

Single Loop DDC Controller

REX-C72 SERIES

INSTRUCTION MANUAL

RKC RKC INSTRUMENT INC.

IM72C01-E4

HEAD OFFICE: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO JAPAN
 TELEPHONE 03-751-8111
 TELEX No. 0246-8818 RKCTOK J
 CABLE ADDRESS RKCRIKAROL
 FAX No. 03-754-3316

Note:

Arrange that this manual will be handed to person in charge of the Controller.

Specification subject to change without notice.

DEC. 1986 1000 (P)

■ MOUNTING AND DIMENSIONS

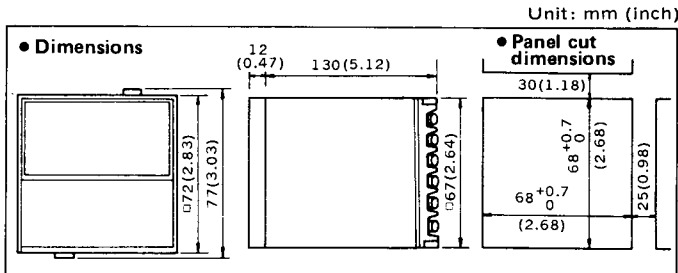


Fig. 1

(1) Mounting

- Make a square cutout on panel by referring to the panel cutout dimensions. (Fig. 1)
- Insert the controller into panel through the cutout from the panel front.
- Insert an upper mounting bracket along a bracket insertion groove from the back, and then engage a projection at the bracket end with a recess at the groove front and also insert metal fitting legs into slots. (Fig. 2 & Fig. 3)
- Tighten a bracket set screw with a phillips screwdriver from the back. Do not overtighten the set screw. (Fig. 4)

