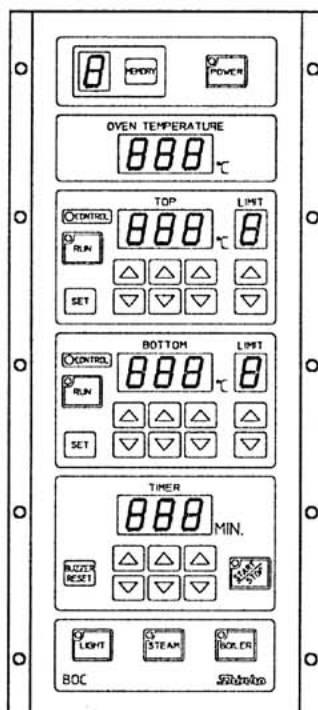


INSTRUCTION MANUAL
FOR
OVEN TEMPERATURE CONTROL EQUIPMENT
BOC-200 SERIES



Thank you for your purchase of our Oven Temperature Control Equipment **BOC-200 series**.

BOC-200 series is delivered after its production and inspection on the basis of severe quality control in our factory.

Further to your confirmation of the model and specifications of the BOC-200, peruse this instruction manual before starting operation.

Note:

Please arrange to give this manual into the hands of the operator who actually uses our product.

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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 the 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.

BOC-200 series has been developed for the complicated oven control to make bread or confectionary. BOC-200 series is an oven temperature control equipment with high function, and it provides the functions such as Temperature controlling function for 2 channels of top and bottom heater, Timer function to control the baking time, Memory function to memorize 8 files of processes (temperature and time), and Steam and Boiler controlling function.

Warning

Turn the power supplied to the instrument off before wiring or checking done. If working or touching the terminal with the power on status, there is a possibility of Electric Shock which can cause severe injury or death. Moreover, the instrument must be grounded before the power supplied to the instrument is turned on.

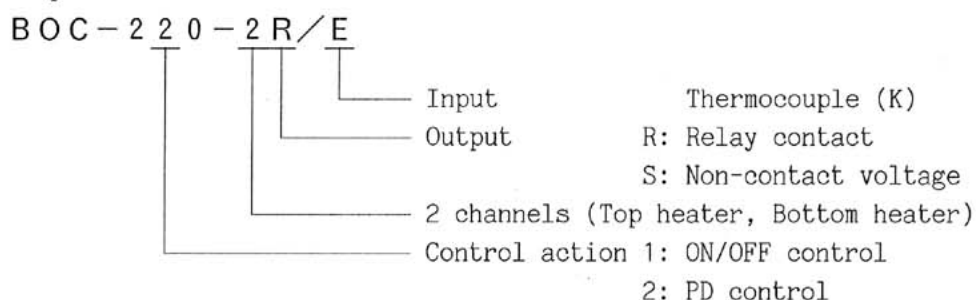
1. Model name

Model name	Control action	Output	Input	Rated scale
BOC-210-2R/E	ON/OFF action	Relay contact	Thermocouple K (2-channel)	0 to 400°C
BOC-220-2R/E	PD action			
BOC-210-2S/E	ON/OFF action	Non-contact voltage		
BOC-220-2S/E	PD action			

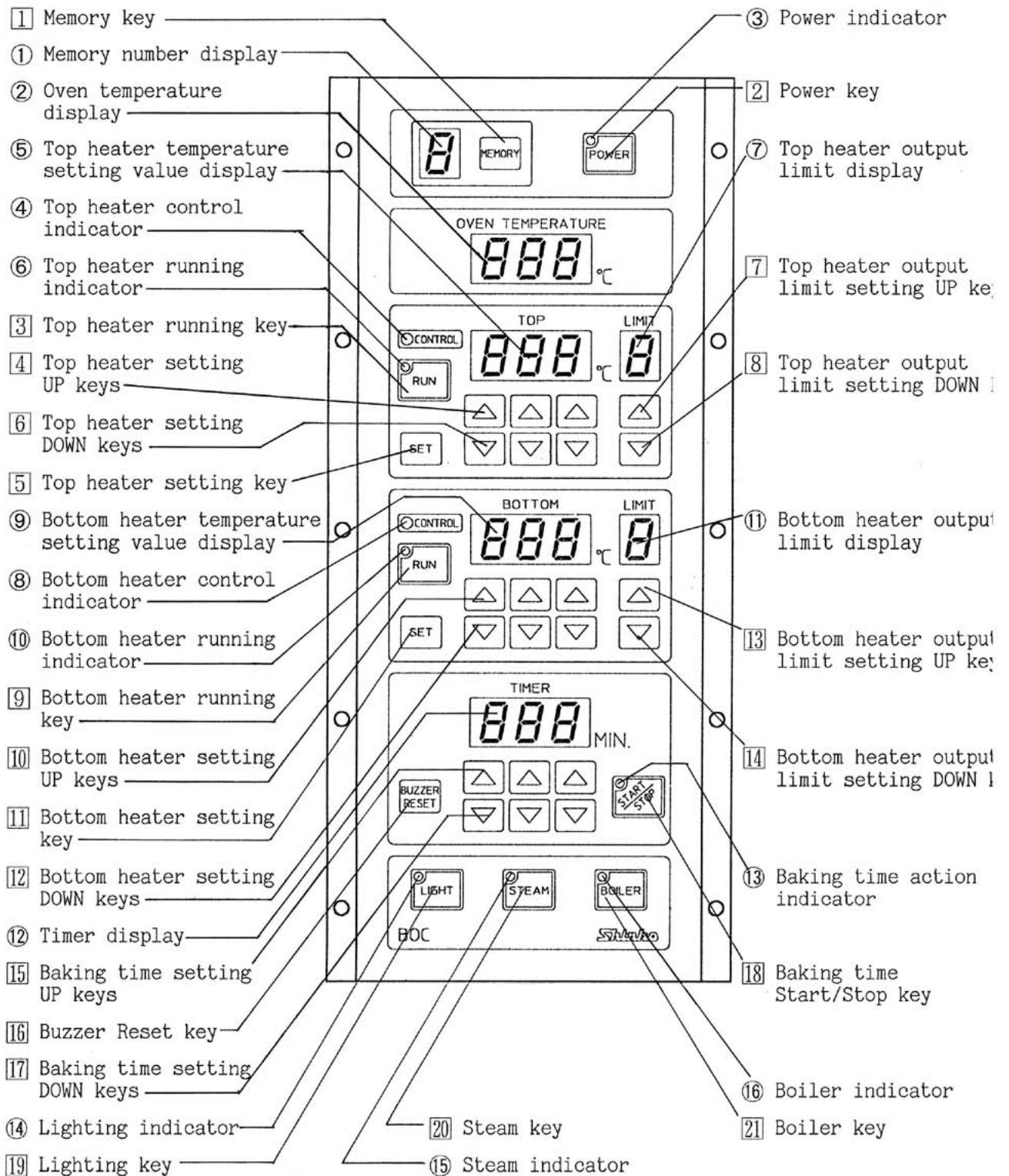
- Model nameplate indication
 - The nameplate is put on the back face.
 - Model nameplate [Example]

MODEL	BOC-220-2R/E	← Model name
OPTION		← Option code
RANGE	0 ~ 400°C K	} ← Rating
VOLT.	AC 100 ~ 240V 50/60Hz	
	No. XXXXXX	← Equipment number

- Explanation of model



2. Name of sections



If you are using the BOC-200 applied the option Program control function (code: PC), see page 27 to 31 as well.

