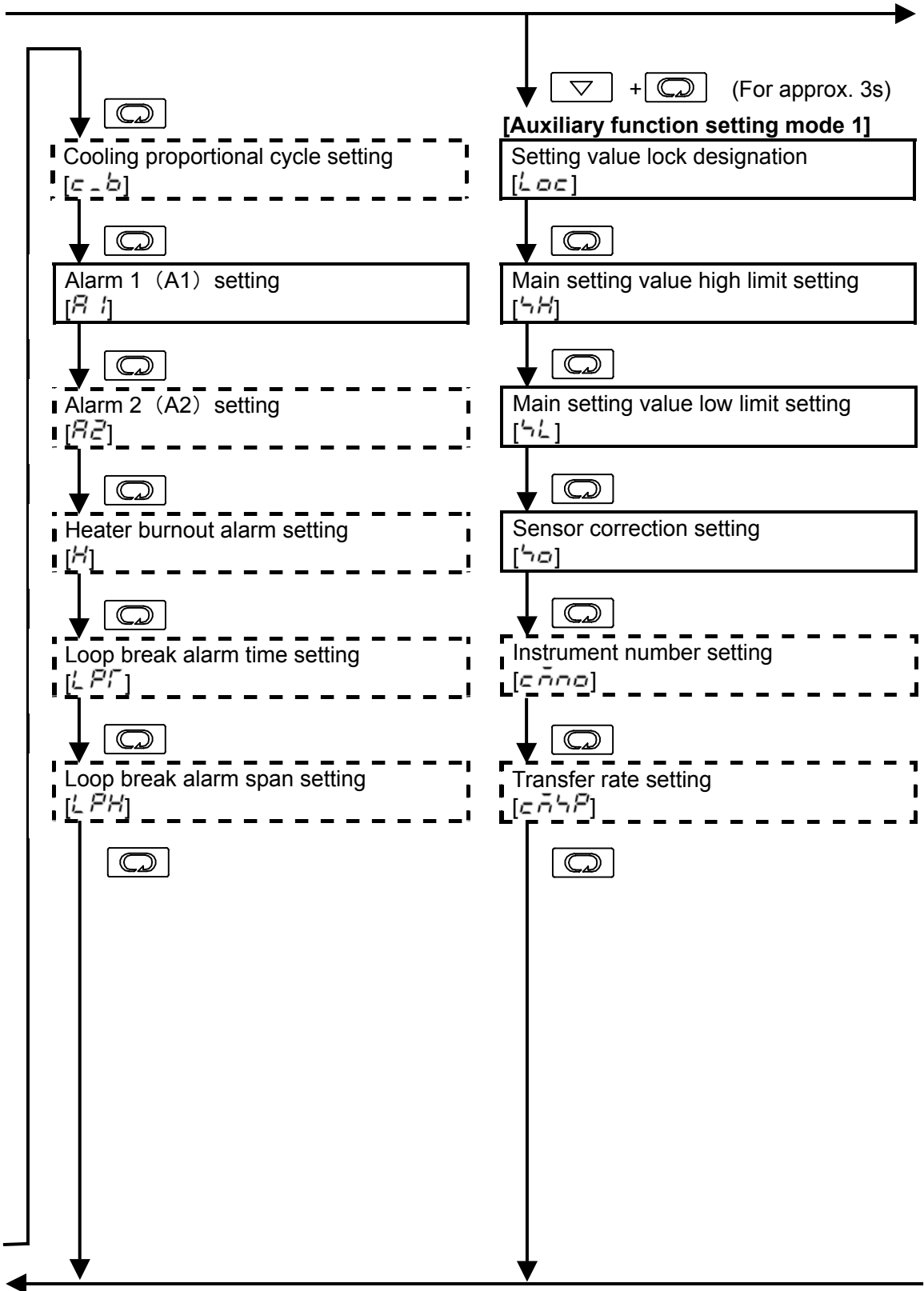
- (1) PV display
Indicates the Process variable (PV) with a red LED.
- (2) SV display
Indicates the Setting value (SV) or Manipulated variable (MV) with a green LED.
- (3) Control output (OUT1) or Heating output action indicator
When the Control output (OUT1) or Heating output is on, a green LED lights.
- (4) Cooling output action indicator
When the Cooling output is on, a yellow LED lights.
- (5) Heater burnout alarm or sensor burnout alarm output action indicator
When Heater burnout alarm output or sensor burnout alarm output is on, a red LED lights.
(When the option [W] is added, in case of the overscale or underscale, a red LED lights.)

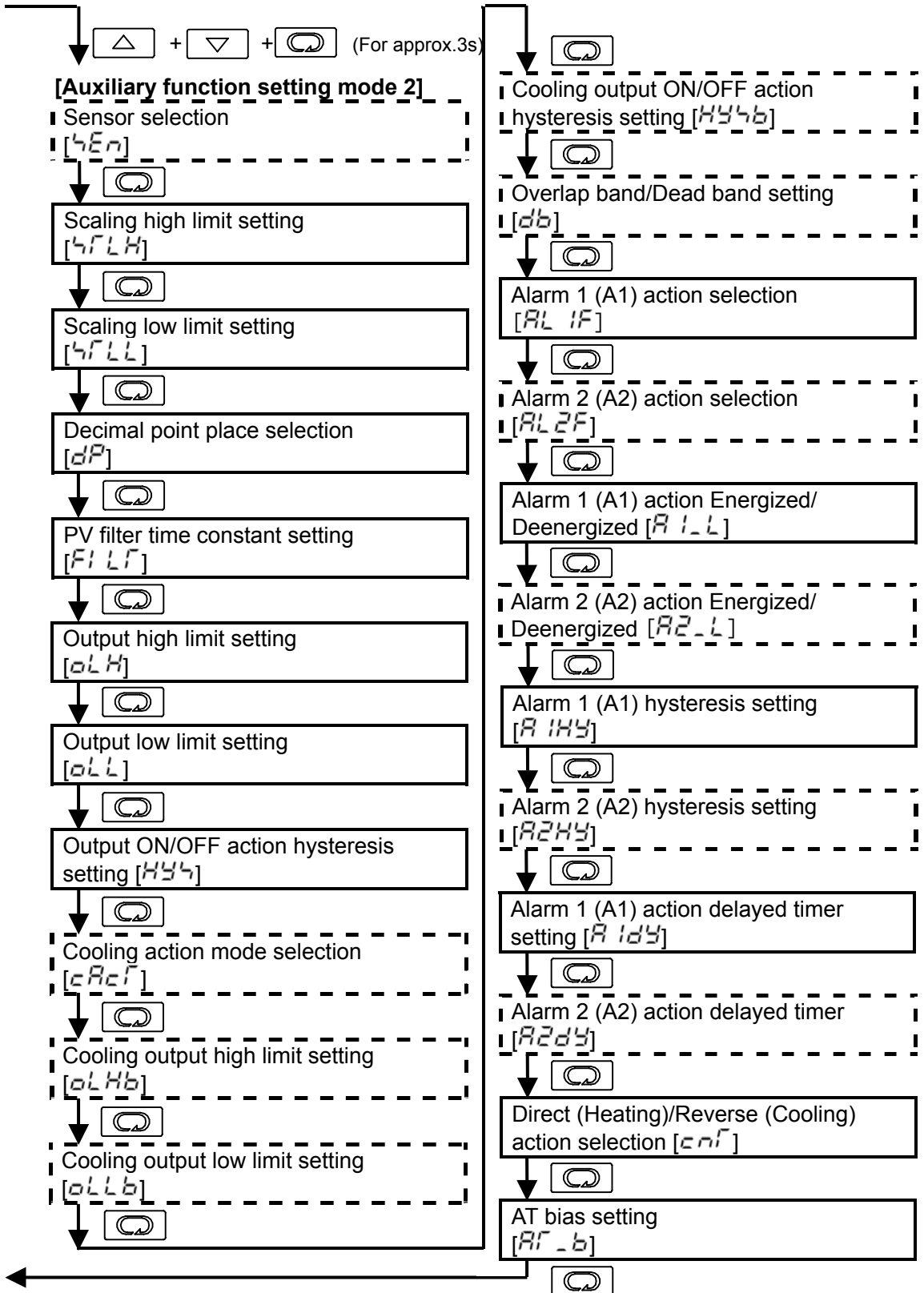
- (6) Alarm 1 (A1) output action indicator
When the Alarm 1 (A1) output is on, a red LED lights.
- (7) Serial communication output indicator
When serial communication output (transmitting) is on, a yellow LED blinks.
- (8) Alarm 2 (A2) or Loop break alarm output action indicator
When the Alarm 2 (A2) or Loop break alarm output is on, a red LED lights.
- (9) Increase key: Increases the numeric value or selects the setting value.
- (10) Decrease key: Decreases the numeric value or selects the setting value.
- (11) Mode key: Selects the setting mode or registers the setting value or selected value.
(By pressing the Mode key, the setting value or selected value can be registered.)
- (12) OUT/OFF key
The output is turned on or off. If this key is pressed for 1 second from any mode, control output off function works. **Once the Control output function is enabled, the function cannot be released even if the power to the instrument is turned OFF and turned ON again. To cancel the function, press the OUT/OFF key again for approx. 1 second.**
- (13) Auto-tuning action indicator
During auto-tuning, the dot of the least significant digit on the PV display blinks.
- (14) The 2nd main setting value indicator
Lights when the 2nd main setting value is indicated on the SV display.

3. Operations

3.1 Operation flow chart








3.2 PV/SV display mode

The PV display indicates the sensor type and the SV display indicates the rated scale maximum value for approx. 2 seconds after the power is turned on. See [table 3.2-1]. (If any other value is set in the scaling high limit setting, the SV display indicates the set value.)

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

After that, the actual temperature is displayed on the PV display, main setting value on the SV display and the control starts.

[*OFF*] is indicated on the PV display while control output off function is working.



To release the function, press the  key for approx. 1 second.


[Table 3.2-1]

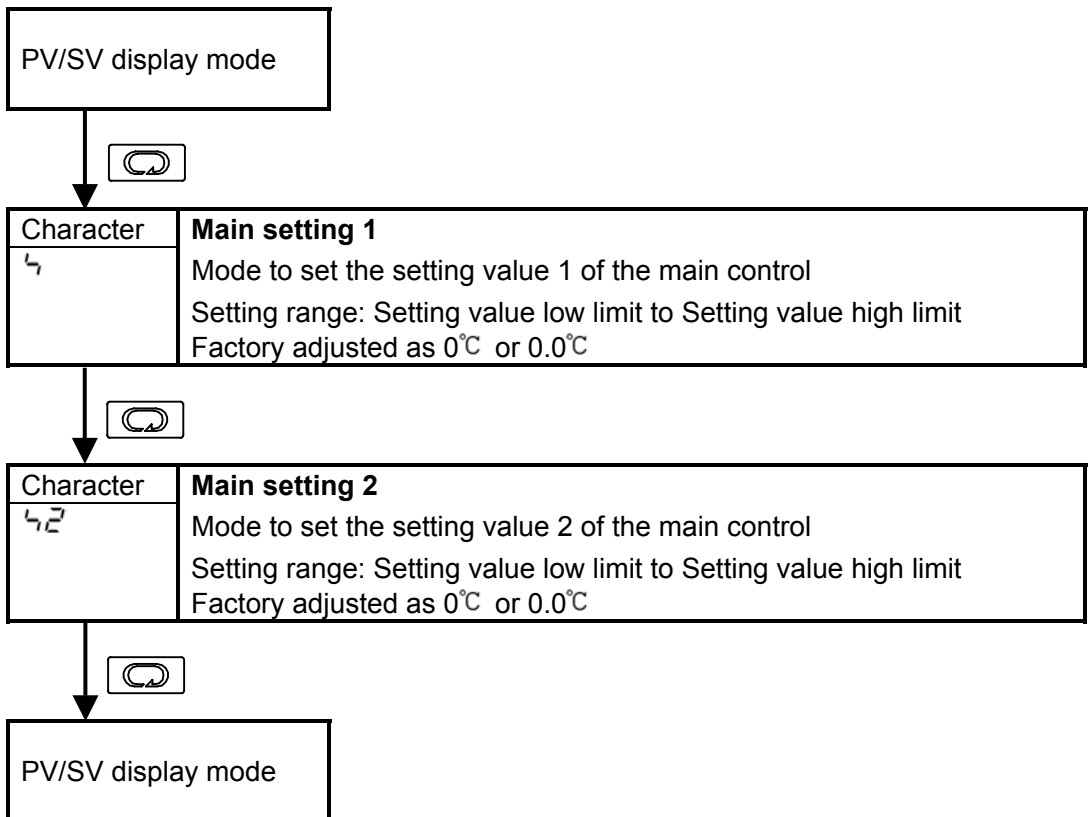
Input	°C		°F	
	PV display	SV display	PV display	SV display
K	<i>K C</i>	<i>1370</i>	<i>K F</i>	<i>2500</i>
J	<i>J C</i>	<i>1000</i>	<i>J F</i>	<i>1800</i>
E	<i>E C</i>	<i>800</i>	<i>E F</i>	<i>1500</i>
Pt100	<i>PT C</i>	<i>8500</i>	<i>PT F</i>	<i>9999</i>
	<i>PT C</i>	<i>850</i>	<i>PT F</i>	<i>1500</i>
JPt100	<i>JPT C</i>	<i>5000</i>	<i>JPT F</i>	<i>9000</i>
	<i>JPT C</i>	<i>500</i>	<i>JPT F</i>	<i>900</i>
0 to 20mA	<i>02A</i>	Scaling high limit value	<i>02A</i>	Scaling high limit value
0 to 1V	<i>02A</i>		<i>02A</i>	
0 to 10V	<i>02A</i>		<i>02A</i>	
4 to 20mA	<i>42A</i>		<i>42A</i>	

3.3 Main setting mode



If the  key is pressed, the Main setting mode can be selected.




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

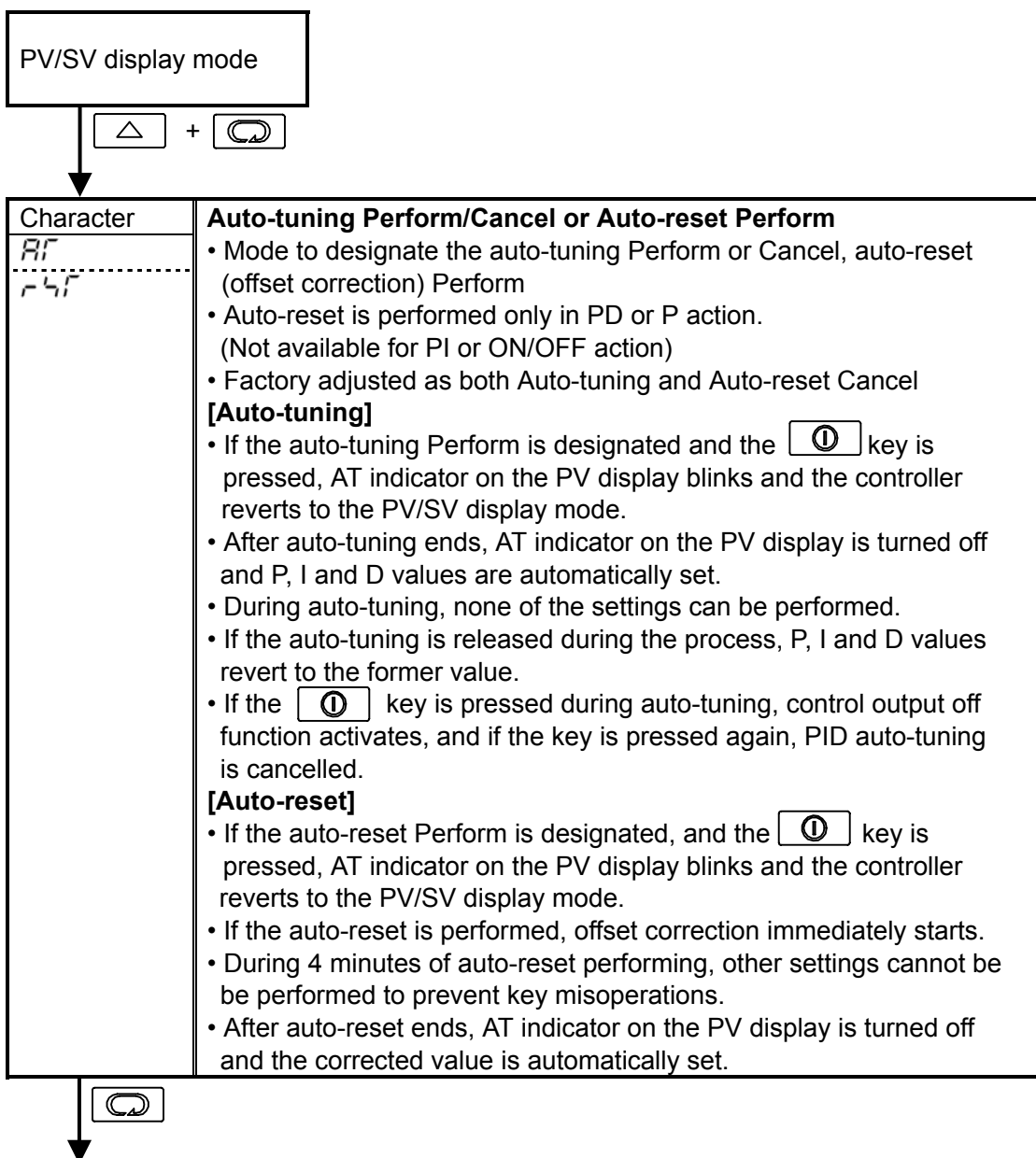
If the  key is pressed again, the setting value will be registered and the controller will revert to the PV/SV display.