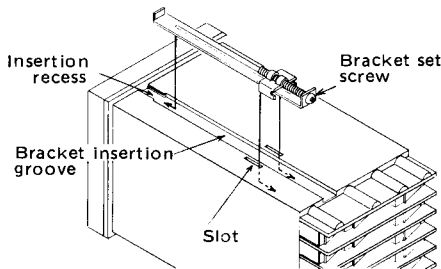


Fig. 2

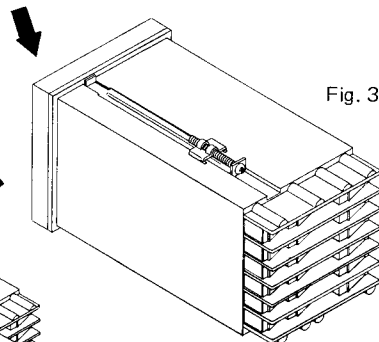


Fig. 3

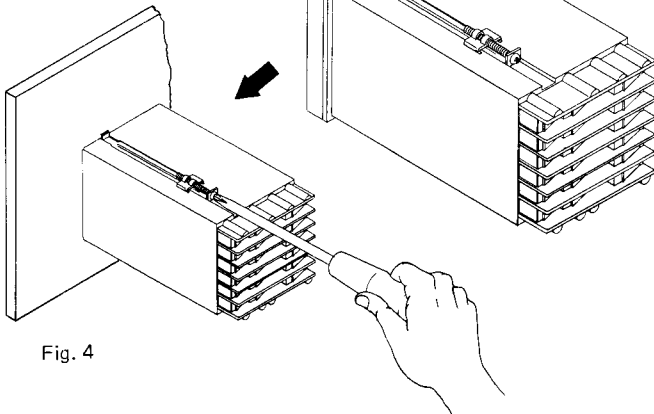


Fig. 4

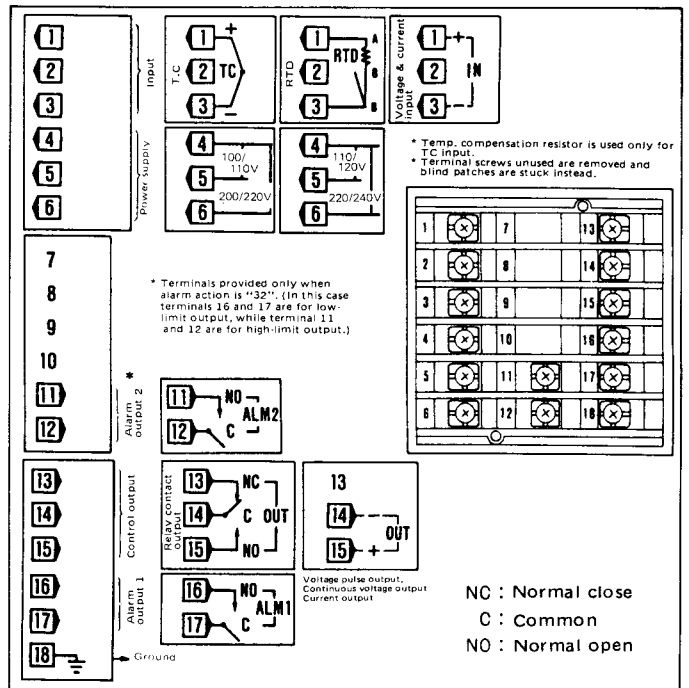
- Follow the same procedures as described in Items (c) and (d) above when mounting a lower mounting bracket.

(2) Cautions for mounting

Avoid the following locations where the controller is mounted.

- Location where ambient temperature is more than 50°C (122°F) or less than 0°C (32°F).
- Location where much dust exists and where corrosive gas is generated.
- Location where strong vibration and shock exist, where flooding and oil splash exist and where humidity is high.
- Location where inductive disturbance is large and other location where bad influence is exerted on electric instrument.

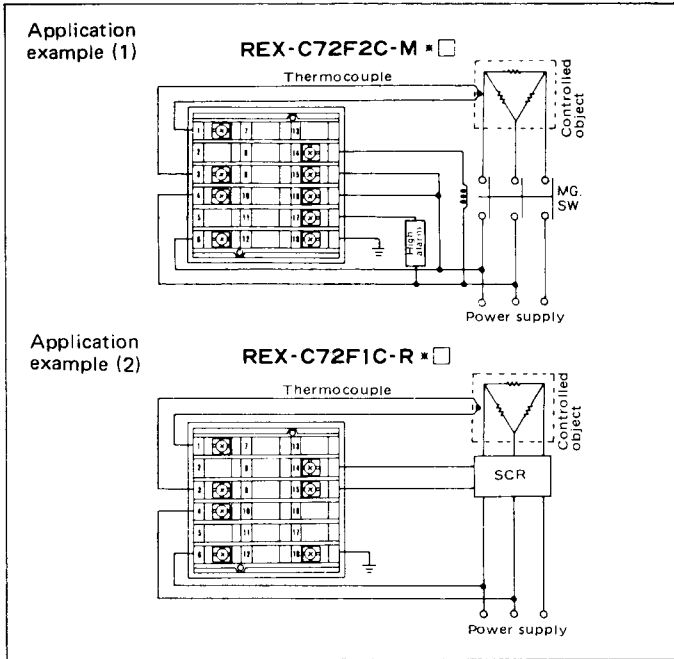
■ REAR TERMINALS



■ EXTERNAL WIRING EXAMPLE

• Cautions:

- Separate input signal cable from instrument power, electrical equipment power and load cables as much as possible to avoid an influence of noise.
- Separate instrument power cable from electrical equipment power cable as much as possible to avoid an influence of noise.
- In order to lessen a bad influence caused by noise, twist instrument power cables at close intervals. (The closer, the more effective.)
- Preparatory time 1 to 2 seconds is necessary for the relay contact output after power is applied.