2.1 Displays and Indicators

① Memory number display

It displays the setting value memory number with red display.

② Oven temperature display

It displays the oven temperature with red display. Usually, it displays the top heater temperature. As for the bottom heater, refer to page 6, [1].

The characters Proportional cycle setting mode [$\underline{c} \underline{4} \underline{c}$] and Dead band setting mode [$\underline{d} \underline{F} \underline{A}$] are also indicated on this display. (See page 17, 18)

③ Power indicator

Green indicator lights when the power supplied to the BOC-200 is ON.

④ Top heater control indicator

Red indicator lights when the top heater control output is ON.

⑤ Top heater temperature setting display

It displays the top heater temperature setting value with green display.

⑥ Top heater running indicator

Green indicator lights while the top heater is running.

⑦ Top heater output limit display

It displays the top heater output limit setting value with red display.

The character Process variable correction setting mode [$\underline{4}$] is indicated on this display as well.

⑧ Bottom heater control indicator

Red indicator lights when the bottom heater control output is ON.

⑨ Bottom heater temperature setting display

It displays the bottom heater temperature setting value and the character for steaming time setting mode [$\underline{4} \underline{r} \underline{n}$] with green display.

⑩ Bottom heater running indicator

Green indicator lights while the bottom heater is running.

⑪ Bottom heater output limit display

It displays the bottom heater output limit setting value with red display.

The character Process variable correction setting mode [$\underline{4}$] is also indicated on this display.

⑫ Timer display

It displays the Baking time or Steaming time with red display.

[When setting, it displays the setting time, and when controlling it displays the rest time for baking.]

⑬ Baking time action indicator

Green indicator blinks during baking time.

⑭ Lighting indicator

Green indicator lights while the oven lighting output is ON.

⑮ Steam indicator

Green indicator lights while the steaming output is ON.



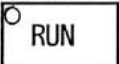










[When reached to the steam setting time, the indicator turns to light out, and the steaming output turns OFF.]



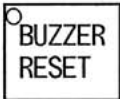


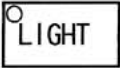

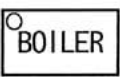
⑯ Boiler indicator

Green indicator lights while the boiler output is ON.

When the option High limit alarm output is applied, the boiler output is not available, and it lights when the alarm output is ON.

2.2 Key functions

- ①  Memory key : It calls the memory number from No.1 to 8.
- In case the option [M15] is applied, it can call the memory file from No.1 to 15 (Display: 1 to F) (See page 34)
 - When setting, the temperature setting value, baking time setting value, etc. are memorized to the memory number being called.
 - When running, it operates with the temperature setting value and baking time setting value, etc. memorized to the memory number being called.
- ②  Power key : It turns the power for BOC-200 ON or OFF.
- ③  Top heater running key : It starts or stops the top heater running.
- ④  Top heater setting UP key : It increases the temperature setting value for each digit. *1
- ⑤  Top heater setting key: It calls the top heater setting mode, or registers the setting values.
- ⑥  Top heater setting DOWN key : It decreases the temperature setting value for each digit. *1
- ⑦  Top heater output limit setting UP key : It increases the high limit value (No.0 to 9, F) of the top heater output. *2
- ⑧  Top heater output limit setting DOWN key : It decreases the high limit value (No.0 to 9, F) of the top heater output. *2
- ⑨  Bottom heater running key : It starts or stops the bottom heater running.
- ⑩  Bottom heater setting key : It increases the temperature setting value for each digit. *1
- ⑪  Bottom heater setting key : It calls the bottom heater setting mode, or registers the setting values.
If it is pressed for 5 seconds, the bottom heater temperature will be indicated on the oven temperature display. *3
- ⑫  Bottom heater setting DOWN key : It decreases the temperature setting value for each digit. *1
- ⑬  Bottom heater output limit setting UP key : It increases the high limit value (No.0 to 9, F) of the bottom heater output. *2

- 14  Bottom heater output limit setting DOWN key: It decreases the high limit value (No.0 to 9, F) of the bottom heater output. *2
- 15  Baking time, Steaming time setting UP key : It increases the baking time or the steaming time setting value of each digit. *1
- 16  Buzzer reset key : It makes the buzzer (to inform baking completion) output OFF and resets the baking time count to the setting value.
- 17  Baking time, Steaming time setting DOWN key : It decreases the baking time or the steaming time setting value of each digit. *1
- 18  Baking time Start/Stop key : It starts or halts the baking time count. [To release the halt, press the key again, then it starts the count at which the count is halted.]
- 19  Oven lighting key : It turns the oven lighting output ON or OFF.
- 20  Steam key : It calls the steaming time setting mode or turns the steam output ON. If pressed again, it makes the steam output OFF.
- 21  Boiler key : It turns the boiler output ON or OFF. When the option High limit alarm output (code: AH) is applied, this key does not function.

*1 The numerical value can be increased or decreased by the key operation of each digit, and the key also carries the digit or the reverse.

*2 F means Full (100%).

*3 In case of bottom heater temperature indication, the decimal point at the first digit lights to distinguish the bottom heater from the top heater. The bottom heater temperature indication will return to the top heater if no keys are operated for approx. 30 seconds.

[Steaming time setting]

If the steam key 《 STEAM 》 is pressed during bottom heater setting mode by pressing the 《 SET 》 bottom heater setting key, the steaming time setting mode will be selected. (See page 15)

[Proportional cycle setting]

If the top heater setting key 《 SET 》 is pressed for approx. 5 seconds while the top heater setting DOWN key 《 ▼ 》 (the second digit) is being pressed, the proportional cycle setting mode will be selected. (See page 17)

[Dead band setting]

Only when it is in ON/OFF action, if the top heater setting key 《 SET 》 is pressed for approx. 5 seconds while the top heater setting DOWN key 《 ▼ 》 (the first digit) is being pressed, the dead band setting mode will be selected. (See page 18)

[High limit alarm setting (Option)]

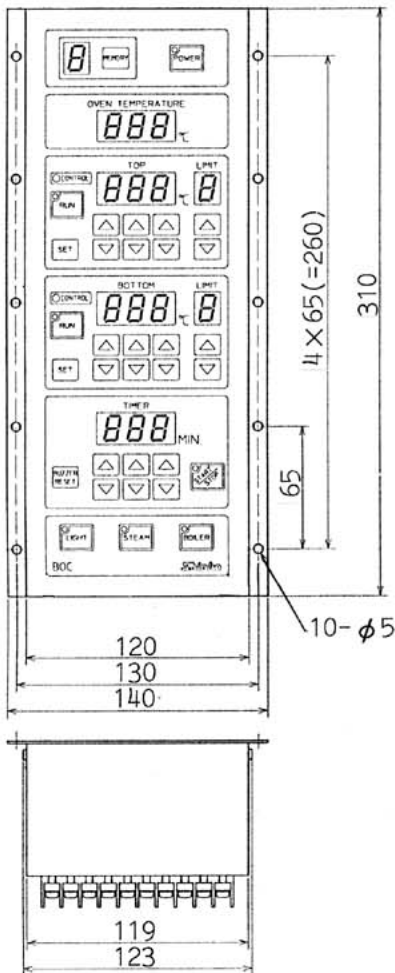
If the top heater setting key 《 SET 》 is pressed for approx. 5 seconds while the top heater setting UP key 《 ▲ 》 (the first digit) is being pressed, the high limit alarm setting mode will be selected. (See page 21)