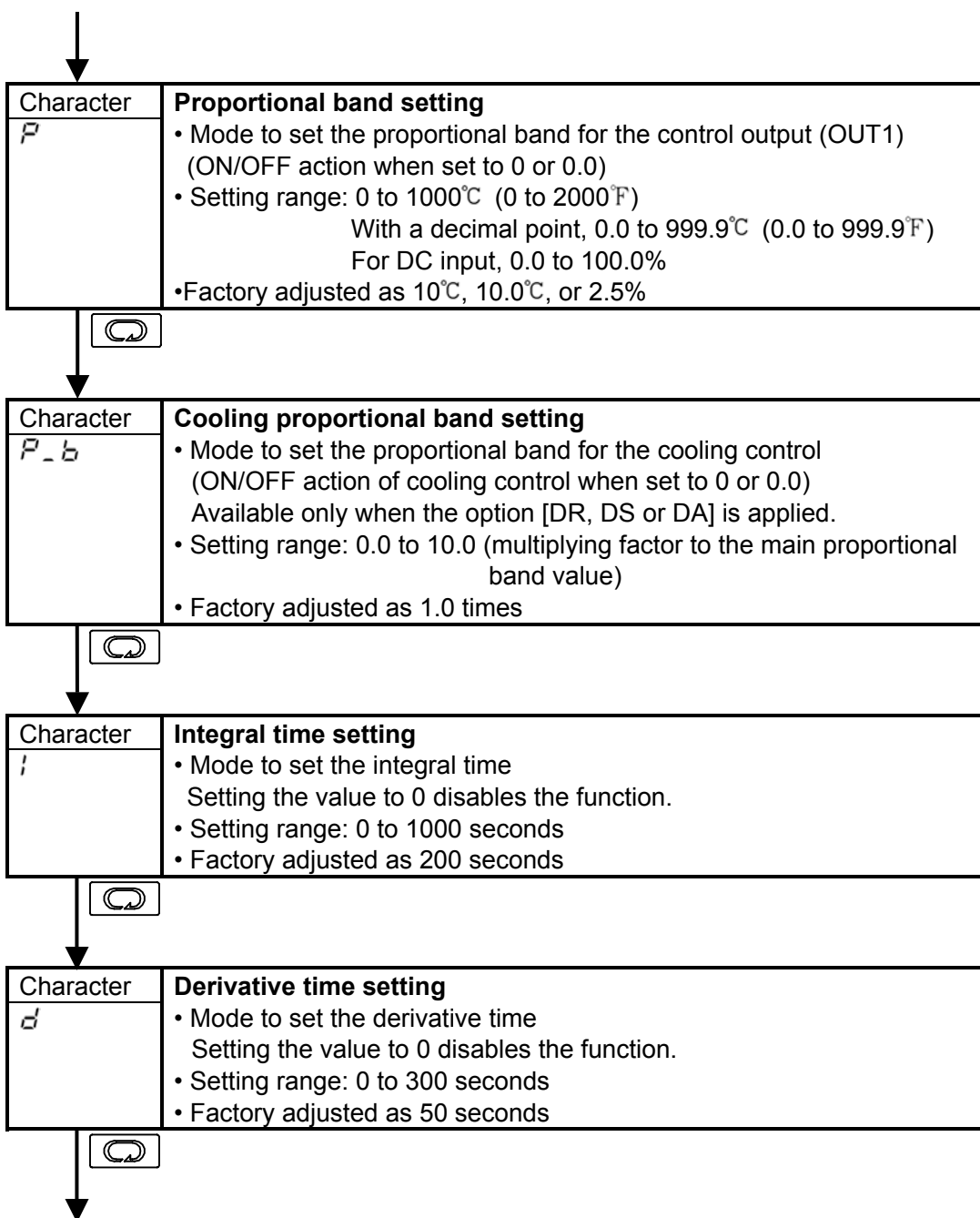


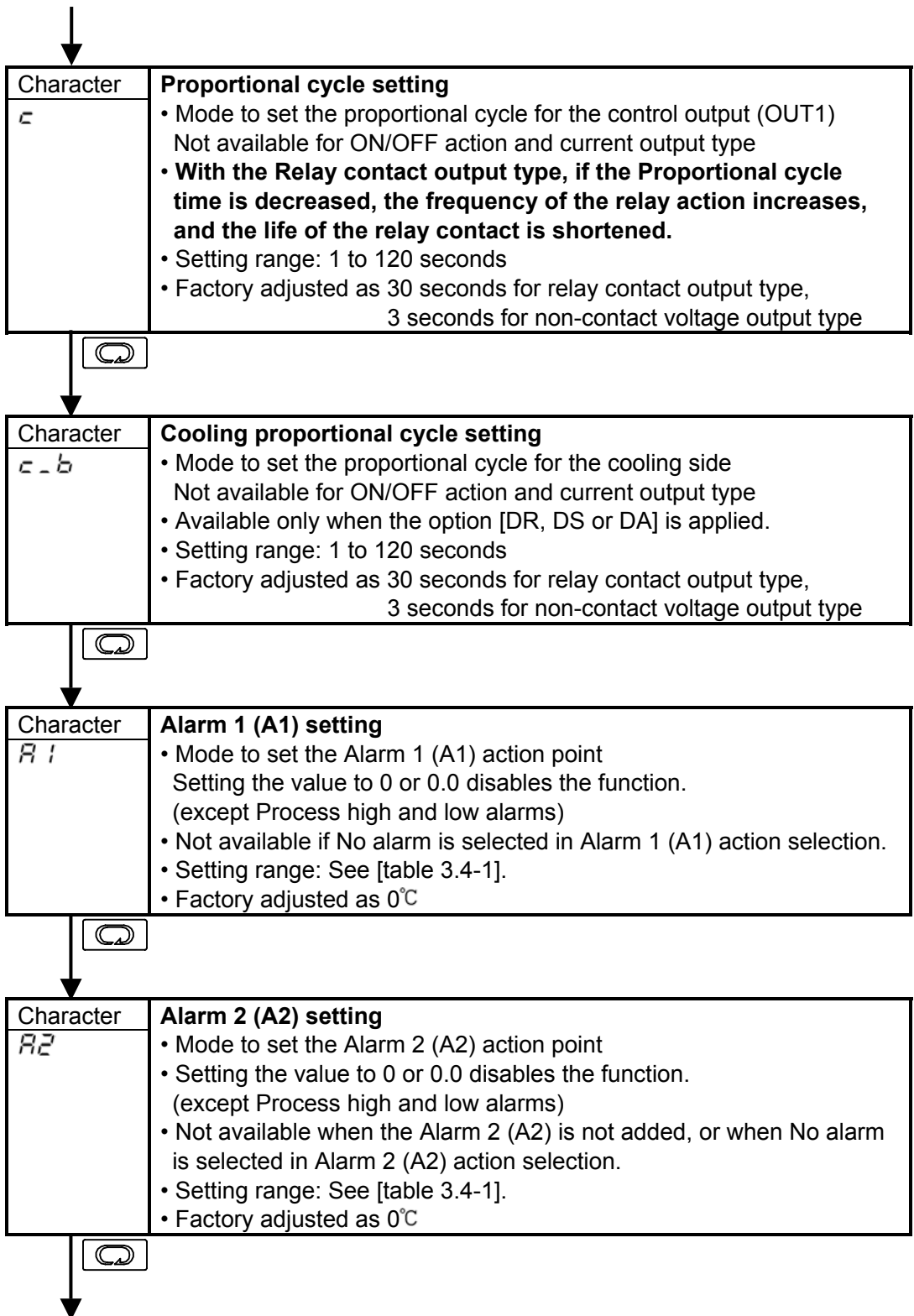
3.4 Sub setting mode

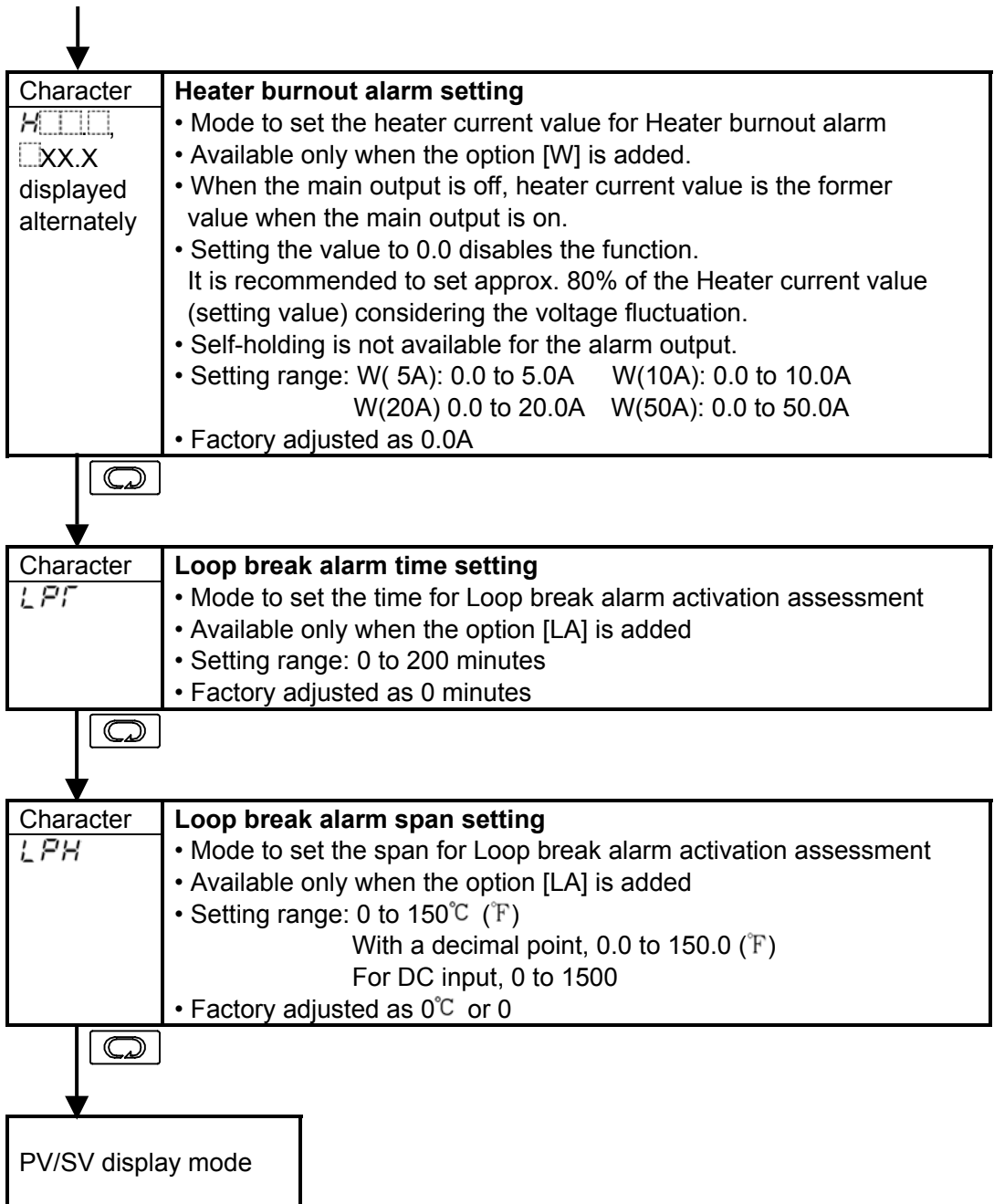
In the PV/SV display mode, if the  key is pressed while the  key is being pressed, Sub setting mode will be selected.

The setting value can be increased or decreased by pressing the  or  key. If the  key is pressed again, the setting value is registered and the next setting item will be selected.









[Setting range of Alarm 1 (A1) and 2 (A2)]

[Table 3.4-1]



Alarm type	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 minimum to Input range maximum	*2
Process low alarm	Input range minimum to Input range maximum	*2
High limit alarm w/standby	–Input span to Input span °C (°F)	*1
Low limit alarm w/standby	–Input span to Input span °C (°F)	*1
High/Low limits alarm w/standby	0 to Input span °C (°F)	*1



- When the input has a decimal point, the minimum value of the negative side is –199.9, and the maximum value of the positive side is 999.9


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

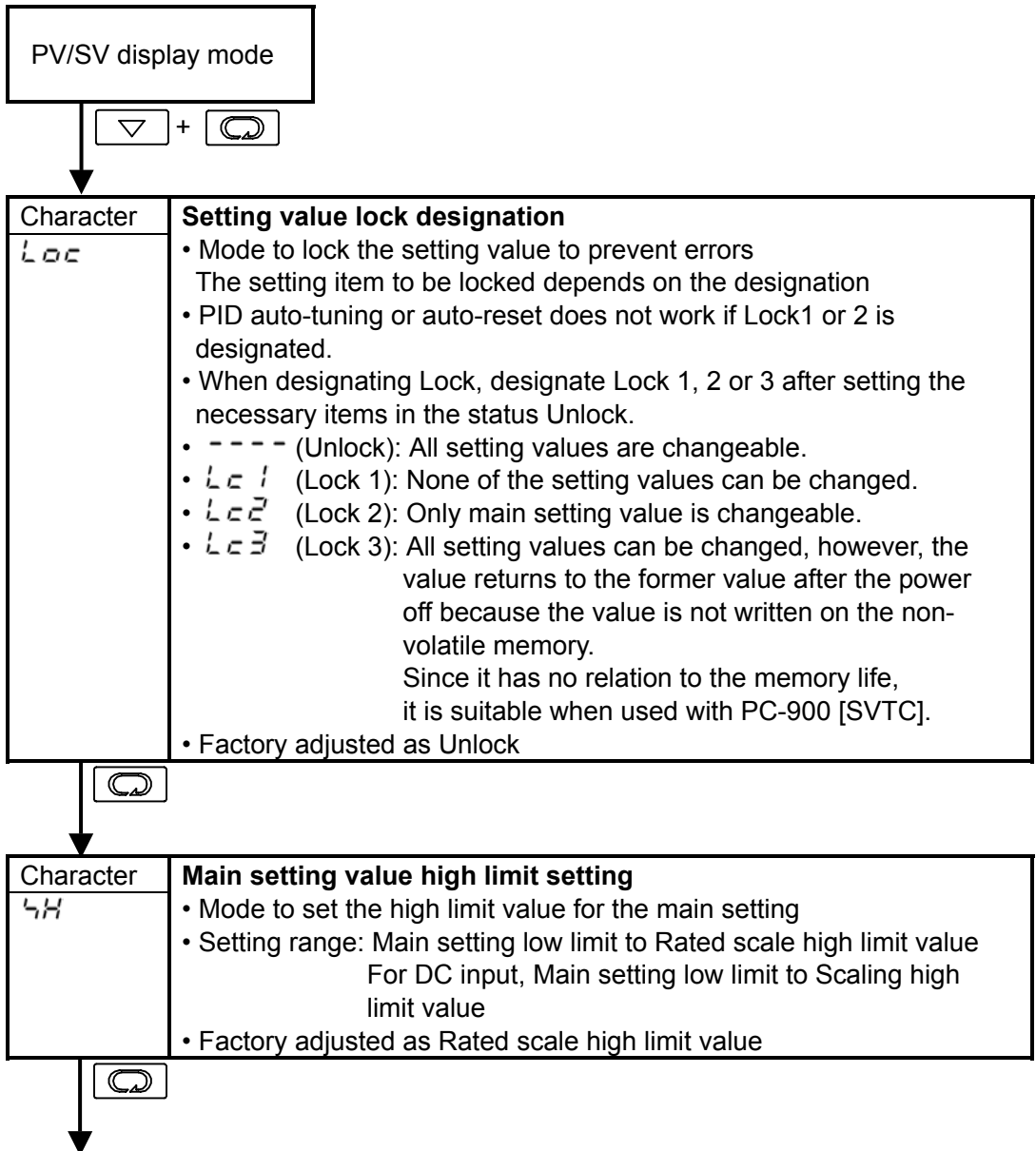
*2: For DC input, Input range maximum (minimum) is the same as the Input range scaling maximum (minimum) value.