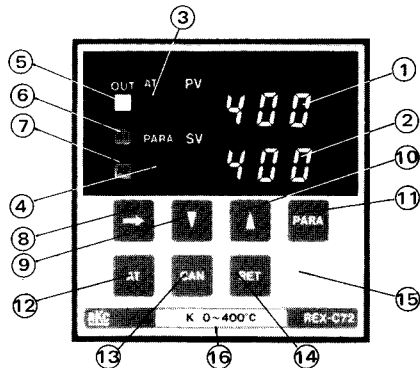
- ⑬ Cancel key:
Used to cancel the Auto tuning mode.
- ⑭ Return key:
Used to return the characters of the relevant parameter to the main set-point, which is made in one touch without selecting the characters.
- ⑮ Hidden key:
Simultaneously pushed with any of the ⑧ cursor shift key, ⑫ Auto tuning key and ⑬ cancel key, when required.
- ⑯ Input range display:
Displays the input range. Always check the range.

(2) Major Functions

- a) Auto tuning (AT) function
The auto tuning function calculates and automatically sets the optimum P,I,D and ARW constants.
- b) Set-value storage
Since each set value is stored in a non-volatile memory when the power is turned OFF, its re-setting is not required when the power recovers.
- c) Control action selection
Any of PID, PI, PD, proportional and two-position actions is selectable.
 - For PID action:
In the Auto tuning mode the optimum P, I, D and ARW constants are automatically set only when the AT key and hidden key are simultaneously pressed. However each constant of P, I, D and ARW is set in the manual setting mode.
 - For PI action:
Proportional band, integral time and ARW constant are set. Only PI action is available with D action set to "0".
 - For PD action:
Proportional band and derivative time are set. PD action is available with I action set to "0".
 - For proportioning action:
Proportional band is set. Proportioning action is available with I and D actions set to "0".
 - For two-position action:
Two-position action without hysteresis band is available with P action set to "0".
- d) Data lock function
With the data lock switch inside the controller turned to the ON side, the hidden key at the controller front does not function. As a result, **→** (cursor shift key), **AT** (Auto tuning key) and **CAN** (cancel key) become disabled so that no set value change is made. Therefore, this function can prevent the set value (already set) from being changed by mistake.

FUNCTIONAL DESCRIPTION & MAJOR FUNCTION

(1) Functional Description



- ① Measured value (PV) display unit:
Displays measured value.
- ② Set value (SV) display unit:
Displays the set value of each parameter.
- ③ 1. Auto tuning display unit:
The lamp (• dot) flashes during Auto tuning. It is extinguished when the Auto tuning function ends.
2. Burnout display unit:
The LED (⌋) lights when detecting element is burnt out for TC or RTD input.
- ④ Character display unit:
Displays characters of each parameter on the 7-segment LED.
- ⑤ Control output action display unit:
Flashes in green for relay contact output or voltage pulse output. For current output or continuous voltage output brightness changes depending on output status.
- ⑥ Alarm output (1) action indicating lamp:
Lights in red when alarm 1 is turned ON.
- ⑦ Alarm output (2) action indicating lamp:
Lights in red when alarm 2 is turned ON.
- ⑧ Cursor shift key:
When the character set-value of each parameter is necessary to be changed, the cursor is moved up to any digit corresponding to that character. The cursor is displayed as a flashing dot (•) at the lower right of the set-value display unit ②
- ⑨ Set-value decrease key:
Decreases numerics corresponding to any digit indicated by the flashing cursor.
- ⑩ Set-value increase key:
Increases numerics corresponding to any digit indicated by the flashing cursor.
- ⑪ Parameter select key:
Selects each parameter.
- ⑫ Auto tuning key:
Used to operate the controller in the Auto tuning mode.