3. Mounting to control panel

3.1 Site selection

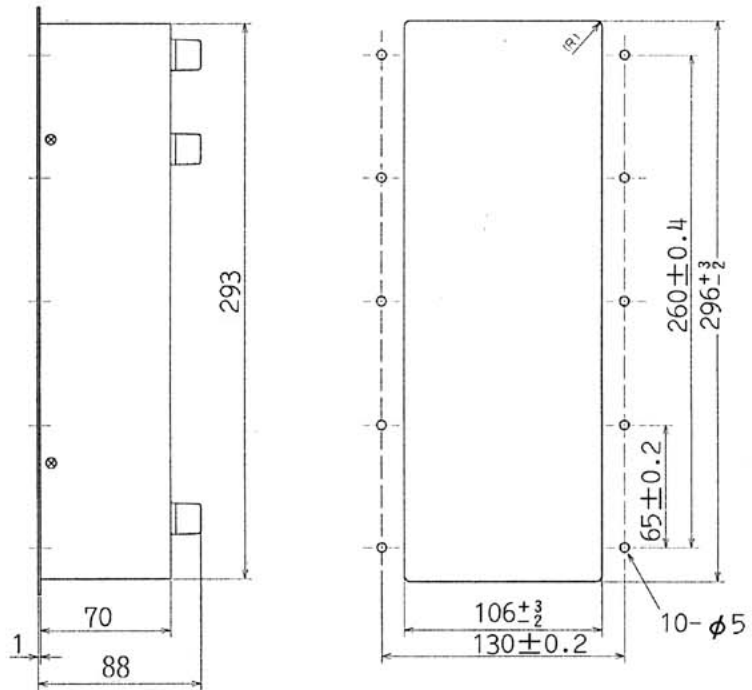
- Mount the BOC-200 in a place with:
 - A minimum of dust.
 - An absence of corrosive gases.
 - No mechanical vibrations or shocks.
 - No exposure to direct sunlight, ambient temperature within 0 to 55°C and it does not change suddenly, ambient humidity within 35 to 85%RH and non-condensing.
 - The BOC-200 should be away from the electromagnetic switch of large capacity or cables through which large current flows.
 - No water or oil and their vapor directly splash.

3.2 External dimensions



3.3 Panel cutout

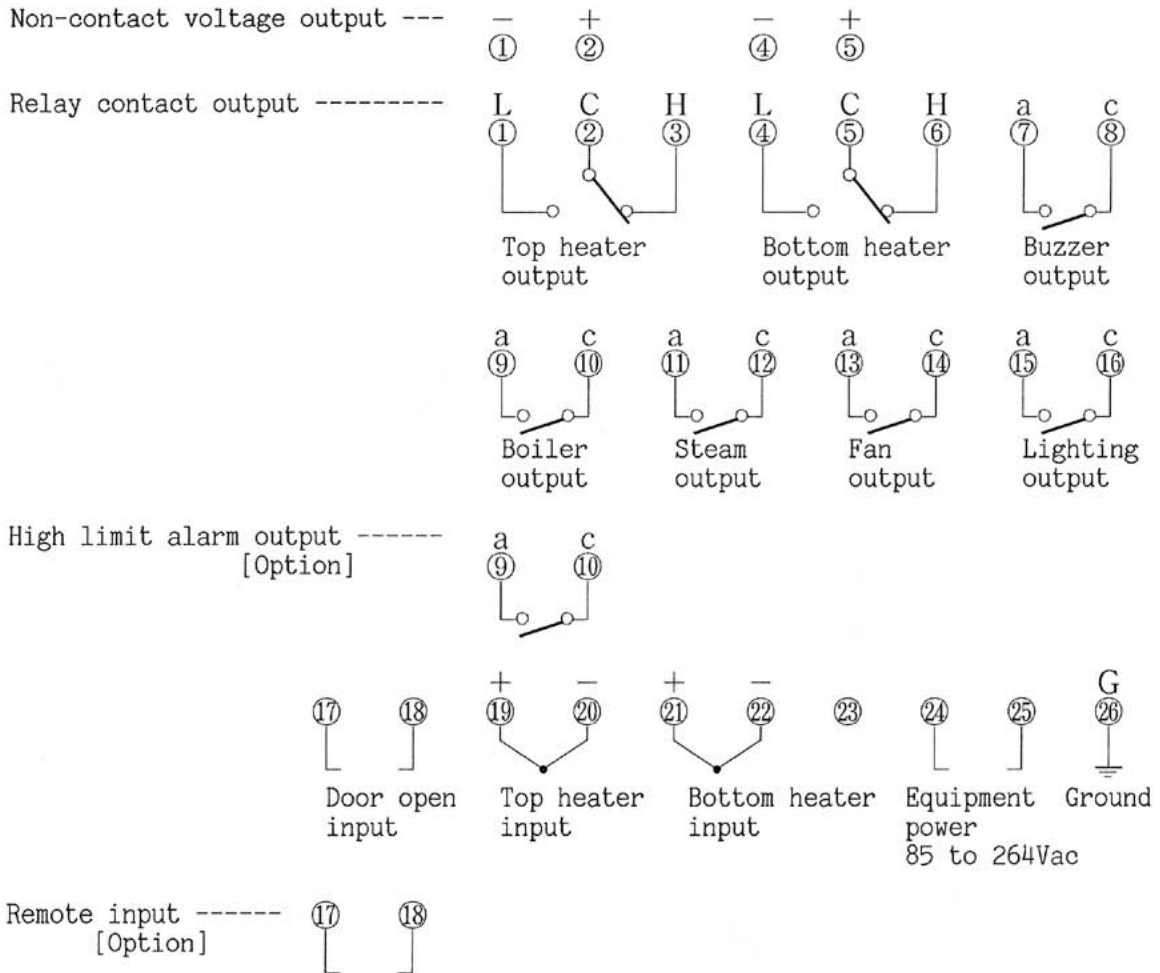
(Reference dimension)



Panel cutout dimensions when rear-mounting
[for reference]