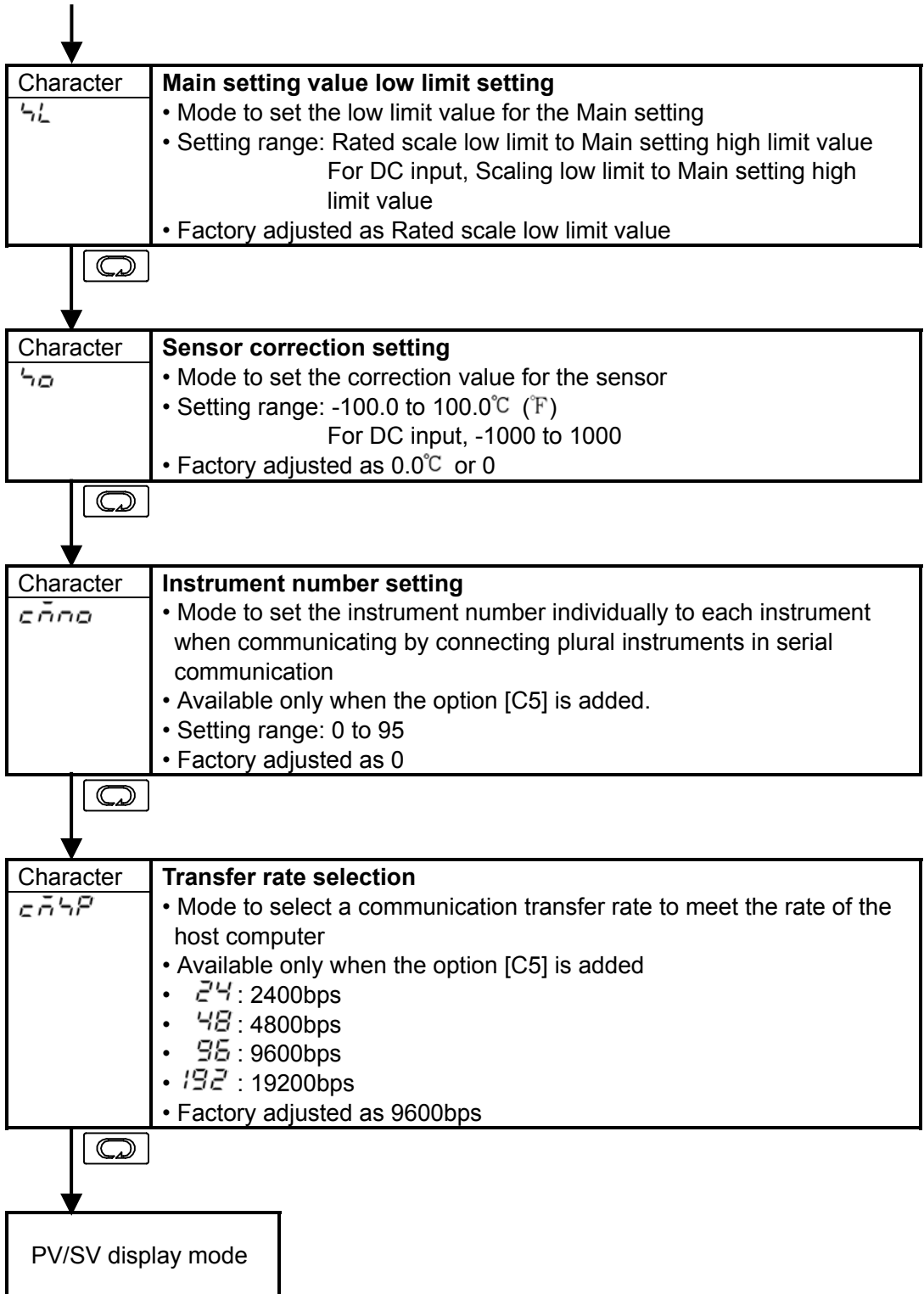
3.5 Auxiliary function setting mode 1

In the PV/SV display mode, if the  key is pressed while the  key is being pressed, 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.




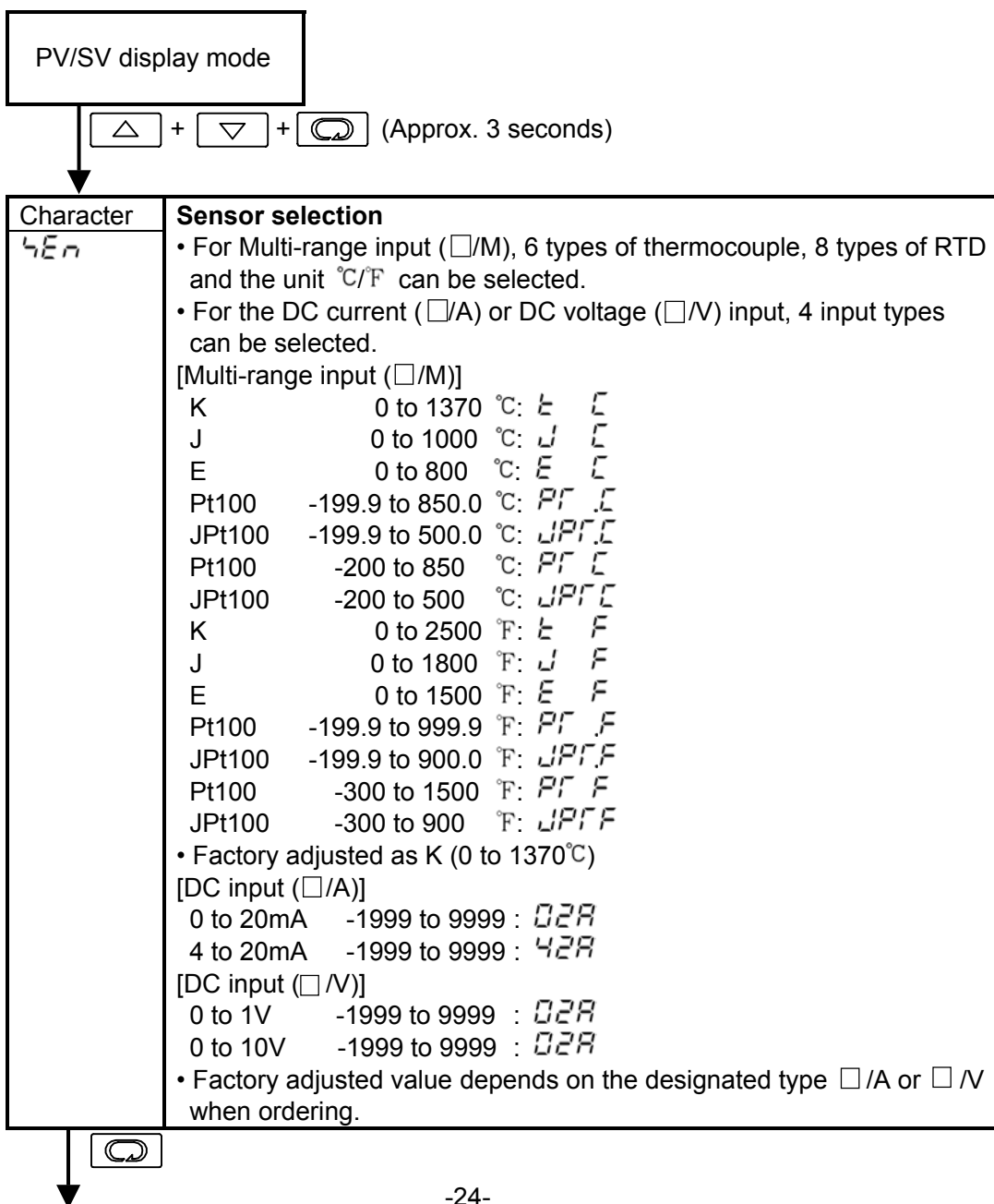


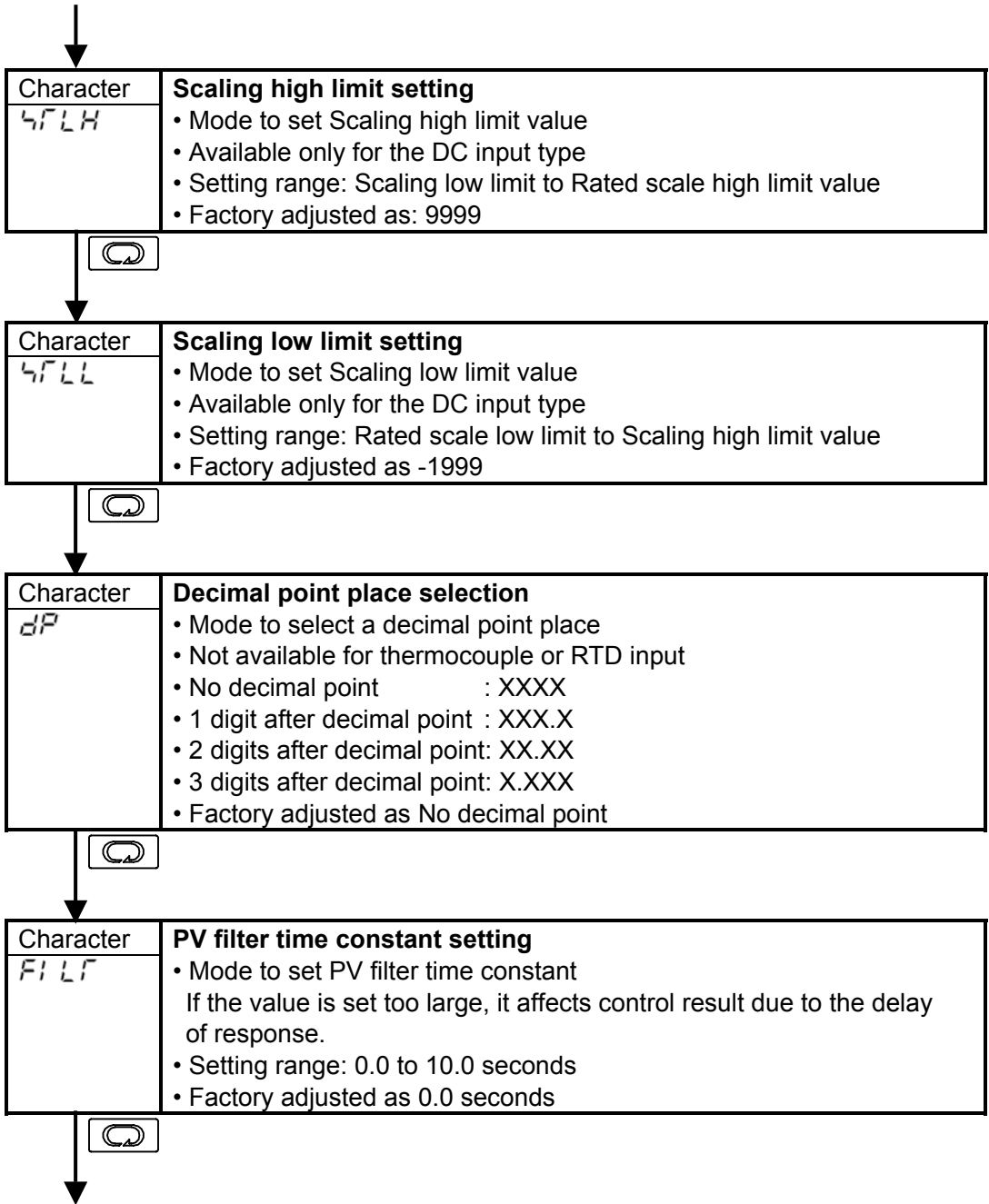
3.6 Auxiliary function setting mode 2

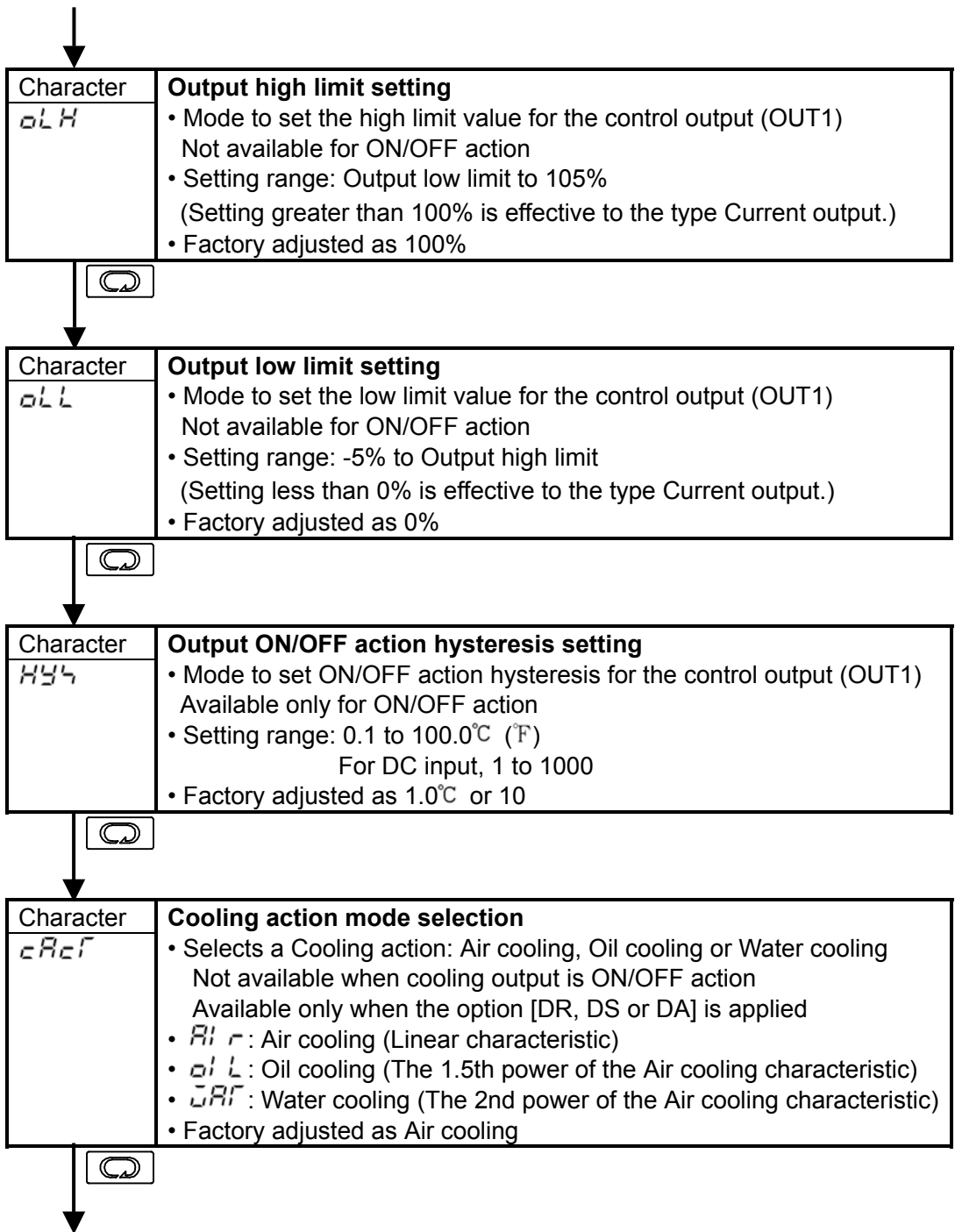
In the PV/SV display mode, if the  key is pressed for approx. 3 seconds while the  and  keys are being pressed, the Auxiliary function setting mode 2 can be selected.