☆ Internal chassis withdrawal, and switch and short pin mold location

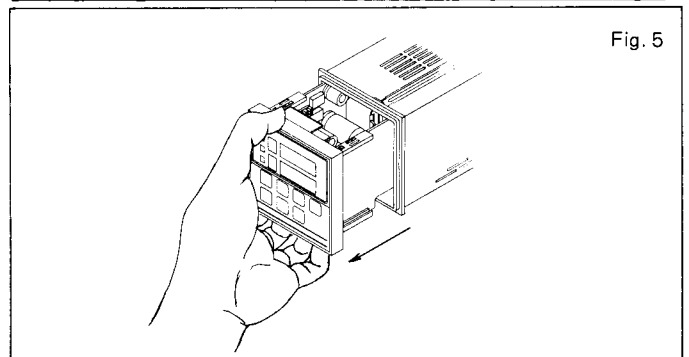
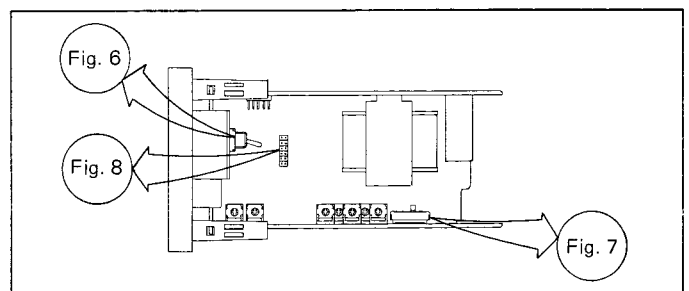


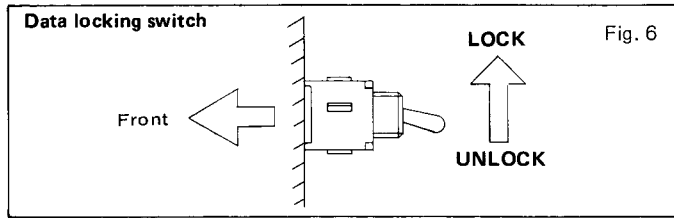
Fig. 5

First, as shown in the Figure 5, lift the lever at the bottom of the controller front to unlock the internal chassis, and then withdraw the chassis from its housing. Thus, the data lock switch, Types K and J thermocouple select switch and short-pin mold appear.



• **Data locking**

No hidden key functions with the data lock switch (LOCK) turned to the lock side to disable data change. In addition, data lock is released with the switch turned to the unlock side to enable data change.



(3) Type K/J thermocouple select function (Option)

The selection of Types K and J thermocouples is easily made by changing the insertion positions of a short-pin mold inside the controller if measured temperature is in the same range.

(For example, a range of 0 to 400°C for Type K thermocouple is easily changed to the same range for Type J.)

When no Type K/J select function is specified, its addition requires special adjustment.

When the addition of this function is required, contact us or your nearest RKC's agent.

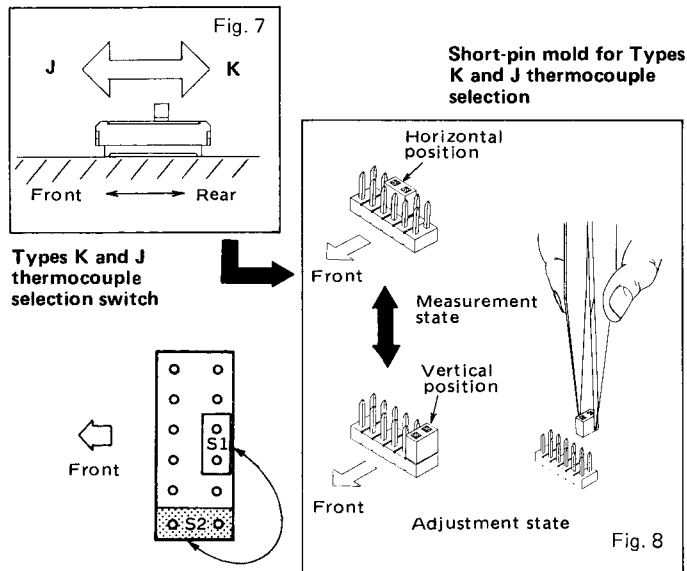
Caution: No correct control is performed if different ranges for Types K and J thermocouples are selected, and/or any other thermocouple Type than Types K and J is selected.