4. Wiring connection

4.1 Terminal arrangements



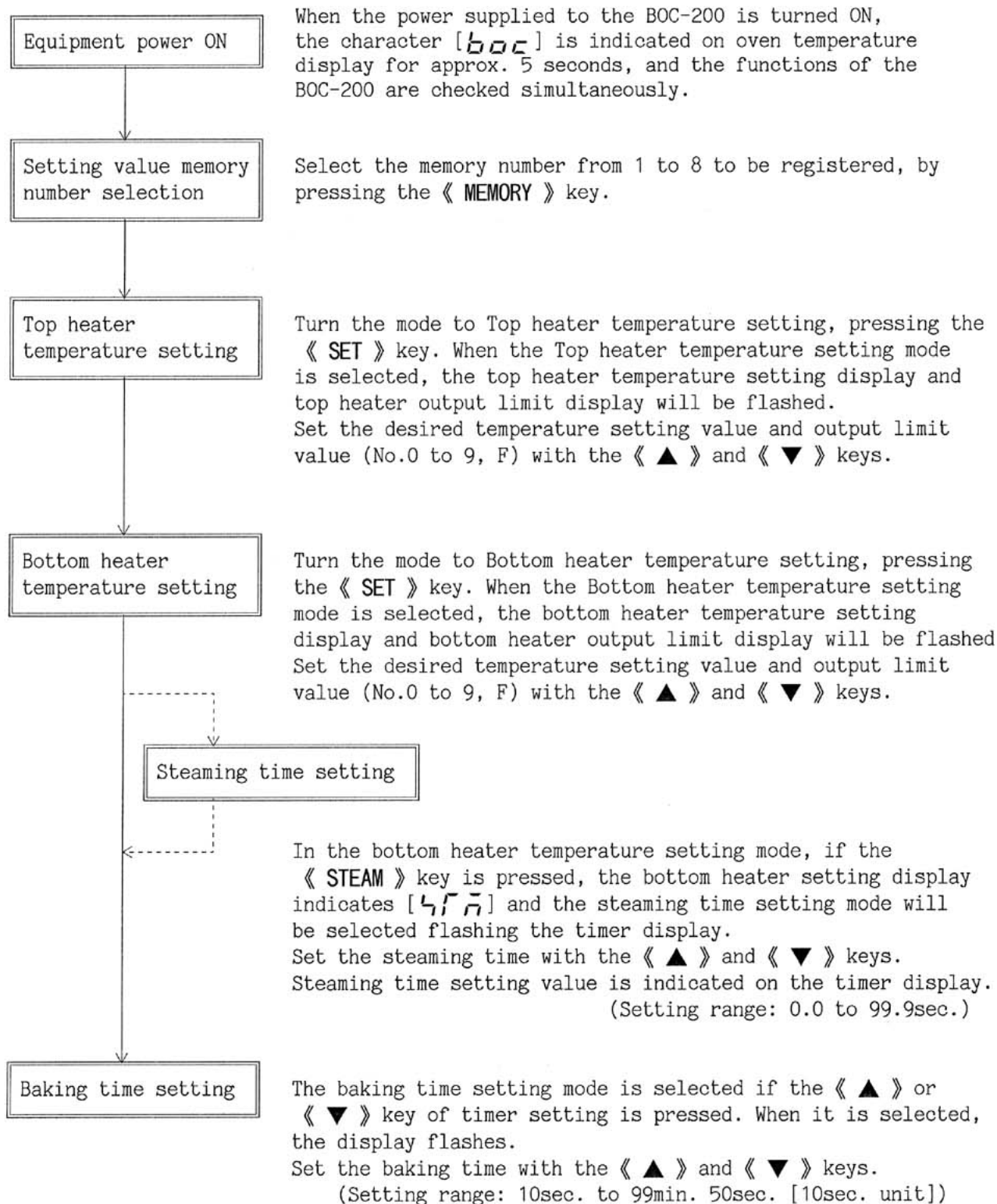
4.2 Notice when wiring

- Use a thermocouple and the compensating lead wire applicable to the input specifications (K) of the BOC-200.
- The BOC-200 has no fuse. It is therefore recommended that the fuse is to be provided in the circuit near the external of the BOC-200.
- When wiring, keep input wire (Thermocouple, Compensating lead wire) away from AC source and load wire to avoid external interference.
- With relay output type of BOC-200, it is suggested to provide the suitable relay to protect the built-in contact even if the load capacity is smaller than the contact capacity considering the rush current.
- To prevent from bad influence to the BOC-200 by unexpected level of noise, the surge absorber should be provided between the coils of the external relay.
- Suitable fan should be connected to the fan output to prevent from the excessive temperature rise for the BOC-200.
- Door open input must be connected to prevent the malfunction. If the door open and close switch is connected, it stops the timer count during the door open.

5. Settings

5.1 Basic setting procedure

- During the setting mode (flashing), if the 《 ▲ 》 or 《 ▼ 》 key is not pressed for approx. 30 seconds, the flashing will stop and the values at that time will be registered.
- Do not use the sharp thing to operate the keys, but operate it with fingers.



5.2 Setting value memory number selection

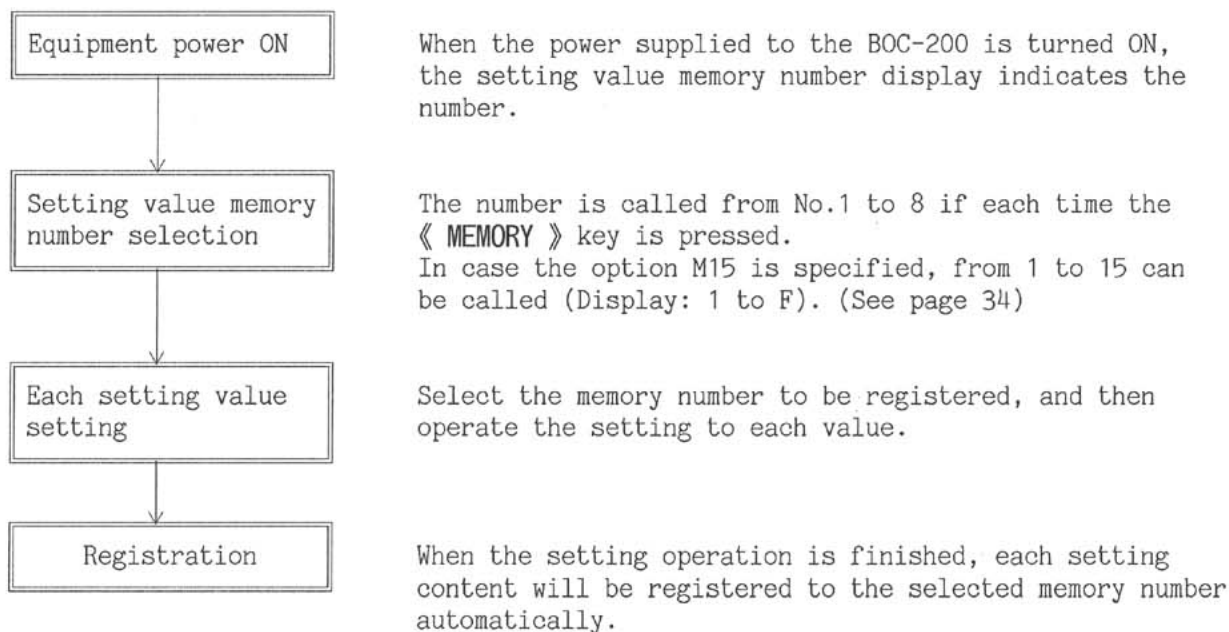
8 files of setting values (No.1 to 8) can be registered by this function.

In one (1) file, 7 kinds of setting values: Top heater temperature, Bottom heater temperature, High limit alarm, Top heater output limit, Bottom heater output limit, Baking time and Steaming time can be registered.