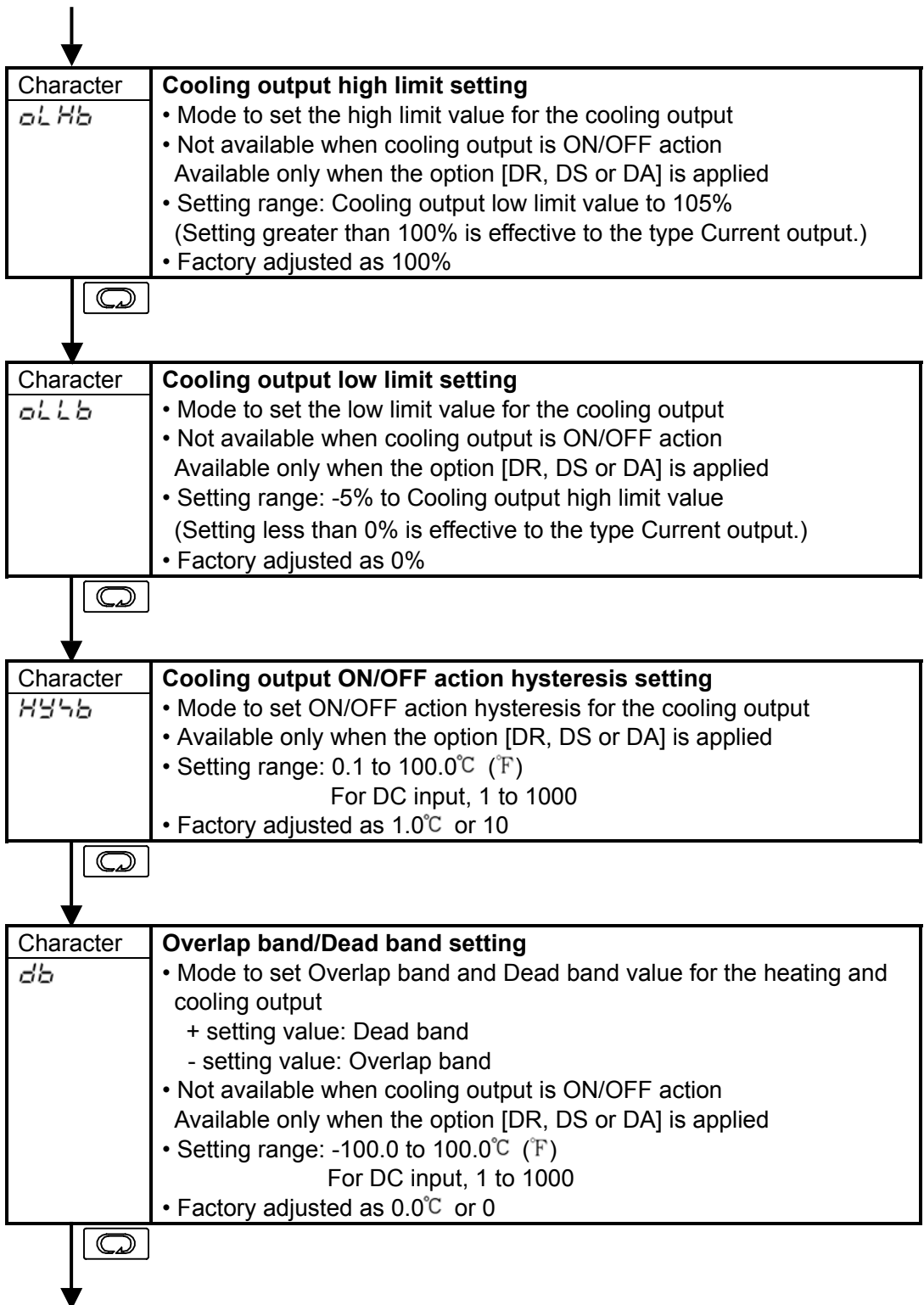
The setting value can be increased or decreased by pressing the  or  key.

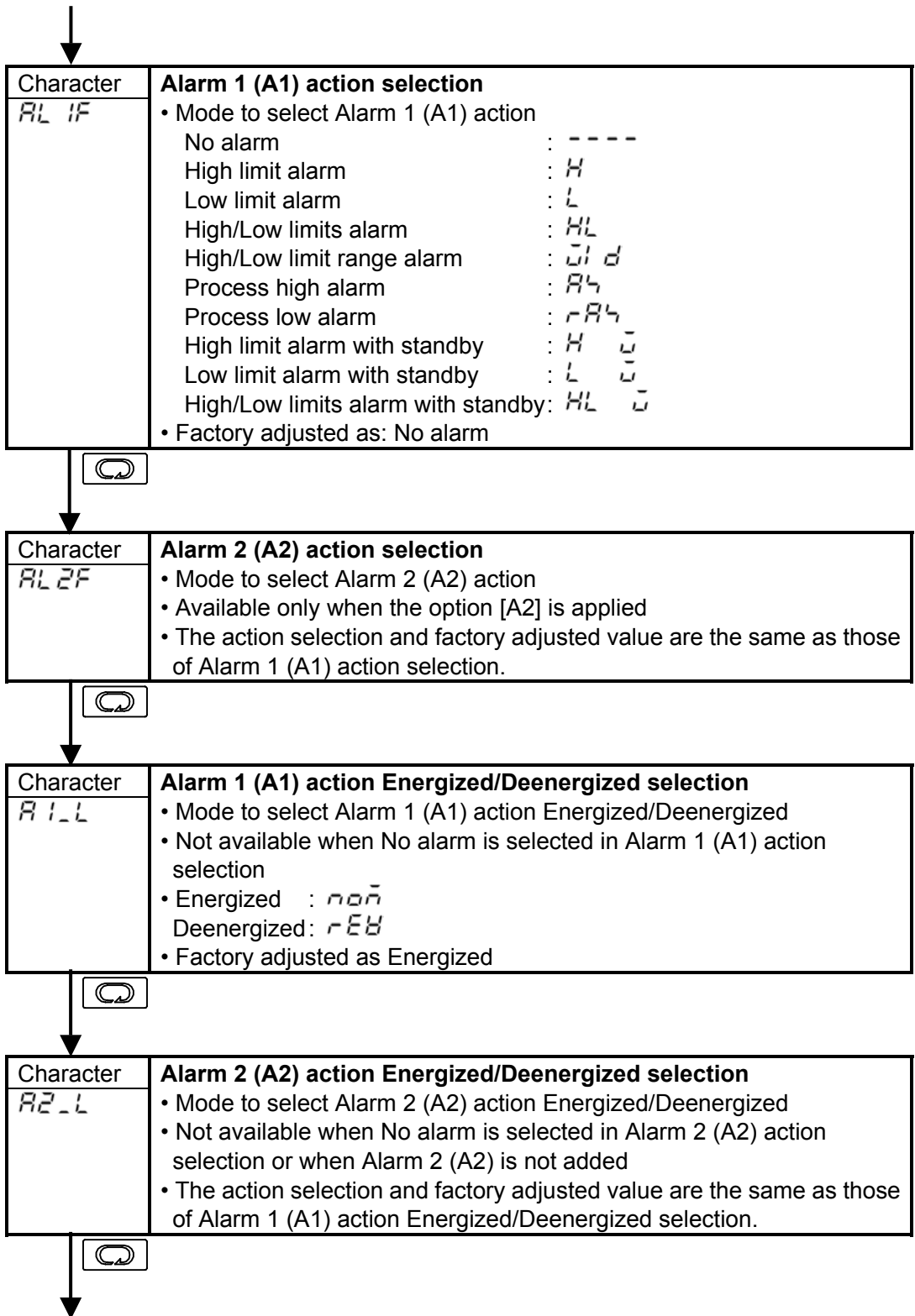
If the  key is pressed, the setting value is registered and the next setting item is selected.

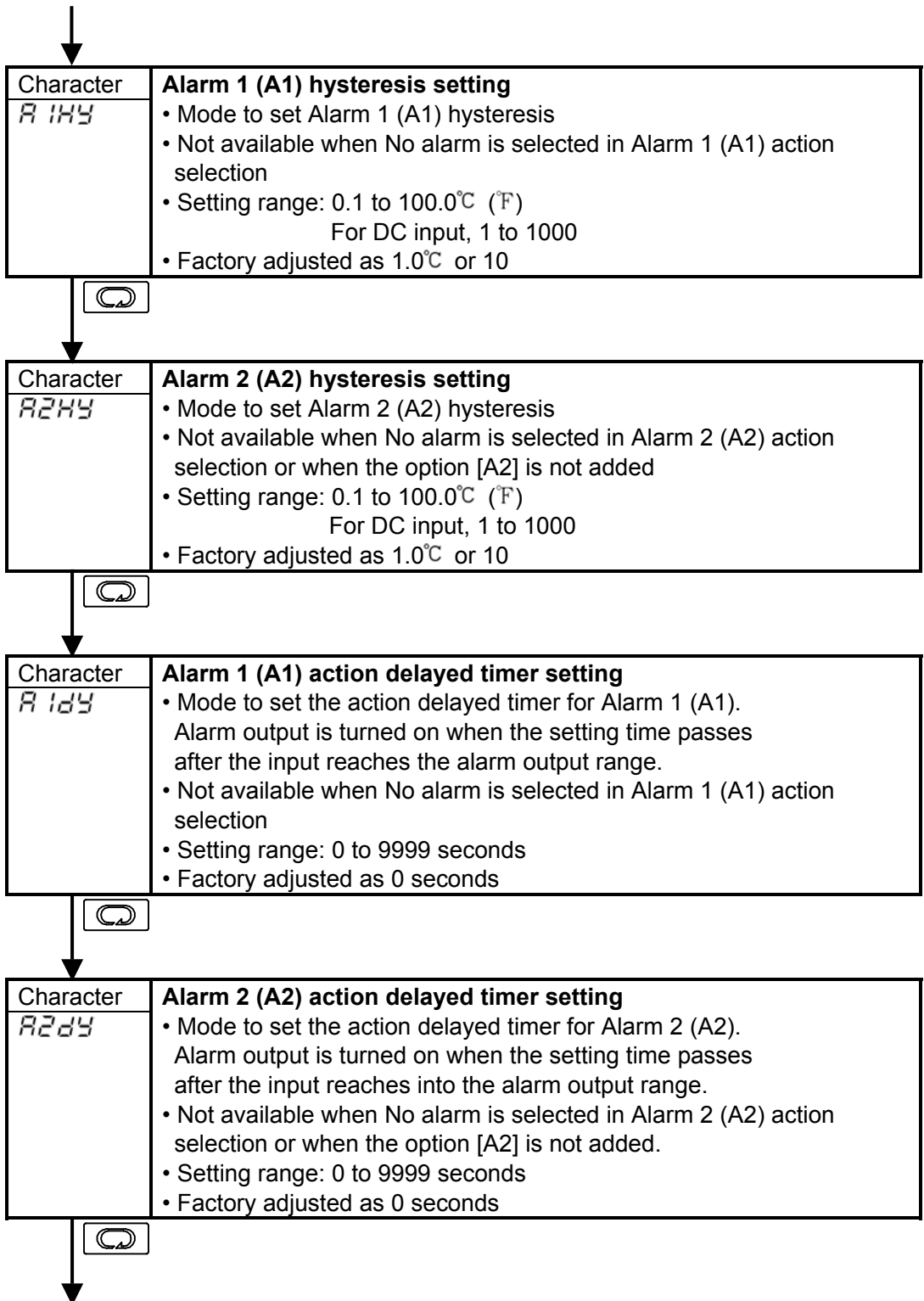


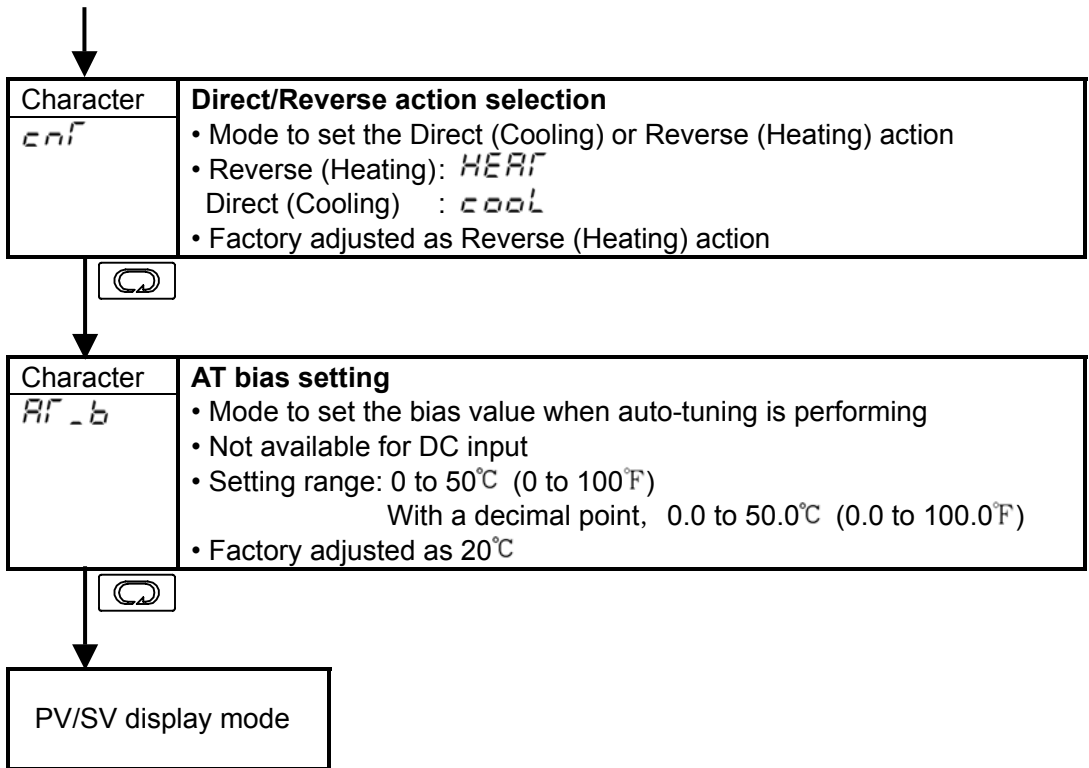












Sensor correction function

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 multiple controllers, the accuracy of sensors has influence on the control. Therefore, sometimes the measuring temperature (input value) does not concur with the same setting value. In such a case, the control can be set with desired temperature by shifting the input value of sensors.

Loop break alarm

The alarm will be activated when the process variable (PV) does not rise as much as the span or greater within the time it takes to assess the loop break alarm after the manipulating value has reached 100% or the output high limit value. The alarm will also be activated when the process variable (PV) does not fall as much value as the span or greater within the time it takes to assess loop break alarm after the manipulating value has reached 0% or the output low limit value.

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

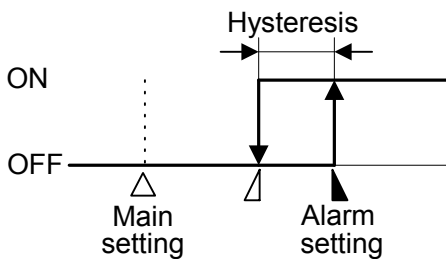
Energized/Deenergized function

[If the alarm action Energized is selected]

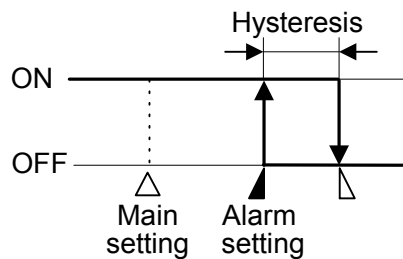
When the alarm output action indicator is lit, the alarm output (terminal 7-8, 12-13) is conducted (ON). When the alarm output action indicator is unlit, the alarm output is not conducted (OFF).

[If the alarm action Deenergized is selected]

When the alarm output action indicator is lit, the alarm output (terminal 7-8, 12-13) is not conducted (OFF). When the alarm output action indicator is unlit, the alarm output is conducted (ON).



[High limit alarm Energized]



[High limit alarm Deenergized]

[Fig. 3.6-1]

Setting value memory selection

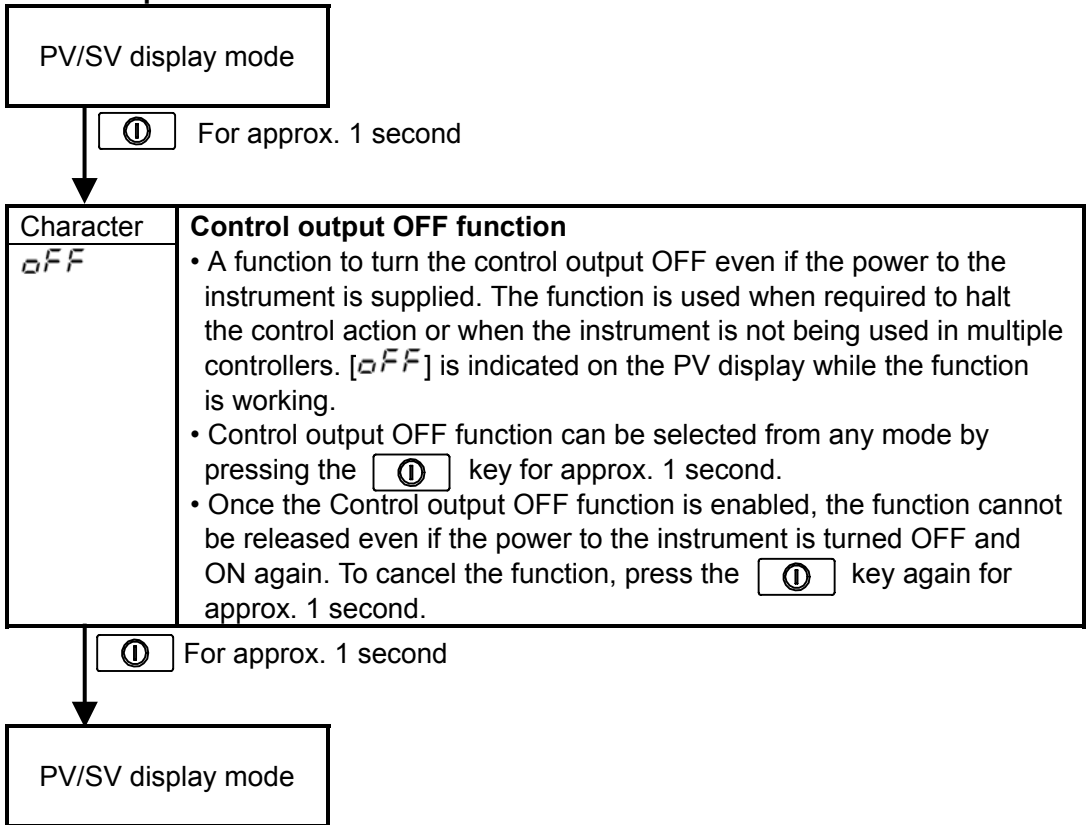
Setting value memory number can be selected by the external operation.