• **Types K and J thermocouple selection**

- ① First, turn the Types K and J thermocouple select switch to either the K or J side depending on the input desired. (See Fig. 7)
- ② Next, change the short pin mold from the measurement state (S1) to the adjustment state (S2) as shown in Fig. 8.
- ③ Select parameter *r* by the front **PARA** key and then enter 0 in the units digit for the selection of Type K, while 1 in the same digit the selection of Type J. (The display of 0 in the tens digit indicates °C and the display of 1, indicates °F. Therefore, do not change the present display.)
- ④ Then, return the short-pin mold back to the measurement state (S1) from the adjustment state (S2).
- ⑤ Thus, Types K and J thermocouple selection has ended. Return the chassis back into its housing.
- ⑥ Finally, re-write the input label at the front to the thermocouple Type changed (K ↔ J).

Cautions:

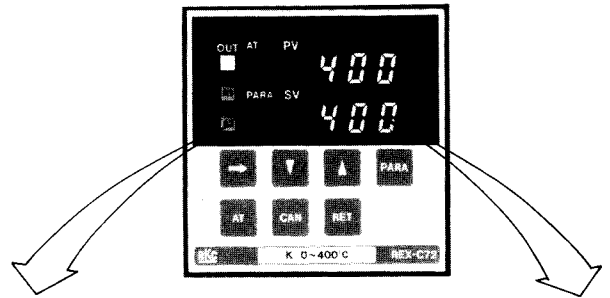
- After the above changes made, if no correct control is performed, again check the select switch and short-pin mold positions.
- When using a pair of tweezers, do not touch on any part other than that necessary to be handled.
- In Fig. 8, only one short-pin mold is shown, but another short-pin mold is also provided depending on the specification. Do not change these molds.



■ **OPERATION**

a) **Explanation of each parameter**

The PV and SV are displayed if the power is turned ON. The PV corresponds to the present measured value, while the SV corresponds to the main set-point preset prior to shipment. In addition, each parameter corresponds to the character set-value preset prior to shipment. Therefore, change these values to those required.



Parameter	Name	Description	Initial value preset prior to shipment
(Blank)	Main set-point	Desired value of control. Setting within the main set-point range is possible.	0
H	High-limit alarm setting	Sets a plus deviation value from the main set-point. (Ex.: If the main set-point is set to 200°C and high-limit alarm is set to 100°C, the alarm functions at 300°C.)	30 *
L	Low-limit alarm setting	Sets a minus deviation value from the main set-point.	30
P	Proportional band	Set when performing proportional action.	30
A	Anti-reset windup	Prevents overshoot and undershoot caused by integral effect. Integral action turns OFF when this is set to 0.	30
I	Integral time	Eliminates offset occurring only in proportioning action to match a measured value with the set-point. Integral action turns OFF with this action set to 0.	240
d	Derivative time	Predicts output change to prevent ripples from their occurrence and as a result improves control stability.	60
r	Cycle	For relay contact or voltage pulse output, its setting range is from 1 to 99 sec. For current output & continuous voltage output, no setting is required, since 0 sec. is set in the memory.	20 (0)

* 3 and 7 actions with V and I (voltage and current) inputs are set by this parameter.

b) **Setting of each parameter**

= Operational Cautions =

Cautions:

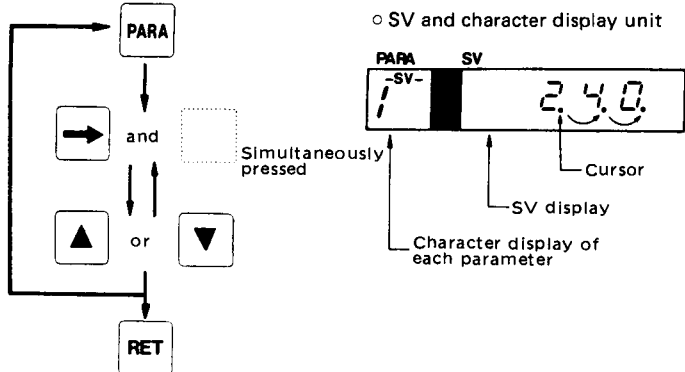
- No **←** (cursor shift key) functions if it is not pressed simultaneously with the hidden key.
- If the above key does not function with the hidden key simultaneously pressed, the Dip SW. Inside the controller may be turned to the LOCK side.
- In order to prevent any trouble occurring during setting change, no set value changed during cursor flashing is accepted.
- Even when the cursor is eliminated by the **←** (cursor shift key), no set value changed is accepted for 10 sec.

* M.S.D → L.S.D → Cursor disappears.

- When the cursor is eliminated by the **PARA** (parameter select key) or **RET** (return key), the re-set value is accepted, since it is assumed that the setting has ended.
- It is assumed that the setting has ended if **←**, **↓** or **↑** is not pressed for more than 10 sec. Thus, the cursor is eliminated to accept the re-set value.

= Setting Steps =

- Select any of the following characters by pressing the **PARA** key.
 Blank : Main set-point H : High-limit alarm setting
 L : Low-limit alarm setting P : Proportional band
 R : ARW I : Integral time
 d : Derivative time f : Cycle
- Shift the cursor to the lower right of any digit whose numeric is necessary to be changed, by the **→** and **←** (hidden) keys. (Simultaneously press these keys.)
- Then, increase or decrease numerics by the **▲** and **▼** keys. After the above setting has been finished, move to the next character by the **PARA** key.
- After each setting described above has been finished, return the character back to blank (main set-point display).



c) Auto tuning procedure

Set the main set-point, alarm and proportioning cycle (for current output continuous voltage output, this setting is not required.) even in the Auto tuning mode.

Press **AT** (Auto tuning key) simultaneously with the hidden key. The optimum P,I,D and ARW constants are automatically set.

This auto tuning function can start from any state of temperature rise and stabilized control after the power is turned ON.

- When the auto-tuned constants are necessary to be checked, press **PARA** (parameter select key).
 Thus, the constants are shown on the SV display unit in due order.
- When the constants automatically set in the Auto tuning mode are necessary to be changed, change the character set-value in accordance with Setting procedure of each parameter.
- When suspending the auto tuning function during its execution, press **CAN** (cancel key) simultaneously with the hidden key. Thus, the dot on the auto tuning display unit stops flashing to release the auto tuning function.
- Even when the auto tuning function is suspended during its execution, each set value, and PID and ARW constants are not changed. (Values before auto tuning start)

■ ACTUAL OPERATION PROCEDURE

- Set the main set-point to the temperature desired.
- When the controller is provided with alarm setting, the setting is set to the desired temperature. This becomes deviation setting from the main set-point.
- Set proportioning cycle to the optimum time (sec.). For current output continuous voltage output, no cycle setting is required.
- Set PID and ARW constants to the optimum values. When operating the controller in the Auto tuning mode, the settings only required are from item ① to item ③.
- Thus, the setting procedures have ended.

Start controller operation by turning ON the power. For auto tuning operation, press the auto tuning key and the hidden key.

*1 For the controller with high and low limit alarms and a self-hold circuit, the hold circuit is released when the input is out of the low alarm setting range after the power is turned ON. Afterward, the alarm output is turned ON if the input is again in the high or low alarm setting range.