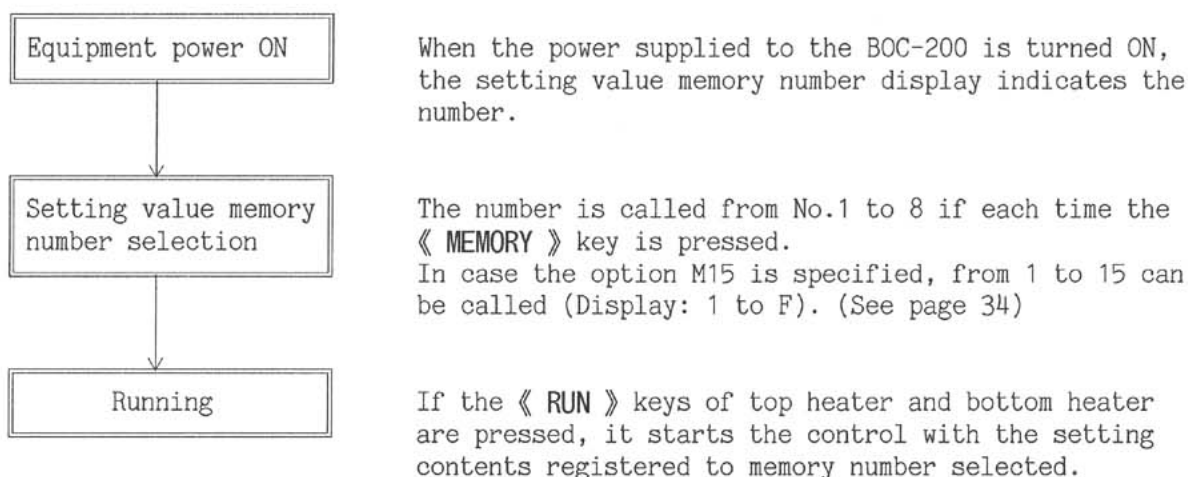
In case the option M15 is specified, 15 files of data can be registered.

Using this function, even if the setting condition differs from the other, the input operation is not required on each occasion, the control will be started only pressing the 《 RUN 》 key by selecting the setting value memory number.

① Setting value registration to the memory



② Running (controlling) by the setting value memory



The memory file number is unchangeable during running.

5.3 Top and Bottom heater temperature setting

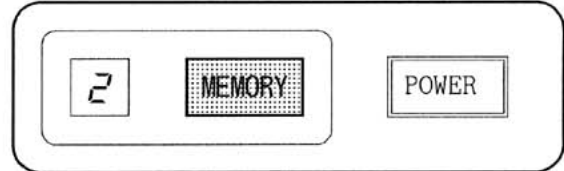
Set the temperature for the top heater and bottom heater, and register the values to setting value memory.

- **Settable range:** Rated scale
- **The setting method**

When setting 180°C for the Top heater temperature setting value to the Memory No. 2.

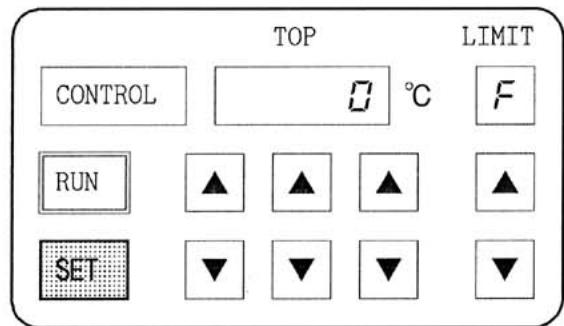
- (1) Press the 《 MEMORY 》 key to select the memory number 2.

If the option M15 is specified, the number can be selected from 15-file. (See page 34)



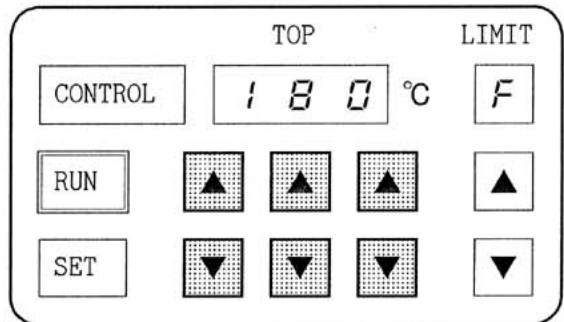
- (2) Press the 《 SET 》 key of the Top heater side.

Then the Top heater temperature setting mode will be selected flashing the displays (TOP, LIMIT).



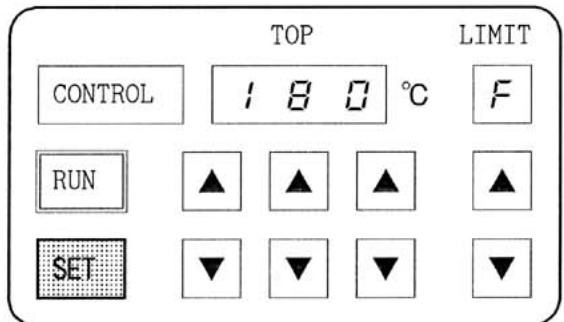
- (3) Set the Top heater temperature setting value with the 《 ▲ 》 and 《 ▼ 》 keys to 180.

The numerical value can be increased or decreased by the key operation of each digit, and the key operation also carries the digit or reverse.



- (4) Press the 《 SET 》 key of the Top heater side.

Then the Top heater temperature setting value 180°C will be registered to the memory number 2 being indicated on the memory number display.



5.4 Top and Bottom heater output limit (high limit) setting

This function can limit the conducting value (high limit) to the heater and adjust the oven performance so as to meet the object to be baked.

- Setting value: 0 to F (0 to 100%)

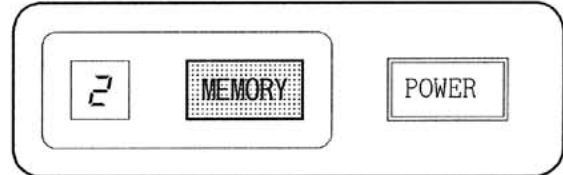
Output limit No.	0	1	2	3	4	5	6	7	8	9	F
Output limit value	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

- The setting method

When setting 5 (50%) for the Top heater output limit value to the Memory No. 2.

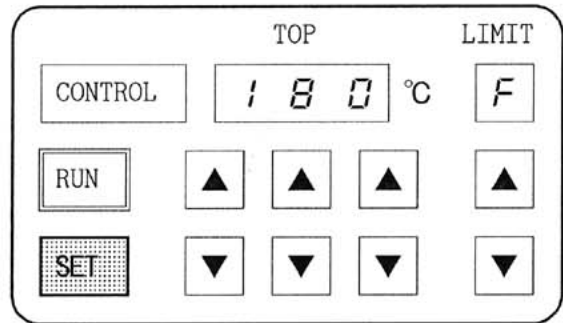
- (1) Press the 《 MEMORY 》 key to select the memory number 2.

If the option M15 is specified, the number can be selected from 15-file. (See page 34)

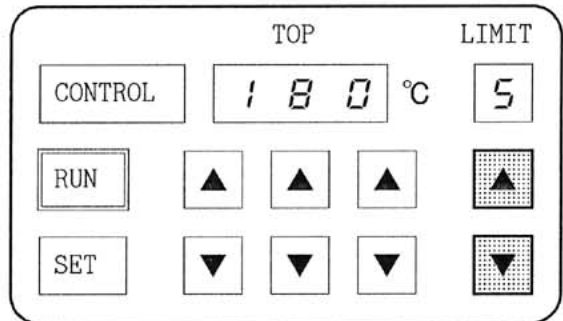


- (2) Press the 《 SET 》 key of the Top heater side.

Then the Top heater output limit setting mode will be selected flashing the displays (LIMIT, TOP).