(However, only No. 2 can be selected.)

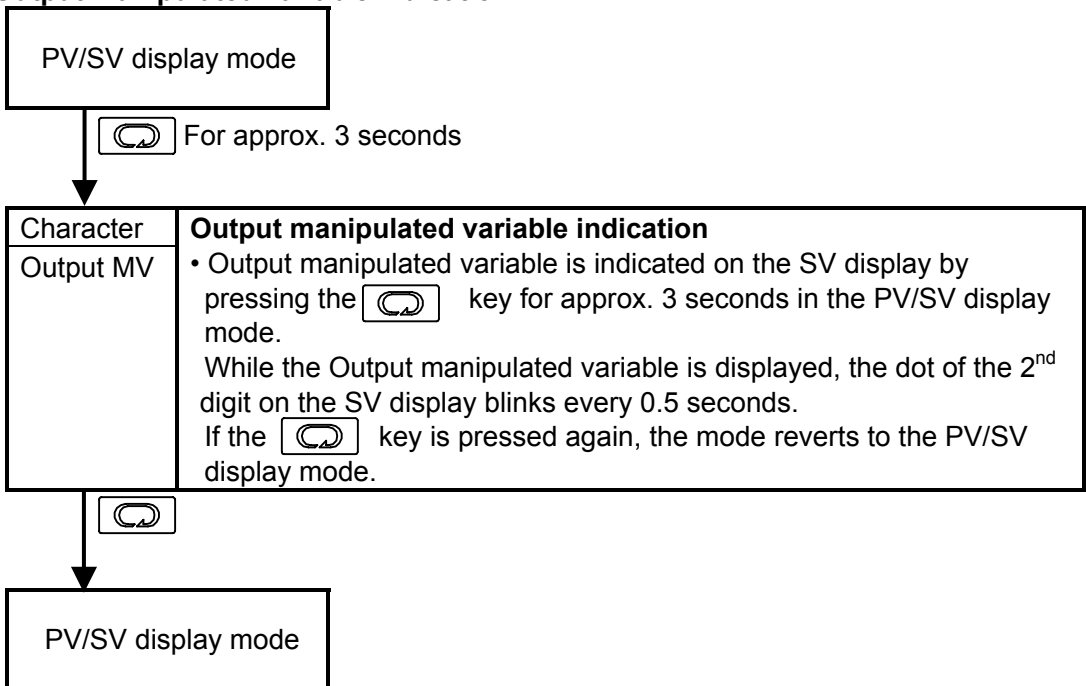
Setting value memory number 2 can be selected by connecting the terminals between 14 and 17.

Memory number cannot be changed during setting mode or PID auto-tuning.

3.7 Control output OFF function



3.8 Output manipulated variable indication



4. 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 JC □-13A ON.

For approx. 2 seconds after the power is switched ON, the type of sensor will be indicated on the PV display, and the rated scale maximum value will be indicated on the SV display. See [table 4-1].

(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.)

During this time, all outputs and the LED indicators are in their OFF status. After that, the process variable is indicated on the PV display, and Setting value on the SV display.

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

[Table 4-1]

Input	°C		°F	
	PV display	SV display	PV display	SV display
K	K C	1370	K F	2500
J	J C	1000	J F	1800
E	E C	800	E F	1500
Pt100	PT C	8500	PT F	9999
	PT C	850	PT F	1500
JPt100	JPT C	5000	JPT F	9000
	JPT C	500	JPT F	900
0 to 20mA	02A	Scaling high limit value	02A	Scaling high limit value
0 to 1V	02A		02A	
0 to 10V	02A		02A	
4 to 20mA	42A		42A	

(2) Input each setting value, referring to Chapter 3. Operations.

(3) Turn the load circuit power ON.

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

5. Other functions

(1) Input burnout

(In case of overscale and underscale, the Heater burnout alarm is activated.)
For thermocouple or RTD input, if the input value exceeds the [Rated scale maximum value + 50°C (100°F)], the control output is turned OFF, and the PV display blinks [_ _ _ _].

For DC input, if the input value exceeds [Scaling high limit value +10% of scaling span], the control output is turned OFF, and the PV display blinks [_ _ _ _].

In the case rated scale maximum value is 999.9, if the input value exceeds 999.9, the PV display blinks [_ _ _ _]. However, the control is performed up to the [999.9 + 1% of the rated scale span].

For thermocouple input, if the input value falls below -50°C (100°F), the control output is turned OFF (output low limit value for the current output type), and the PV display blinks [- - - -].

For RTD input, if the input value falls to [Rated scale minimum value -1% of rated scale span] or less, the control output is turned OFF (output low limit value for the current output type), and the PV display blinks [- - - -].

In the case rated scale minimum value is -199.9, if the input value falls below -199.9, the PV display blinks [- - - -]. However, the control is performed up to the [-199.9 -1% of rated scale span].

For DC input, if the input value falls to [scaling low limit value -1% of scaling span] or less, the control output is turned OFF (output low limit value for the current output type), and the PV display blinks [- - - -].

However, if the input value falls below -1999, the PV display blinks [- - - -].

(2) Sensor burnout (Burnout)

When the thermocouple or RTD is burnt out, the control output is turned OFF (output low limit value for the current output type), and [- - - -] blinks on the PV display.

In the case of DC input burnout, the PV display blinks [- - - -] for the current (4 to 20mA) burnout, and [_ _ _ _] for the voltage burnout.

[For the current (0 to 20mA) burnout, the figure when DC current input is 0mA is indicated.]

(3) 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.

(4) Automatic cold junction temperature compensation (Thermocouple input type)

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

6. Action explanations

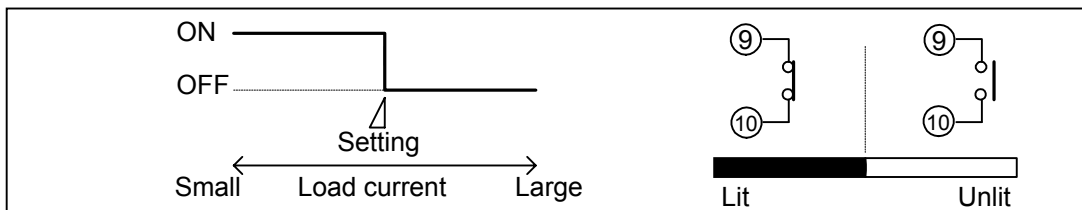
6.1 Standard action drawings

Action		Heating (reverse) action			Cooling (direct) action		
Control action							
Output	Relay contact						
	Non-contact voltage						
	Current						
Indicator [OUT1] Green							

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

6.2 Heater burnout alarm action drawings



When the option [DR, DS or DA] is applied, the terminals 12 and 13 are used for the Heater burnout alarm terminal.

6.3 ON/OFF action drawings

Action		Heating (reverse) action		Cooling (direct) action	
Control action					
Output	Relay contact				
	Non-contact voltage				
	Current				
Indicator [OUT1] Green					

■ part: Acts ON or OFF.

6.4 Heating/Cooling action drawings [Option D □]

Heating (reverse) action in Heating control

Control action				
		<p>Heating P-band (Cooling P-band)</p> <p>ON Heating</p> <p>OFF (Cooling)</p> <p>Setting</p>		
Heating output	Relay contact			
	Non-contact voltage			
	Current			
Indicator [OUT1] Green				

■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Cooling (direct) action in Heating control

Control action				
		Relay contact		
Cooling output	Non-contact voltage			
	Current			
Indicator [OUT2] Yellow				

■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Heating (reverse) action in Cooling control

Control action				
		Relay contact		
Heating output	Non-contact voltage			
	Current			
Indicator (OUT1) Green				

■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Note: When the option [DR, DS or DA] is applied and the action is changed in Direct/Reverse action selection mode, the control action is performed as shown above.

However, it is recommended that the heating and cooling actions are used in the usual manner. (See pages 37 and 38.)

Cooling (direct) action in Cooling control

Control action				
			 (*1)	
Cooling output	Non-contact voltage		 (*1)	
	Current		 (*2)	
Indicator [OUT2] Yellow				

■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Note: When the option [DR, DS or DA] is applied and the action is changed in Direct/Reverse action selection mode, the control action is performed as shown above.

However, it is recommended that heating and cooling actions are used in the usual manner. (See page 37 and 38.).

When setting Dead band

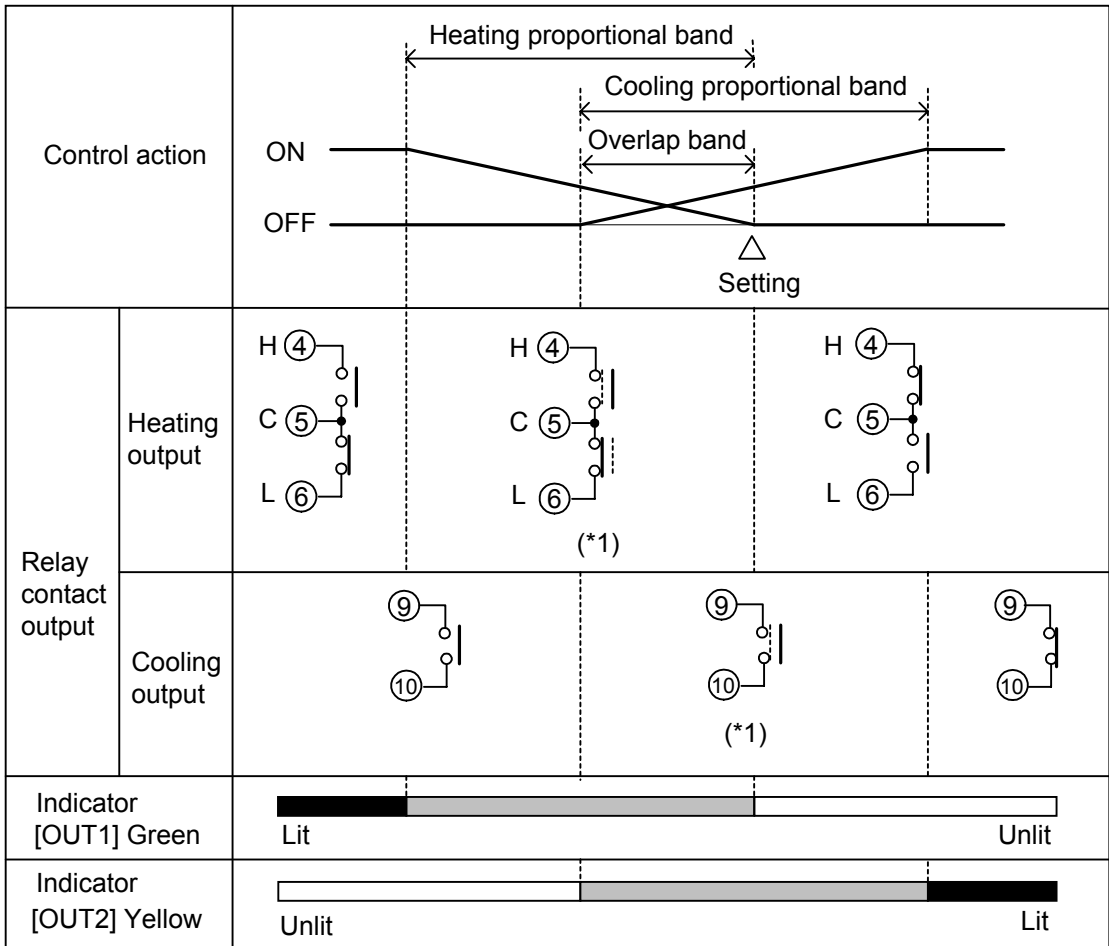
Action		Heating action			Cooling action		
		Proportional band	Dead band	Proportional band	Proportional band	Dead band	Proportional band
Control action							
Output	Relay contact		 (*1)			 (*1)	
	Non-contact voltage		 (*1)			 (*1)	
	Current		 (*2)			 (*2)	
Indicator [OUT1] Green							
Indicator [OUT2] Yellow							

■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

When setting Overlap band with Relay contact output.



■ part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

6.5 Alarm 1 (A1) and 2 (A2) action drawings

	High limit alarm	Low limit alarm
Temperature alarm action	<p>Hysteresis</p>	<p>Hysteresis</p>
Output Indication		
	High/Low limits alarm	High/Low limit range alarm
Temperature alarm action	<p>Hysteresis</p>	<p>Hysteresis</p>
Output Indication		
	Process high alarm	Process low alarm
Temperature alarm action	<p>Hysteresis</p>	<p>Hysteresis</p>
Output Indication		

▲ and ▼ shows the action point of the alarm output.

	High limit alarm with standby	Low limit alarm with standby
Temperature alarm action	<p>Hysteresis</p>	<p>Hysteresis</p>
Output Indication	<p>Unlit Lit</p>	<p>Lit Unlit</p>
	High/Low limits alarm with standby	
Temperature alarm action	<p>Hysteresis</p>	
Output Indication	<p>Lit Unlit Lit</p>	

- part: Acts ON or OFF.
- part: Standby function works.
- ▲ and ▼ shows the action point of the alarm output.

7. Control action explanations

7.1 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, and 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.

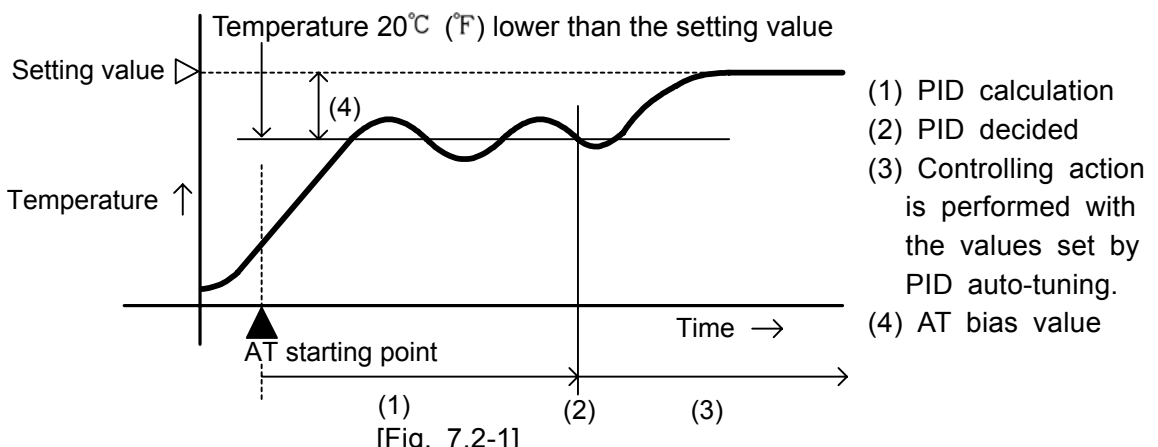
If the derivative time is shortened, restoring value becomes small, and if the derivative time is made longer, an excessive returning phenomenon may occur and the control system may be oscillated.

7.2 PID auto-tuning of this controller

In order to decide each value of P, I, D and ARW automatically, this system forcibly fluctuates the object being controlled.

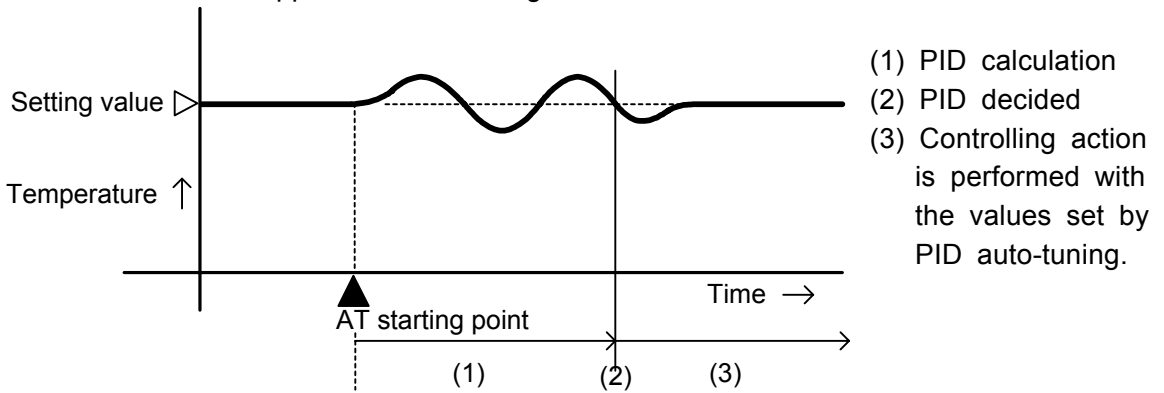
(1) When the difference between setting value and processing temperature is large when the temperature rises.