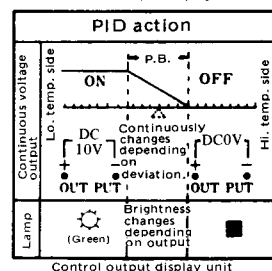
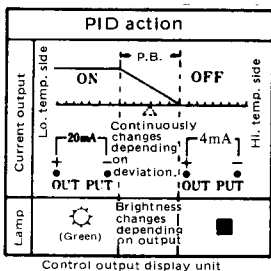
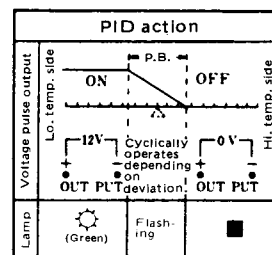
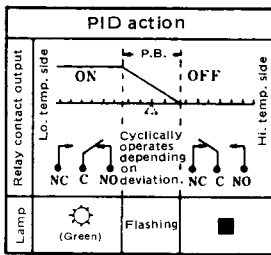
*2 If no hunting occurrence is permitted in a control system, do not use the auto tuning function. In this case, set each parameter matched with the controlled object.

*3 A burnout circuit is built in the controller as standard. Therefore, turn the power ON after the measured circuit has been connected. If the measured circuit opens for TC or RTD input, the PV display unit shows ω in its most significant digit to display the burnout status. For V or I input a displayed value on the display unit goes decreasing to indicate the abnormal status, i.e. the burnout status. (However, for the input of 0 to 10mV, 0 to 100mV or 0 to 300mV, the display unit shows ω in the same way as TC or RTD input.)

■ OUTPUT AND LAMP INDICATION

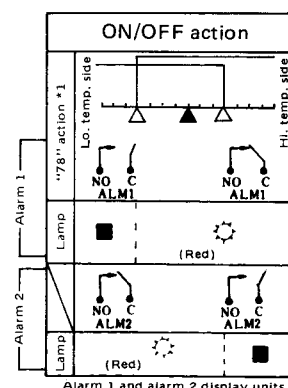
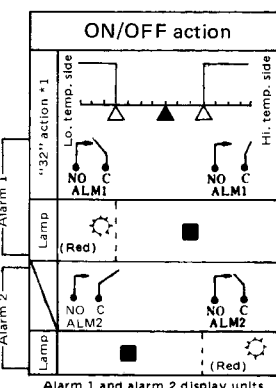
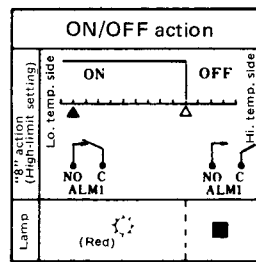
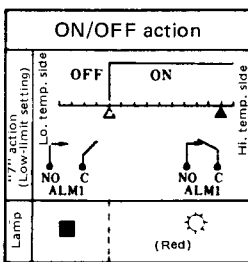
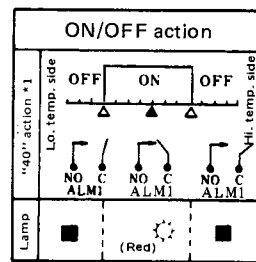
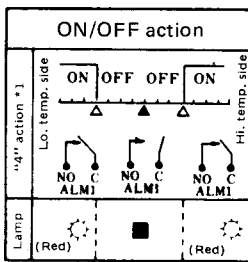
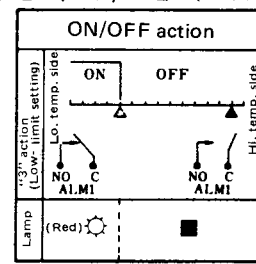
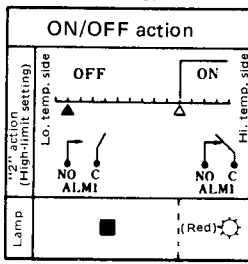
Control action

▲ : Main setting (Integral action turns OFF), ○ : Lamp ON, ■ : Lamp OFF



Alarm action (Relay contact output)

▲ : Main setting, △ : Alarm setting, ○ : Lamp ON, ■ : Lamp OFF



*1 Independent high and low limit settings