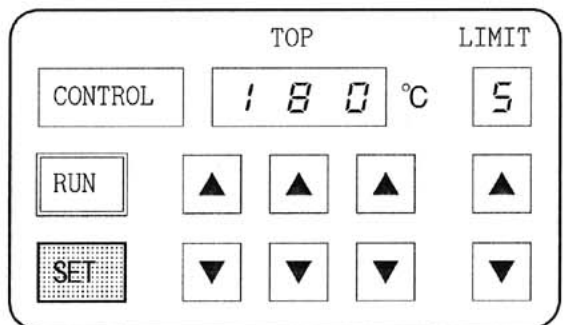


- (3) Set the Top heater output limit setting value with the 《 ▲ 》 and 《 ▼ 》 keys to 5 (50%).



- (4) Press the 《 SET 》 key of the Top heater side.

Then the Top heater output limit setting value 5 (50%) will be registered to the memory number 2 being indicated on the memory number display.



- The limit value is changeable during running as well, however, the change is effective only during running. The setting method is as item (3).

5.5 Baking time setting

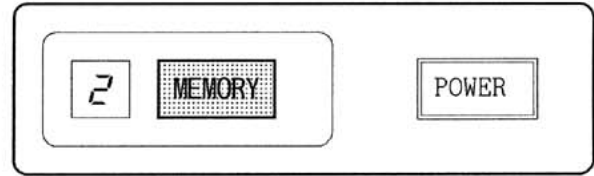
It sets the baking time. (The same time is set to both Top and Bottom heater.)

- **Settable range:** 10sec. to 99min. 50sec. (10sec. unit)
- **The setting method**

When setting 10 minutes 30 seconds for the baking time to the Memory No. 2.

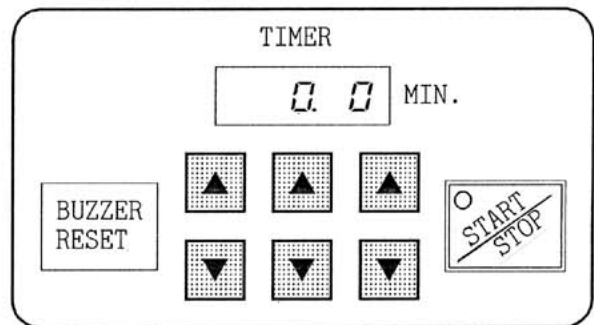
- (1) Press the 《 **MEMORY** 》 key to select the memory number 2.

If the option M15 is specified, the number can be selected from 15-file. (See page 34)



- (2) Press the 《 **▲** 》 or 《 **▼** 》 key.

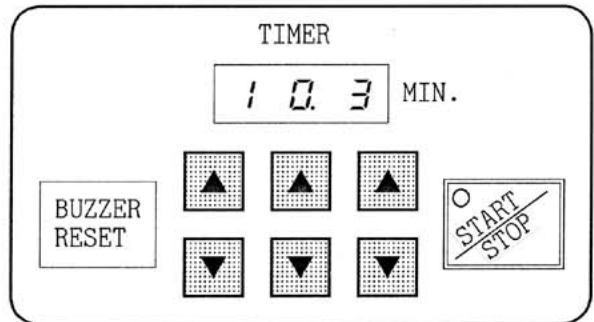
Then the Baking time setting mode will be selected flashing the display (TIMER).



- (3) Set the Baking time setting value with the 《 **▲** 》 and 《 **▼** 》 keys to 10.3.

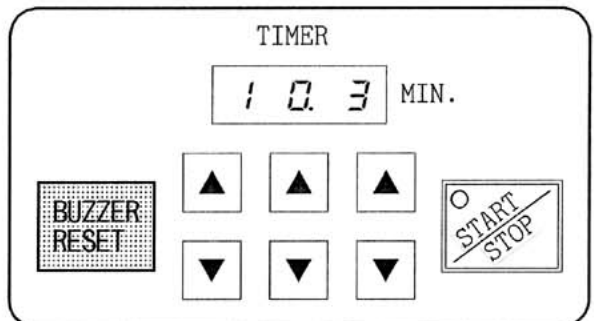
The setting time with decimal point means as follows.

0.1 ⇒ 10sec. 0.2 ⇒ 20sec.
 0.3 ⇒ 30sec. 0.4 ⇒ 40sec.
 0.5 ⇒ 50sec.



- (4) Press the 《 **START/STOP** 》 key.

The Baking time is registered to the memory number being indicated on the Memory number display, and starts the count while the Baking time action indicator is blinking.



When only registering the setting time, press the 《 **BUZZER/RESET** 》 key after that. Then, the Baking time action indicator will be turned off, and the time value 10 minutes 30 seconds is registered to the memory number 2 being displayed.

5.6 Steaming time setting

It sets the steaming time.

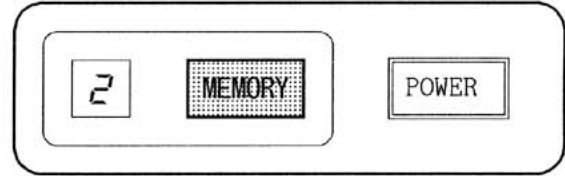
- **Settable range:** 0.0 to 99.9 seconds

- **The setting method**

When setting 10 seconds for the Steaming time to the Memory No. 2.

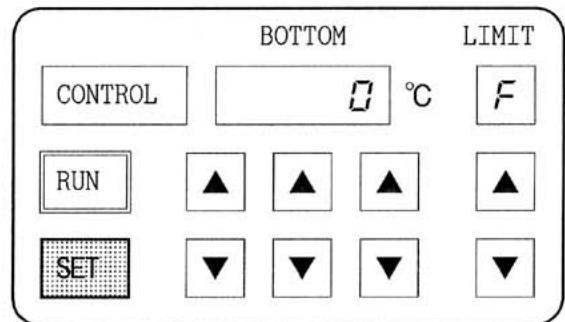
- (1) Press the 《 **MEMORY** 》 key to select the memory number 2.

If the option M15 is specified, the number can be selected from 15-file. (See page 34)



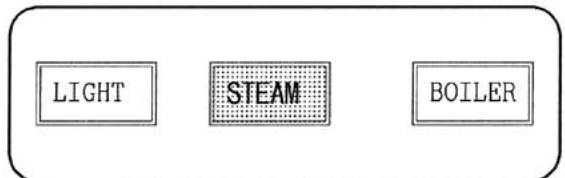
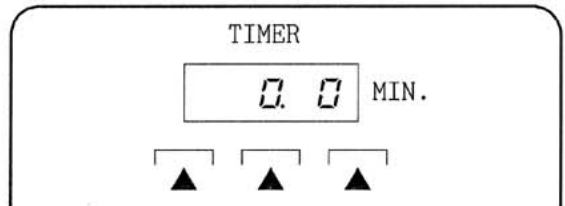
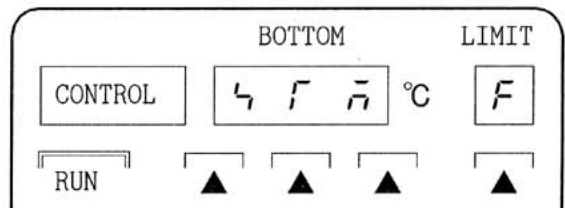
- (2) Press the 《 **SET** 》 key of the Bottom heater side.