Fluctuation is applied at the temperature 20°C lower than the setting value.



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

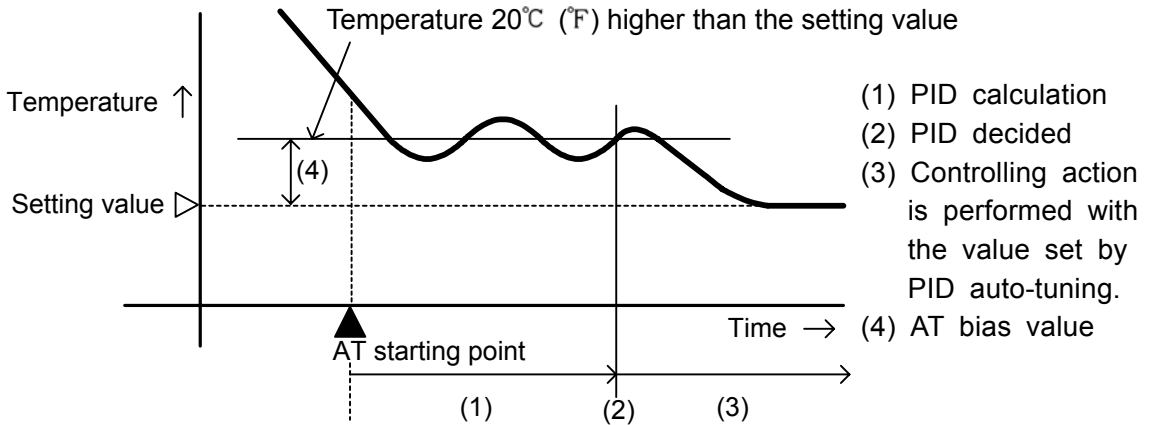
Fluctuation is applied at the setting value.



[Fig. 7.2.2]

(3) When the control temperature is 20°C ($^{\circ}\text{F}$) or higher than the setting value.

Fluctuation is applied at the temperature 20°C ($^{\circ}\text{F}$) higher than the setting value.



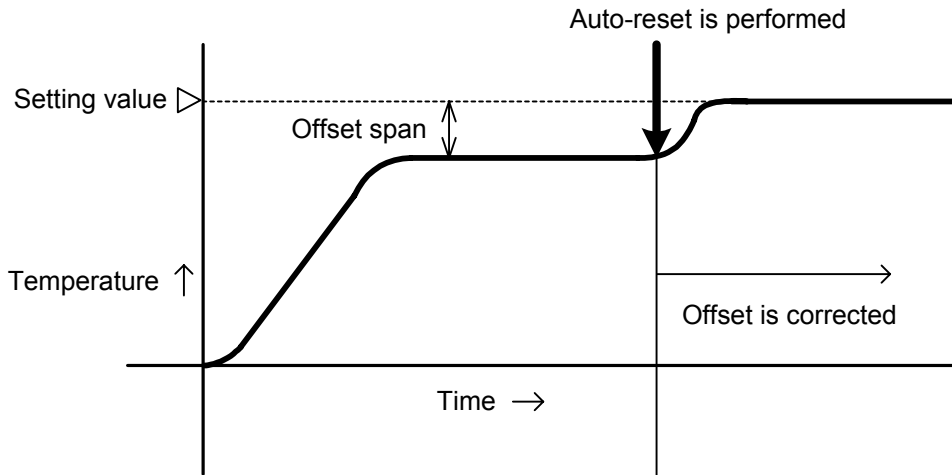
[Fig. 7.2.3]

7.3 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. 7.3-1]

8. Mounting to control panel

8.1 Site selection

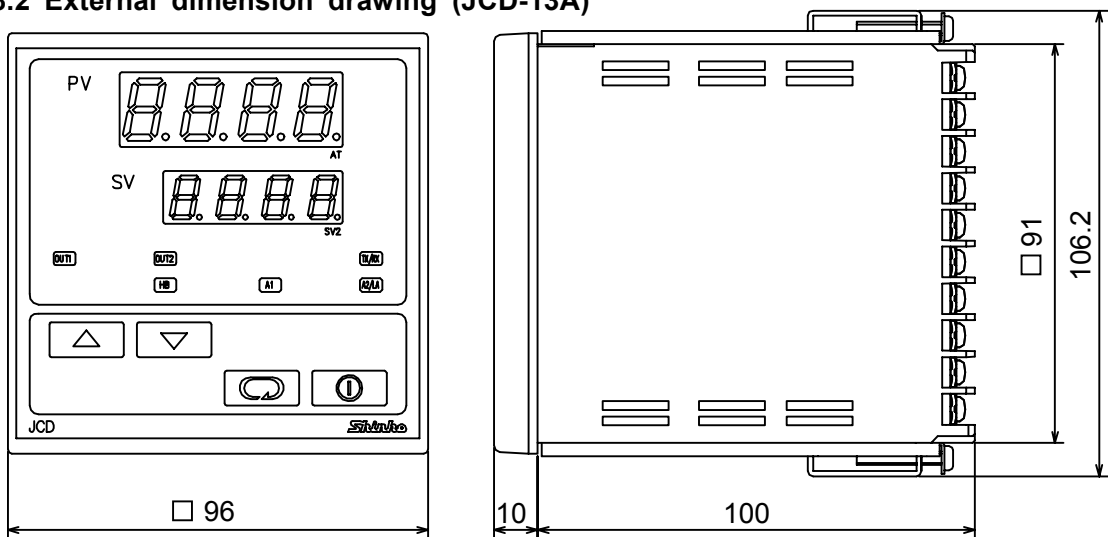
This instrument is intended to be used under the following environmental conditions (IEC61010-1):

Overvoltage category II, Pollution degree 2

Mount the controller in a place with:

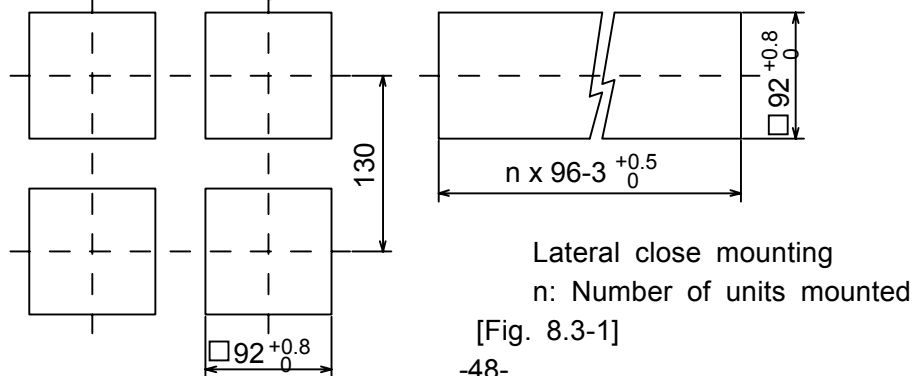
- (1) A minimum of dust, and an absence of corrosive gases
- (2) No flammable, explosive gasses
- (3) No mechanical vibrations or shocks
- (4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change suddenly
- (5) An ambient non-condensing humidity of 35 to 85%RH
- (6) The unit away from 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

8.2 External dimension drawing (JCD-13A)



[Fig. 8.2-1]

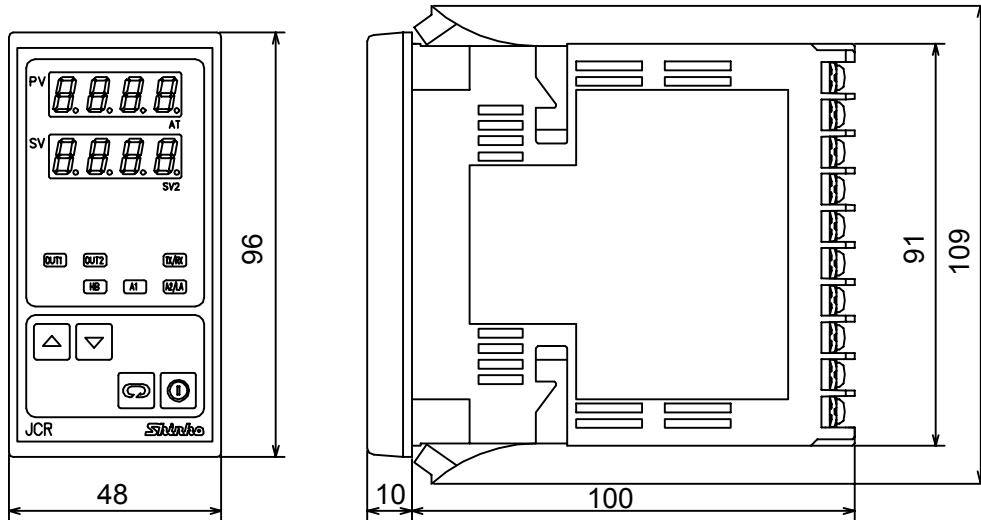
8.3 Panel cutout drawing (JCD-13A)



[Fig. 8.3-1]

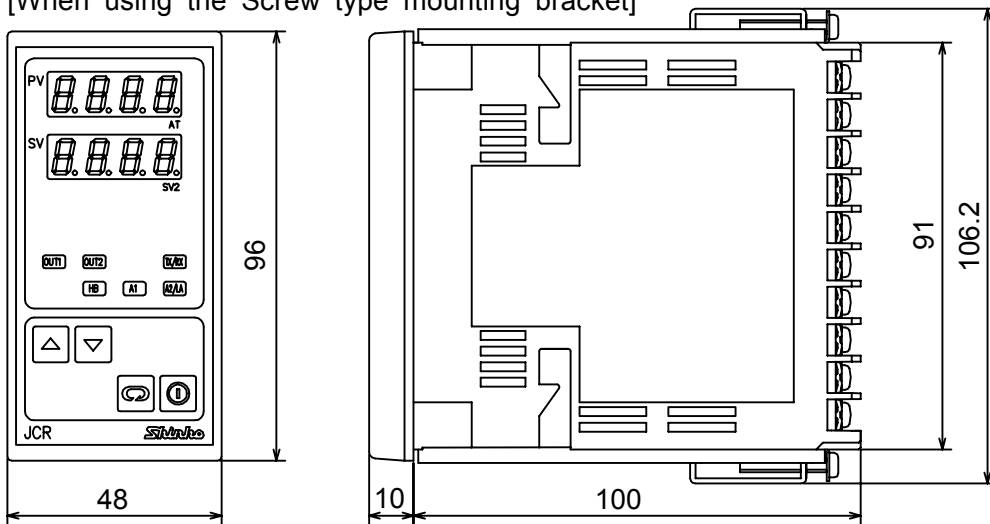
8.4 External dimension drawing (JCR-13A)

[When using the One-touch type mounting bracket]



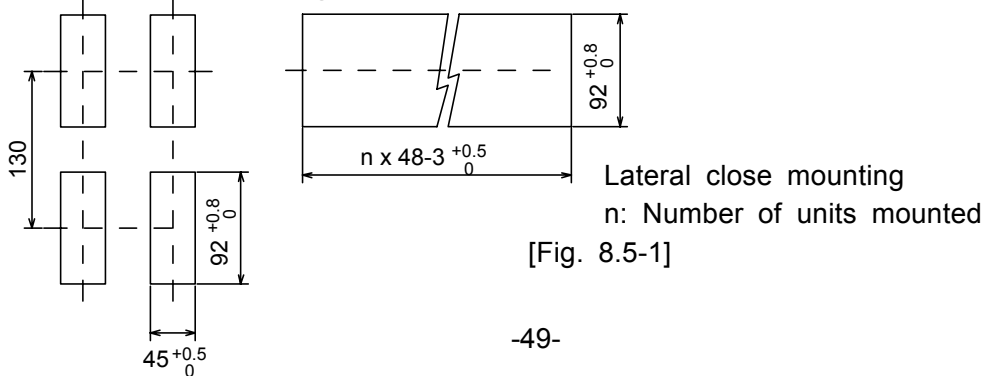
[Fig. 8.4-1]

[When using the Screw type mounting bracket]

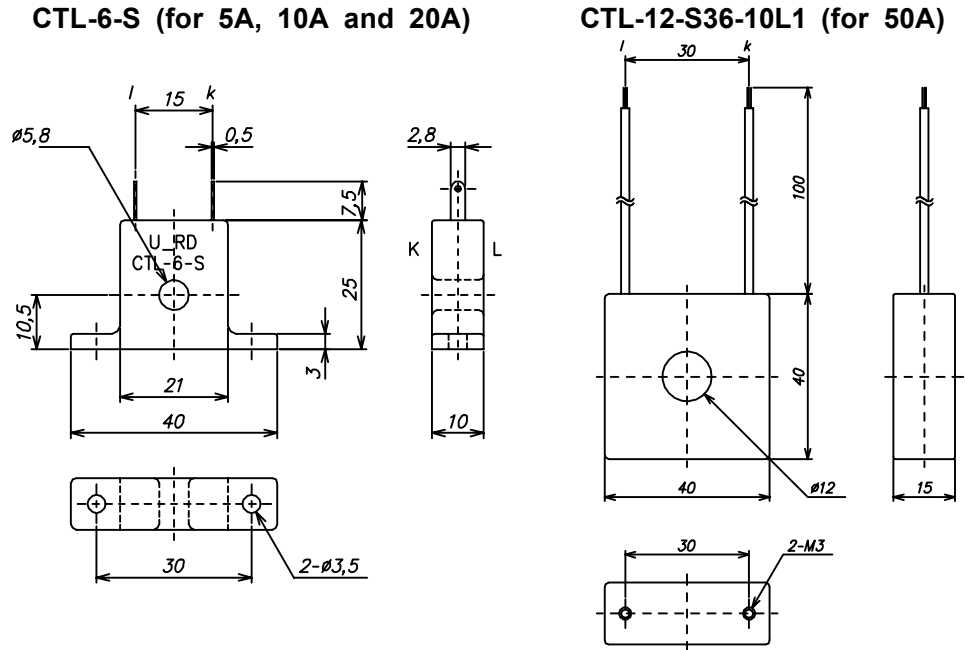


[Fig. 8.4-2]

8.5 Panel cutout drawing (JCR-13A)



8.6 Current transformer (CT) external dimension drawing



[Fig. 8.6-1]

8.7 Mounting

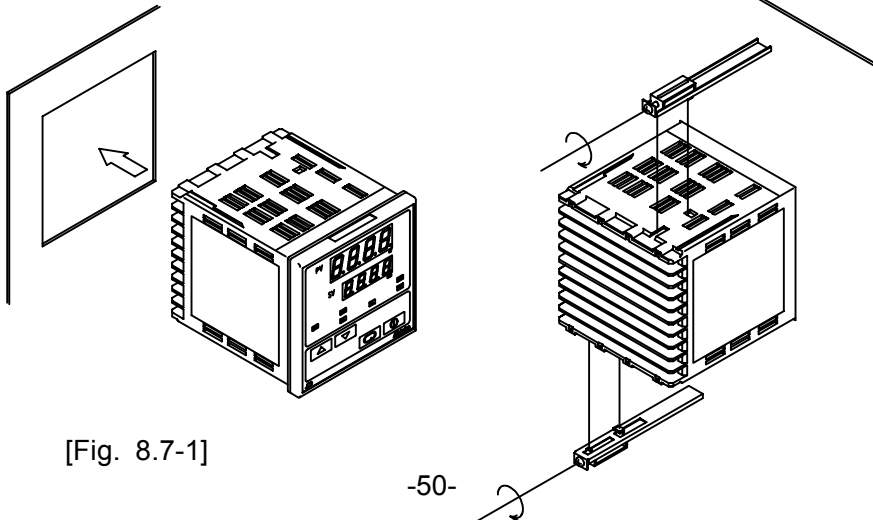
- When using the Screw type mounting bracket (Common to the JCD-13A, JCR-13A)

Mounting panel thickness is from 1 to 15mm.

Insert the instrument from the front of the panel.

Slot the mounting bracket to the holes at the top and bottom of the case, and screw in place.

When using the soft front cover (FC-96-S or FC-R-S), mounting panel thickness is from 1 to 14.5mm.