Then the Bottom heater temperature setting mode will be selected flashing the display (BOTTOM).



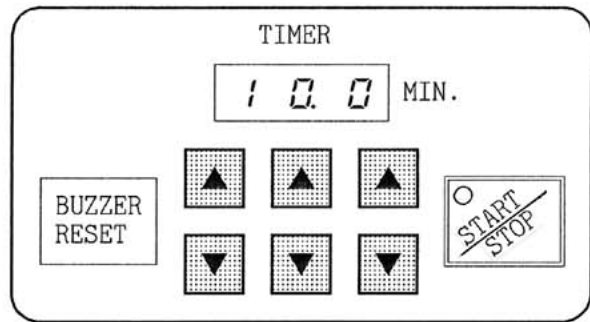
- (3) Press the 《 **STEAM** 》 key.

Then the Steaming time setting mode will be selected indicating the character [4 f ā] on the Bottom heater temperature setting display and flashing the Timer.



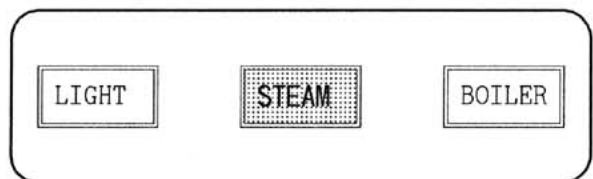
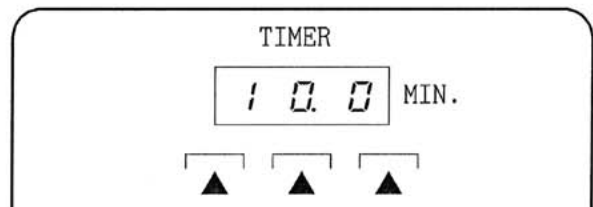
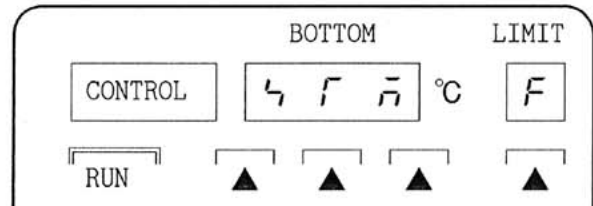
- (4) Set the Steaming time value with the $\langle \blacktriangle \rangle$ and $\langle \blacktriangledown \rangle$ keys to 10.0.

The unit of Steaming time should be the second.
 However, the indication is common to the Baking time, so the unit is expressed as MIN.
 It is the SECOND in fact.



- (5) Press the $\langle \text{STEAM} \rangle$ key.

Then the Steaming time setting value 10.0sec. will be registered to the memory number 2 being indicated on the memory number display.



5.7 Proportional cycle setting (Common to each memory number)

With the controlling action system (PD) of the BOC-200, the proportional cycle time can be changed to meet the controlling status.

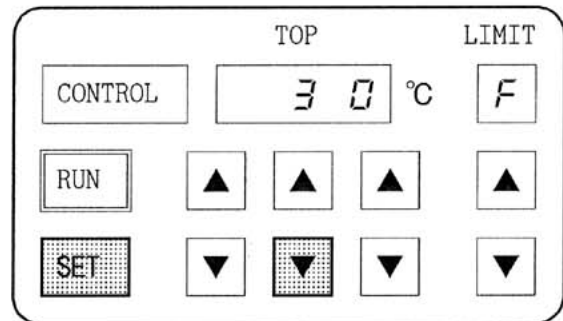
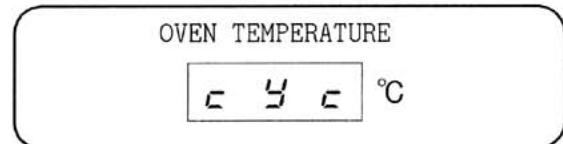
- PD action: Time proportion (P) and Derivative action (D)
- Proportional cycle time action: It automatically acts ON and OFF in cycle according to the setting time in proportional band.
- **Settable range:** from 1 to 120sec.
Factory adjusted as 30 seconds (for Relay contact output type) or 3 seconds (for Non-contact voltage output type)
- **The setting method**
When setting 15 seconds for the Proportional cycle.

- (1) Press the 《 SET 》 key of the Top heater side for approx. 5sec. while the 《 ▼ 》 key of the Top heater temperature setting (the second digit) is being pressed.

Then the Proportional cycle setting mode will be selected flashing the display (TOP).

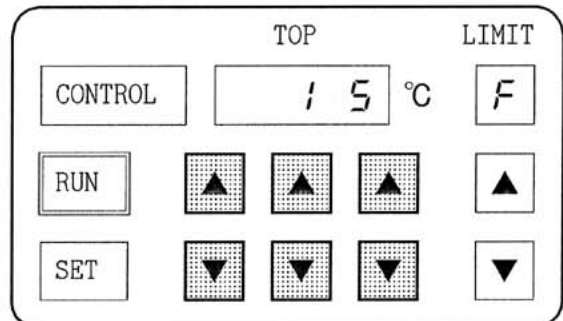
Simultaneously, the character [c 4 c] is indicated on the oven temperature display.

The unit is expressed as °C, however, it is second in fact.



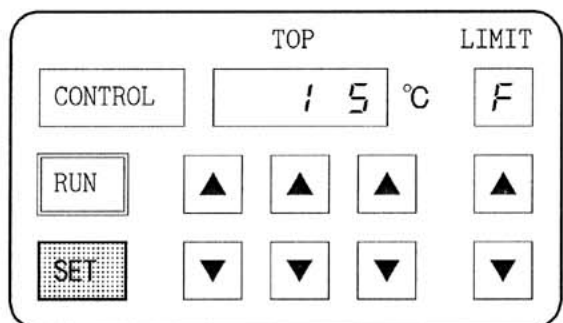
- (2) Set the Proportional cycle setting value with the 《 ▲ 》 and 《 ▼ 》 keys to 15.

The unit of the proportional cycle is the second. Substitute the °C for the second.



- (3) Press the 《 SET 》 key of the Top heater side.

Then the Proportional cycle setting value being indicated on the Top heater temperature setting display 15 seconds will be registered.



- With the relay output type of BOC-200 (-R/E), if the proportional cycle time is set shorter, the number of ON/OFF action times becomes more, and sometimes the relay life becomes shorter.

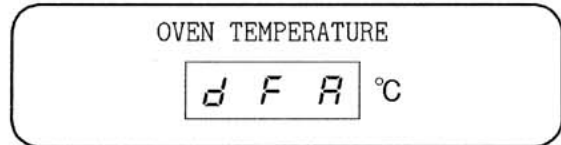
5.8 Dead band setting (Common to each memory number)

It sets the Dead band between ON and OFF when ON/OFF controlling.
 If the control action system is PD action, this mode is not available.
 When changing the action system from PD to ON/OFF, see the next page.

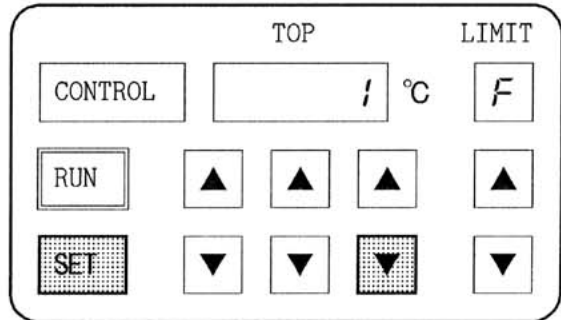
- **Settable range:** 0 to 10°C (Factory adjusted as 1°C)
- **The setting method**

When setting 2°C for the Dead band value.