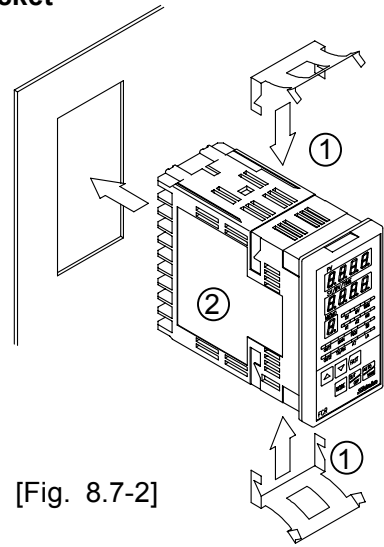
[Fig. 8.7-1]

- **When using the One-touch type mounting bracket
(Only for the JCR-13A)**

Mounting panel thickness is from
1 to 3mm.

Mount one-touch mounting bracket ①
to the body in advance, and then
Insert the JCR-13A ② from the front
of the panel.

If Soft front cover [FC-R-S] is used,
the mounting panel thickness will be
from 1 to 2.5mm.



[Fig. 8.7-2]



Notice

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.

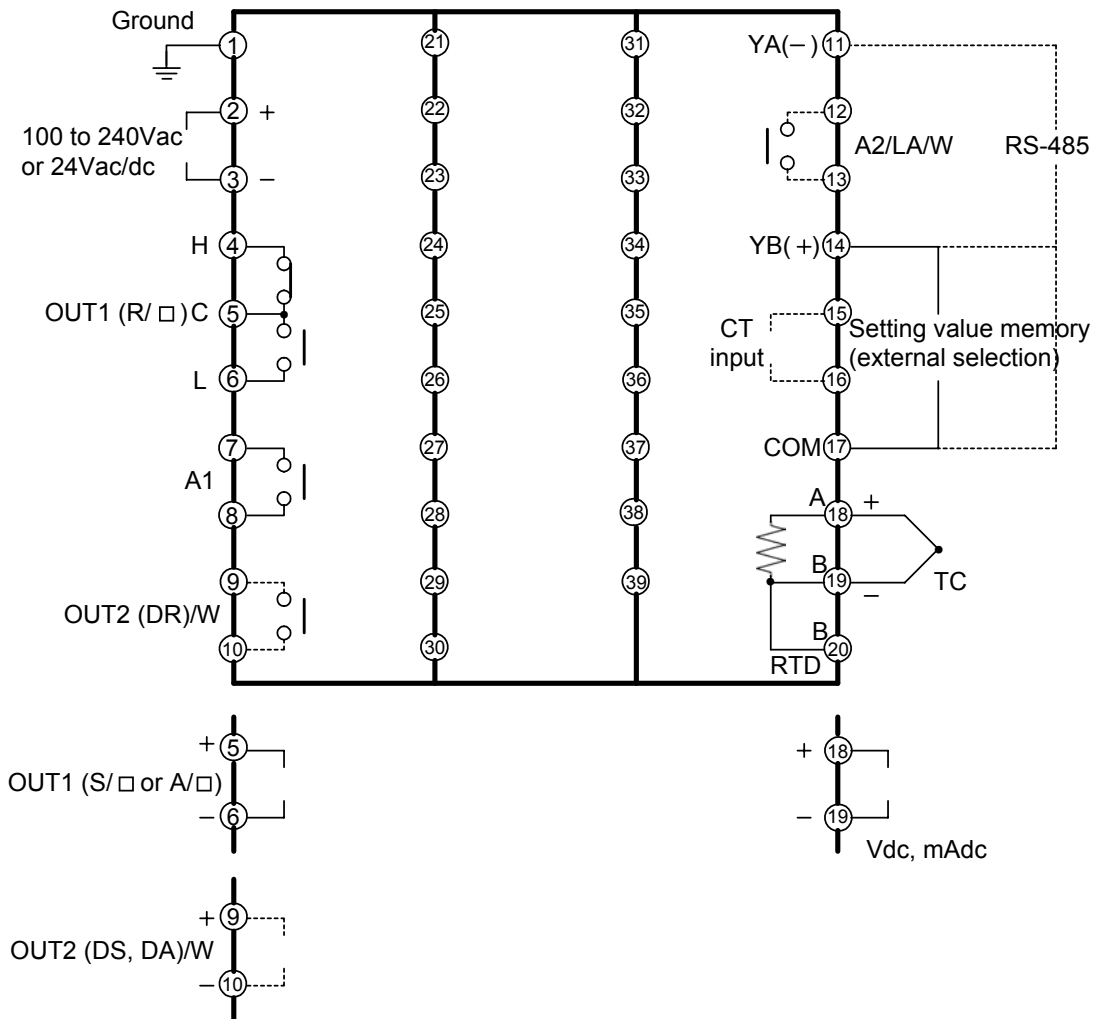
9. Wiring connection



Warning

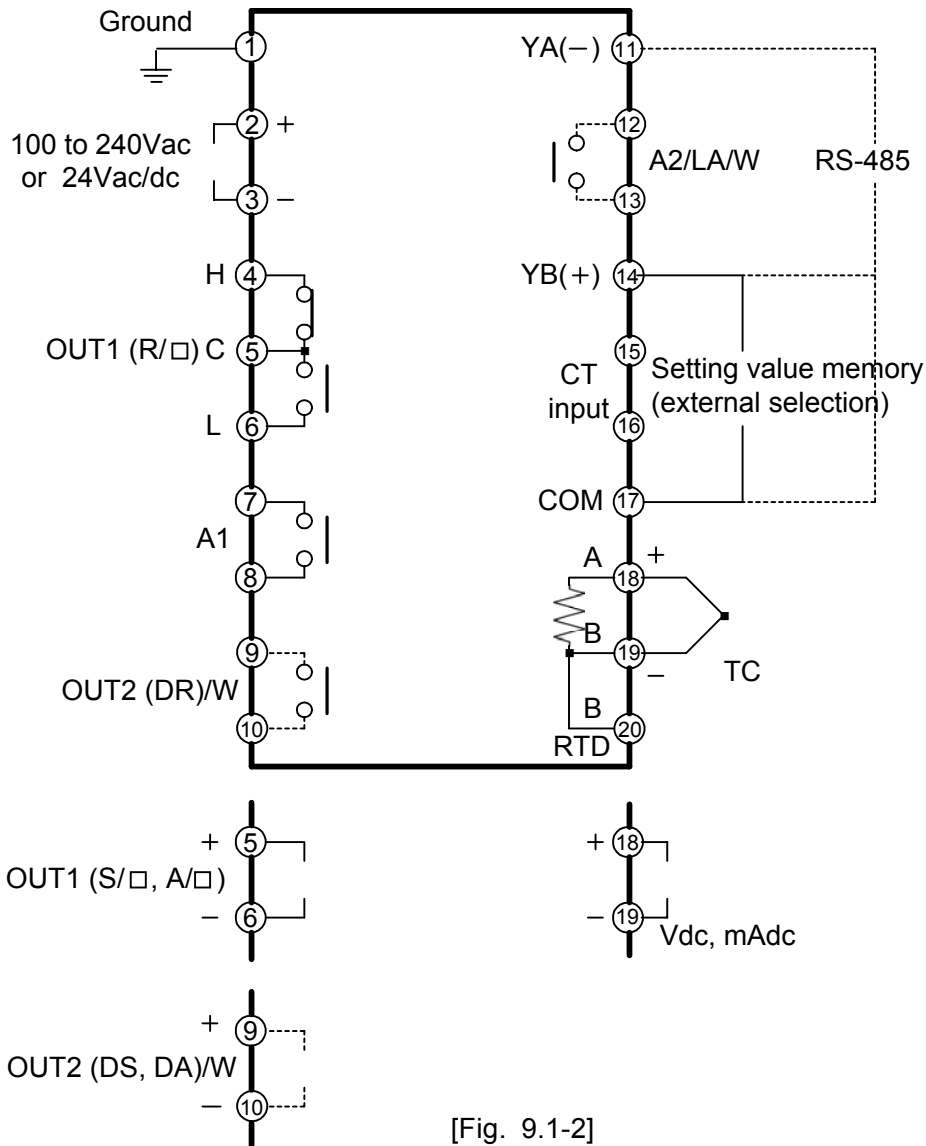
Turn the power supply to the instrument off before wiring or checking.
 Working or touching the terminal with the power switched on may result in an Electric Shock which could cause severe injury or death.
 Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

9.1 Terminal arrangement
[JCD-13A]



[Fig. 9.1-1]

[JCR-13A]



[Fig. 9.1-2]

- R/□: Relay contact output
- S/□: Non-contact voltage output
- A/□: Current output
- A1: Temperature alarm 1 (A1)
- A2: Temperature alarm 2 (A2)
- W: Heater burnout alarm
- LA: Loop break alarm
- RS-485: Serial communication (C5)
- DR, DS, DA: Heating/Cooling control (relay contact, non-contact voltage, current)

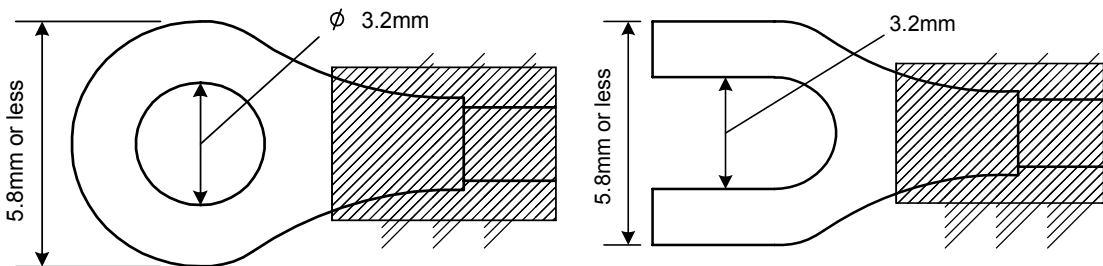


Notice

- The terminal blocks of these instruments 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 [A2] and [W] are applied together, use the terminals 12-13 for the option [A2], and 9-10 for the option [W].
- If the option [DR, DS or DA] is applied with a combination of [A2], [W] or [LA], use the terminals 9-10 for the [DR, DS or DA], and 12-13 for the option [A2], [W] or [LA].
- When the option [A2] and [LA] are applied together, they use common output terminals.

● **Lead wire solderless terminal**

Use a solderless terminal with an isolation sleeve in which an M3 screw fits as shown below.



Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N•m (6kgf•cm) Max. 1.0N•m (10kgf•cm)
	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	

9.2 Wiring examples

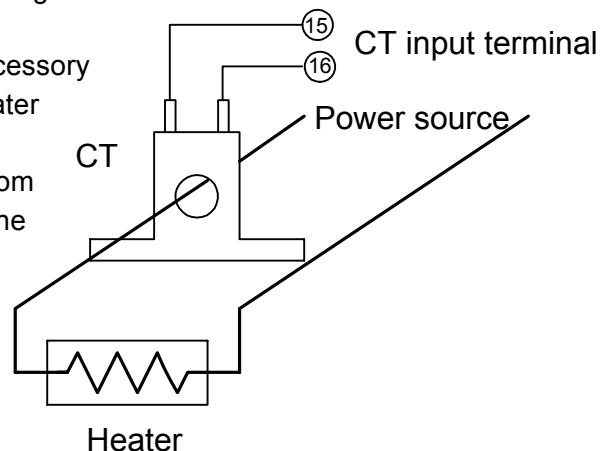


Notices

- 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, Rated current 2A)
- When using 24Vdc of power source, do not confuse the polarity.
- For the relay contact output type, use an external auxiliary electromagnetic switch to protect the built-in relay contact.
- When wiring, keep the input wire (Thermocouple, RTD, etc.) away from AC source and the load wire to avoid external interference.
- Use a thick wire (1.25 to 2.0mm²) for the earth ground.

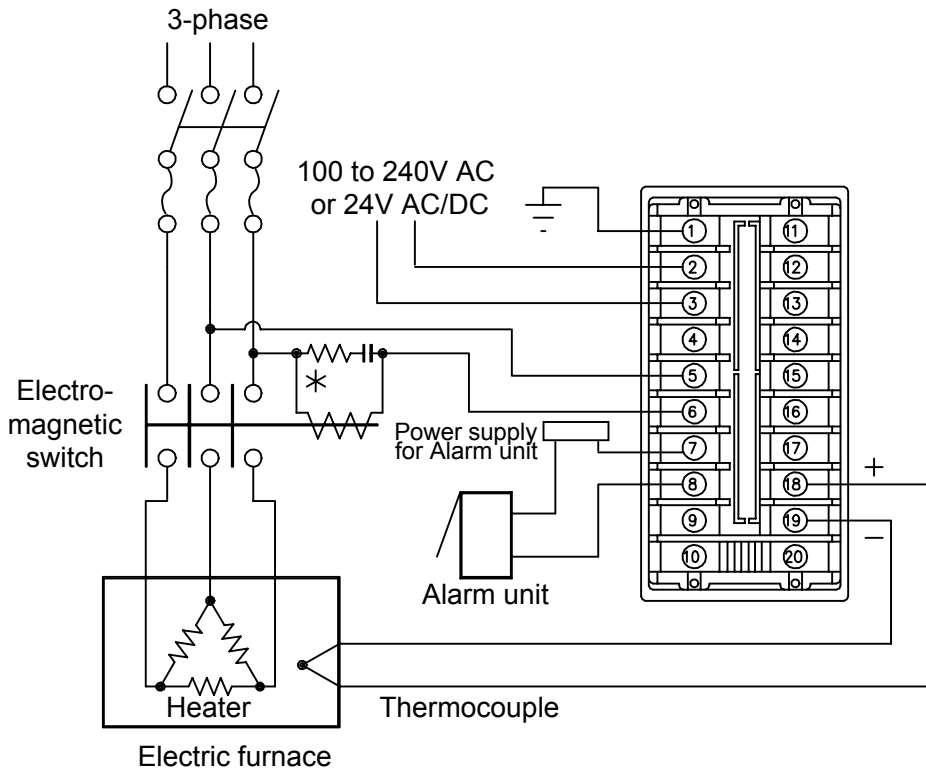
[Heater burnout alarm output]

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



[Fig. 9.2-1]

[JCR-13A-R/E]



[Fig. 9.2-2]

* 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.

The connectable SSRs in parallel are 4 units if the Shinko Technos SSRs (SA-200 series) are used.

AC or DC is available to supply voltage 24V, however, do not confuse the polarity when DC is applied.

10. Specifications

10.1 Standard specifications

Mounting method : Flush
Setting : Membrane sheet key
Display

JCD-13A

PV display : Red LED display 4 digits, size, 14.3 x 8 (H x W)mm
 SV display : Green LED display 4 digits, size, 10 x 5.5 (H x W)mm

JCR-13A

PV display : Red LED display 4 digits, size, 8 x 4 (H x W)mm
 SV display : Green LED display 4 digits, size, 8 x 4 (H x W)mm

Accuracy (Setting, indication)

Thermocouple input : Within $\pm 0.2\%$ of input range full scale ± 1 digit or
 Within $\pm 2^\circ\text{C}$ (4°F), Whichever is greater
 RTD input : Within $\pm 0.1\%$ of input range full scale ± 1 digit or
 Within $\pm 1^\circ\text{C}$ (2°F), Whichever is greater
 Current input : Within $\pm 0.2\%$ of input range full scale ± 1 digit
 Voltage input : Within $\pm 0.2\%$ of input range full scale ± 1 digit

Rated scale

Input type		Scale range	
Thermocouple	K	0 to 1370 °C	0 to 2500 °F
	J	0 to 1000 °C	0 to 1800 °F
	E	0 to 800 °C	0 to 1500 °F
RTD	Pt100	-200 to 850 °C	-300 to 1500 °F
		-199.9 to 850.0 °C	-199.9 to 999.9 °F
	JPt100	-200 to 500 °C	-300 to 900 °F
		-199.9 to 500.0 °C	-199.9 to 900.0 °F
DC input	0 to 20mAdc	-1999 to 9999, -199.9 to 999.9 -19.99 to 99.99, or -1.999 to 9.999	
	4 to 20mAdc		
	0 to 1Vdc		
	0 to 10Vdc		

For DC input, scale range and decimal point place are changeable.

Input sampling period : 0.25 seconds

Input

Thermocouple : K, J, E,
 External resistance, 100 Ω or less
 RTD : Pt100, JPt100, 3-wire system
 Allowable input lead wire resistance, 10 Ω or less per wire
 Current : 0 to 20mAdc, 4 to 20mAdc
 Voltage : 0 to 1Vdc, Input impedance, 1M Ω or greater
 0 to 10Vdc, Input impedance, 100k Ω or greater

Control output (OUT1)

Relay contact : 1a1b
 Control capacity,
 250Vac 3A (resistive load)
 250Vac 1A (inductive load $\cos\phi=0.4$)
 Electric life: 100,000 times

Non-contact voltage : For SSR drive
 12⁺₀Vdc maximum 40mAdc (short circuit protected)

Current : 4 to 20mAdc
 Load resistance, maximum 550 Ω

Alarm 1 (A1) output

The alarm action point is set by \pm deviation from the main setting (except Process value alarm).

[When the alarm action is set as energized]

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.

Setting accuracy : The same as the Indicating accuracy

Action : ON/OFF action

Hysteresis : When thermocouple or RTD input, 0.1 to 100.0 $^{\circ}$ C ($^{\circ}$ F)
 When DC input, 1 to 1000
 (Decimal point place follows the selection.)

Output : Relay contact 1a
 Control capacity, 250Vac 3A (resistive load)
 250Vac 1A (inductive load $\cos\phi=0.4$)
 Electric life: 100,000 times

Controlling action

PID action (with auto-tuning function)

PD action (with auto-reset function)

P action (with auto-reset function)

ON/OFF action

Proportional band (P) : Thermocouple, 0 to 1000 $^{\circ}$ C (0 to 2000 $^{\circ}$ F)
 (ON/OFF action when set to 0)
 RTD, 0.0 to 999.9 $^{\circ}$ C (0.0 to 999.9 $^{\circ}$ F)
 (ON/OFF action when set to 0.0)
 DC current and voltage, 0.0 to 100.0%

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

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

Proportional cycle : 1 to 120s (Not available for the current output type)

Anti-reset windup (ARW) : Automatic

Hysteresis setting range : When thermocouple or RTD input, 0.1 to 100.0 $^{\circ}$ C ($^{\circ}$ F)
 When DC input, 1 to 1000 (Decimal point place follows the selection.)

Setting value memory external selection

Main setting value 1 or 2 can be selected by external contact.

Contact open : Main setting value 1

Contact closed : Main setting value 2

Contact current: 6mA

Supply voltage : 100 to 240Vac 50/60Hz, 24Vac/dc 50/60Hz

Allowable voltage fluctuation range

100 to 240Vac: 85 to 264Vac

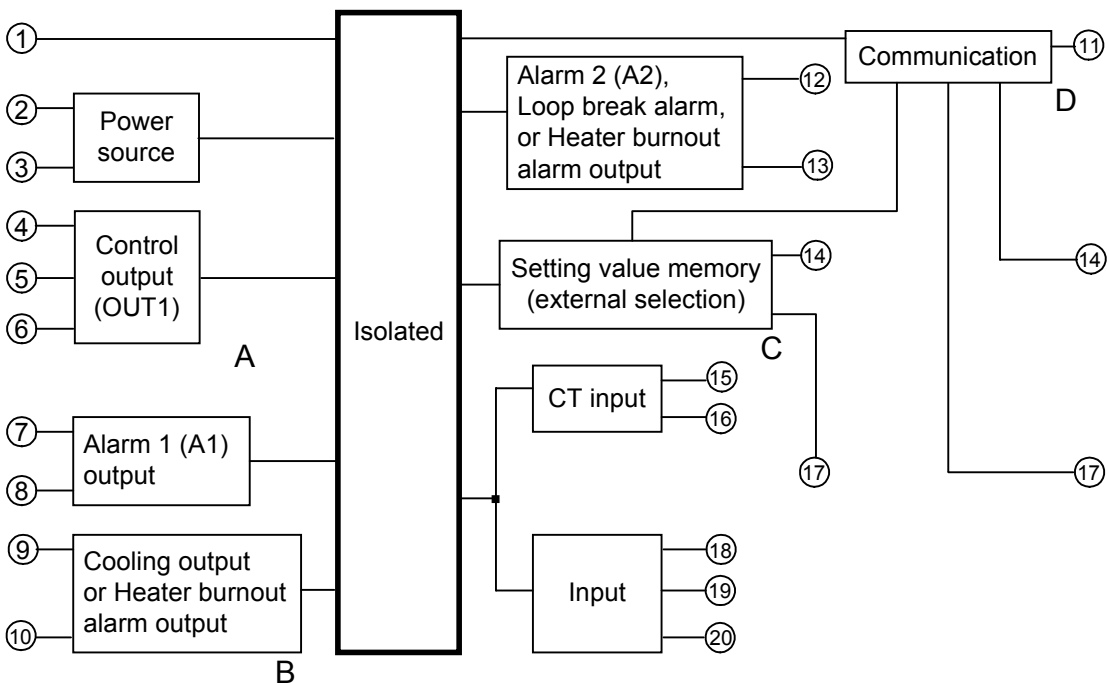
24Vac/dc : 20 to 28Vac/dc

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

Ambient humidity : 35 to 85%RH (non-condensing)

Power consumption: Approx. 8VA

Circuit insulation configuration



When both Main output (OUT1) and Cooling output are Current output type or Non-contact voltage output type (the SSR drive), A to B is non-isolated.

When Main output (OUT1) is Current output type or Non-contact voltage output type (the SSR drive), A to C and A to D are non-isolated.

When Cooling output is Current output type or Non-contact voltage output type (the SSR drive), B to C and B to D are non-isolated.

Insulation resistance

10M Ω or greater at 500Vdc for other combinations except the above mentioned

Dielectric strength

Between input terminal and ground terminal, 1.5kVac for 1 minute

Between input terminal and power terminal, 1.5kVac for 1 minute

Between power terminal and ground terminal, 1.5kVac for 1 minute

Between output terminal and ground terminal, 1.5kVac for 1 minute

Between output terminal and power terminal, 1.5kVac for 1 minute

Weight : JCD-13A, Approx. 370g
JCR-13A, Approx. 240g

External dimension: JCD-13A, 96 x 96 x 100mm (W x H x D)
JCR-13A, 48 x 96 x 100mm (W x H x D)

Material : Case, Flame resisting resin

Color : Case, Light gray

Attached functions : Sensor correction function
Setting value lock function
Power failure countermeasure
Self-diagnosis function
Automatic cold junction temperature compensating function
Burnout
Input burnout

Accessories : Mounting bracket 1 set
Instruction manual 1 copy
Current transformer 1 piece
(CTL-6-S) [When the option W (5A, 10A, 20A) is applied.]
(CTL-12-S36-10L1) [When the option W (50A) is applied.]
Terminal cover For JCD-13A 2 pieces [When the option TC is applied.]
For JCR-13A 1 piece [When the option TC is applied.]

10.2 Optional specifications

Alarm 2 (A2) output [Option code: A2]

The alarm action point is set by \pm deviation to the main setting (except Process value alarm).

[When the alarm action is set as Energized]

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 Alarm 2 (A2) is added, one more option [W] or [DR, DS, DA] can be added.

When Alarm 2 (A2) and Loop break alarm output (LA) are applied together, they use common output terminals.

Setting accuracy : The same as the Indicating accuracy

Action : ON/OFF action

Hysteresis setting range:

For thermocouple or RTD input, 0.1 to 100.0°C (°F)

For DC input, 1 to 1000 (Decimal point place follows the selection.)

Output : Relay contact 1a

Control capacity, 250Vac 3A (resistive load)

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

Electric life: 100,000 times

Heater burnout alarm output [Option code: W]

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

When the option [W] is applied, one more option [A2], [DR, DS, DA] or [LA] can be added.

This option cannot be applied to the current output type.

Heater burnout alarm output is turned on even during overscale or underscale.

Rating : 5A, 10A, 20A, 50A, Must be designated

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

Action : ON/OFF action

Output : Relay contact 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load, $\cos\phi=0.4$)

Electric life: 100,000 times

Heating/Cooling control output [Option code: DR, DS, DA]

When the option [DR, DS, DA] is added, one more option [A2], [LA] or [W] can be added.

The heating side specifications are the same as those of the control output (OUT1).

Cooling side proportional band: Multiplying factor to the heating side proportional band is 0.0 to 10.0 times.

(ON/OFF action when set to 0.0)

Cooling side integral time : The same as that of the heating side

Cooling side derivative time : The same as that of the heating side

Cooling side proportional cycle: 1 to 120s

Overlap band/Dead band:

When thermocouple or RTD input, -100.0 to 100.0°C ($^{\circ}\text{F}$)

When DC input, -1000 to 1000 (Decimal point place follows the selection.)

Output [DR] Relay contact output 1a

Control capacity, 250Vac 3A (resistive load)

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

Electric life: 100,000 times

[DS] Non-contact voltage output (for SSR drive)

12^{+2}_0Vdc maximum 40mAdc (short circuit protected)

[DA] Current output, 4 to 20mAdc

Load resistance: Maximum 550Ω

Cooling action mode selection function:

One mode can be selected by the key operation from the following.

Air cooling (Linear characteristic)

Oil cooling (1.5th Power of the Air cooling)

Water cooling (2nd power of the Air cooling).

Serial communication [Option code: C5]

If the option [C5] is applied, it is impossible to use the setting value memory (external selection) function.

The following operations can be executed from the external computer.

- (1) Reading and setting of the Main setting value, PID values and various setting values.
- (2) Reading of the input value and the action status.
- (3) Change of the functions.

Communication circuit Based on EIA RS-485

Communication method Half-duplex communication start-stop synchronous

Data transfer rate 9600bps (2400, 4800 and 19200bps)

(Selectable by key operation)

Data format Start bit : 1

Data bit : 7

Parity : Even parity

Stop bit : 1

Digital external setting:

Receives digital setting value from the PC-900 series [option: C5].

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

When the data from the PC-900 series exceeds the main setting value high limit or low limit, the JCD or JCR ignores the value, and performs the control with the former value.

Loop break alarm output [Option code: LA]

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

When Loop break alarm output [LA] and Alarm 2 output [A2] are applied together, the output terminals are common.

When Loop break alarm output [LA] is applied, the option [W] cannot be added together.

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

Loop break alarm span,

For TC, RTD, 0 to 150°C (°F), 0.0 to 150.0°C (°F)

For DC current, voltage, 0 to 1500

Output : Relay contact 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load, $\cos\phi=0.4$)

Electric life: 100,000 times

Color black [Option code: BK]

Front panel: Dark gray

Case : Black

Dust-proof•Drip-proof [Option code: IP]

Dust-proof and Drip-proof specification (IP54)

Effective for only panel surface, case part is excluded.

To protect the controller from water leak between the control panel and controller, the panel cutout dimension should be proper and have no burrs.

The front cover (soft type, sold separately) is recommended to strengthen the Dust-proof and Drip-proof specification.

Terminal cover [Option code: TC]

Electrical shock protecting terminal cover

Screw type mounting bracket [Option code: BL]

Mounting panel thickness is 1 to 15mm.

(Optional for JCR-13A, Included with JCD-13A)

Designated specifications

Input, scale range: Shipped as designated input and scale range.

Alarm action : Shipped as designated alarm action.


Cooling action : Shipped as cooling action.

Control action : Shipped as PD or ON/OFF action.

Hysteresis : Shipped as designated hysteresis.

13. Troubleshooting


If any malfunctions occur, refer to the following items after checking the power and the wiring.



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 Electric Shock, which can cause severe injury or death. Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

<Indication>

Phenomena	Presumed cause and the solution
If the PV display is indicating [OFF] or no indication.	<ul style="list-style-type: none"> • Control output OFF function is working. Press the  key for approx. 1 second to release the function.
If [----] is blinking on the PV display.	<ul style="list-style-type: none"> • Thermocouple or RTD is burnt out. [In the case of Thermocouple] If the input terminal of the instrument is shorted, and if nearby room temperature is indicated, the instrument should be normal and the sensor may be burnt out. • [In the case of RTD] If approx. 100Ω of resistance is connected to the input terminal between A-B of the instrument and between B-B is shorted, and if nearby 0°C (32°F) is indicated, the instrument should be normal and the sensor may be burnt out. • Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal.
If [----] is blinking on the PV display.	<ul style="list-style-type: none"> • Polarity of thermocouple or compensating lead wire is reversed. • Codes (A, B, B) of RTD do not agree with the instrument terminal.

Phenomena	Presumed cause and the solution
If the indication of PV display is abnormal or unstable.	<ul style="list-style-type: none"> • Designation of the Sensor input is improper. → Set the Sensor input properly • Temperature unit (°C or °F) setting is mistaken. → Set the unit properly. • Sensor correcting value is unsuitable. → Set the value suitably. • Specification of the Thermocouple or RTD is improper. • AC may be leaking into thermocouple or the RTD circuit. • There may be an equipment producing an inductive fault or noise near the controller.
PV display blinks [Err i].	The internal memory is defective. Please contact our main office or dealers.

<Key operation>

Phenomena	Presumed cause and the solution
If settings (main setting value, P, I, D, p-band, alarm, etc.) are impossible. If the value does not change by the  ,  keys.	<ul style="list-style-type: none"> • Setting value lock (mode 1 or 2) is designated. → Release the lock designation. • During PID auto-tuning or auto-reset. → Cancel the auto-tuning if necessary. → Auto-reset ends in 4 minutes after started.
If the setting indication does not change in the rated scale range even if the  ,  keys are pressed, and settings are impossible.	<ul style="list-style-type: none"> • Main setting value high limit or low limit may be set at the point the value does not change. → Set it again by Auxiliary function setting mode 1.

<Control>

Phenomena	Presumed cause and the solution
If process variable (temperature) does not rise.	<ul style="list-style-type: none"> • Thermocouple or RTD is burnt out. • Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal. • Input or output wirings is imperfect.
If the control output remains its ON status.	<ul style="list-style-type: none"> • Output low limit setting value is set to 100% or greater in Auxiliary function setting mode 2. → Set the value appropriately.
If the control output remains its OFF status.	<ul style="list-style-type: none"> • Output high limit setting value is set to 0% or less in Auxiliary function setting mode 2. → Set the value appropriately.

If any unexplained malfunctions occur other than those mentioned on page 64 and 65, make inquiries at our agency or the shop where you purchased the unit.

12. Character table

<Main setting mode>

Character	Item	Initial	Data
<i>4</i>	Main setting 1	0°C	
<i>42</i>	Main setting 2	0°C	

<Sub setting mode>

Character	Item	Initial	Data
<i>RT</i>	Auto-tuning Perform/Cancel	Cancel	
<i>r4T</i>	Auto-reset perform		
<i>P</i>	Proportional band setting	10°C, 10.0°C, 2.5%	
<i>P_b</i>	Cooling proportional band	1.0 times	
<i>I</i>	Integral time setting	200s	
<i>d</i>	Derivative time setting	50s	
<i>c</i>	Main proportional cycle setting	R/□: 30s S/□: 3s	
<i>c_b</i>	Cooling proportional cycle setting	R/□: 30s S/□: 3s	
<i>R1</i>	Alarm 1 (A1) setting	0°C	
<i>R2</i>	Alarm 2 (A2) setting	0°C	
<i>H</i>	Heater burnout alarm setting	0.0A	
<i>LPT</i>	Loop break alarm time setting	0 minutes	
<i>LPH</i>	Loop break alarm span setting	0°C or 0	

<Auxiliary function setting mode 1>

Character	Item	Initial	Data
<i>Loc</i>	Setting value lock designation	Unlock	
<i>4H</i>	Main setting value high limit	Rated value high limit	
<i>4L</i>	Main setting value low limit	Rated value low limit	
<i>4o</i>	Sensor correction setting	0.0°C or 0	
<i>cāno</i>	Instrument number setting	0	
<i>cā4P</i>	Transfer rate selection	9600bps	

<Auxiliary function setting mode 2>

Character	Item	Initial	Data
4En	Sensor selection	Multi-range input	K: 0 to 1370°C
		DC current input	Must be designated
		DC voltage input	
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	0.0 seconds	
oLH	Main output high limit setting	100%	
oLL	Main output low limit setting	0%	
H44	Output ON/OFF action hysteresis	1.0°C or 10	
cRcF	Cooling action mode selection	Air cooling	
oLHb	Cooling output high limit	100%	
oLLb	Cooling output low limit	0%	
H44b	Cooling output ON/OFF action hysteresis	1.0°C or 10	
db	Overlap band/Dead band setting	0°C or 0	
AL1F	Alarm 1 (A1) action selection	No alarm	
AL2F	Alarm 2 (A2) action selection	No alarm	
A1L	Alarm 1 action Energized/Deenergized	Energized	
A2L	Alarm 2 action Energized/Deenergized	Energized	
A1H4	Alarm 1 (A1) hysteresis setting	1.0°C or 10	
A2H4	Alarm 2 (A2) hysteresis setting	1.0°C or 10	
A1d4	Alarm 1 (A1) delayed timer setting	0 seconds	
A2d4	Alarm 2 (A2) delayed timer setting	0 seconds	
cniF	Direct (Cooling)/Reverse (Heating) action	Reverse (Heating) action	
AT_b	AT bias setting	20°C	

***** Inquiry *****

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

[Example]

- Model ----- JCD-13A-R/M
- Type of input ----- K
- Option ----- A2, C5
- Instrument 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**

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