- (1) Press the 《 SET 》 key of the Top heater side for approx. 5sec. while the 《 ▼ 》 key of the Top heater temperature setting (the first digit) is being pressed.

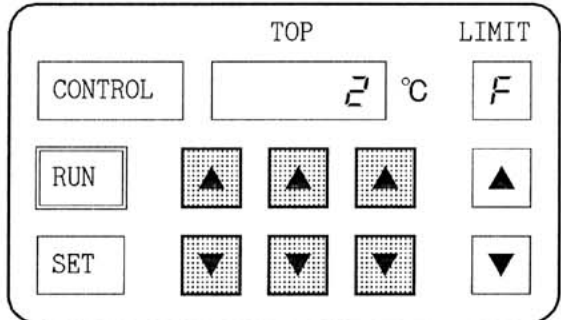


Then the Dead band setting mode will be selected flashing the display (TOP).



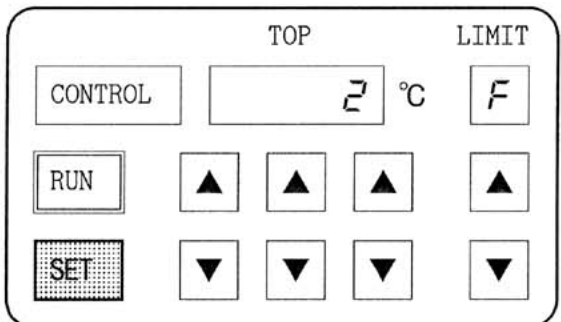
Simultaneously, the character [dFA] is indicated on the oven temperature display.

- (2) Set the Dead band setting value with the 《 ▲ 》 and 《 ▼ 》 keys to 2.



- (3) Press the 《 SET 》 key of the Top heater side.

Then the Dead band setting value 2°C being indicated on the Top heater temperature setting display will be registered.



- Change between PD control ⇔ ON/OFF control

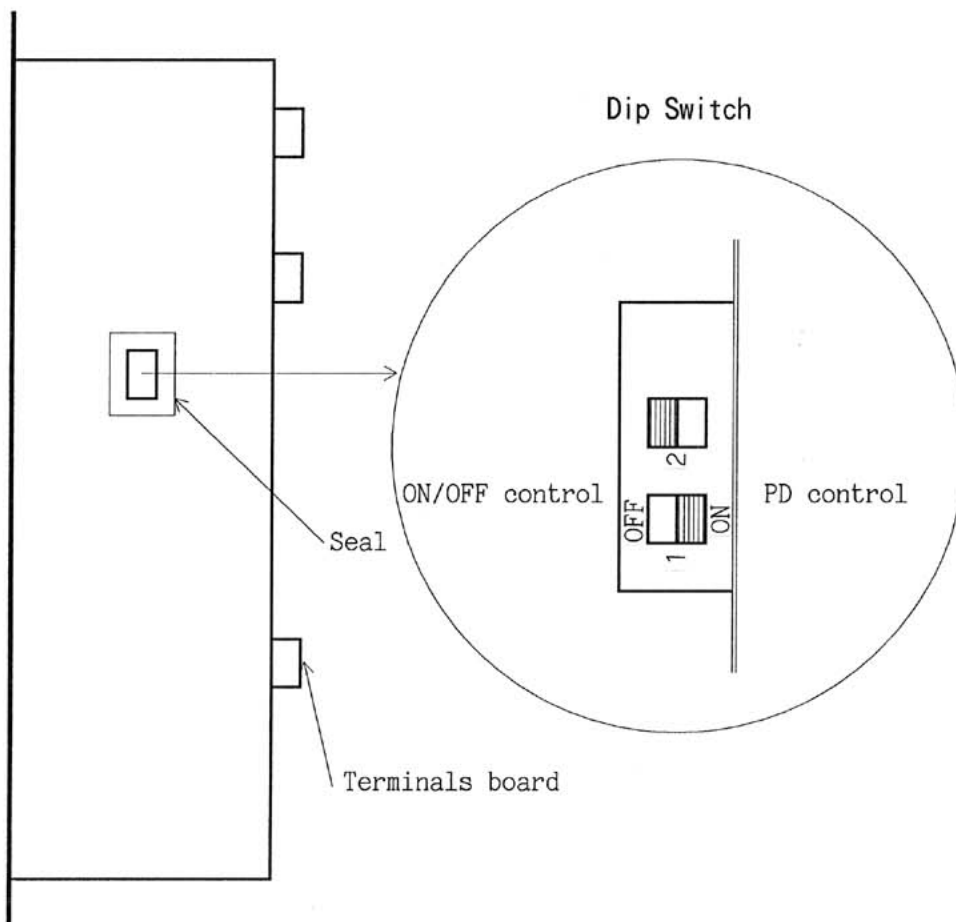
Controlling action system of the BOC-200 consists of the Time proportion (P) and Derivative action (D).

However, according to the circumstances better controlling result can be gotten by ON/OFF control action.

It is simply changeable by the internal dip switch.

- Changing procedure

- (1) Remove the seal on the left side of the steel case observed from the terminal.
- (2) Change the lever of internal dip switch at the lower side (1) to the OFF side (front side).
- (3) Replace the seal after the switch is changed.



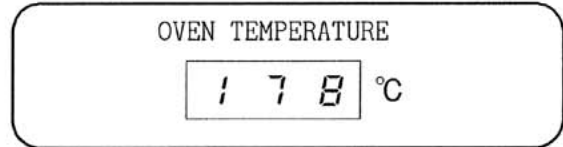
- Notes:
- Do not touch the upper side (2) of dip switch.
 - Take care not to damage the switch, use the top of such as ball-point pen to operate the switch.

5.9 Process variable (PV) correction setting

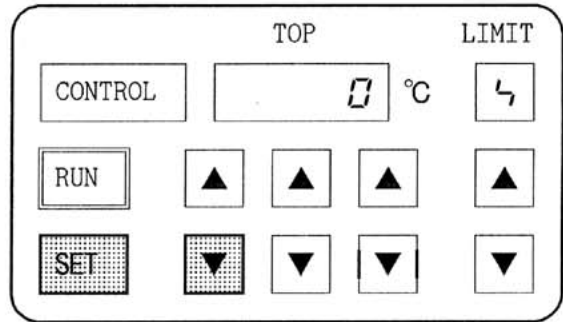
A function to shift the oven temperature indicating value (process variable). It makes the values as Setting value = Process variable display (Oven temperature display). The control is performed with the input value before correction.

- **Setting range:** -30 to 30°C
- **The setting method**
 (Operate the keys 《 ▲ 》 and 《 ▼ 》 on each side Top heater and Bottom heater respectively with the same manner.)
 When setting plus 2°C to the Process variable correction value for the Top heater.

- (1) Press the 《 SET 》 key of the Top heater side for approx. 5sec. while the 《 ▼ 》 key of the Top heater temperature setting (the third digit) is being pressed.

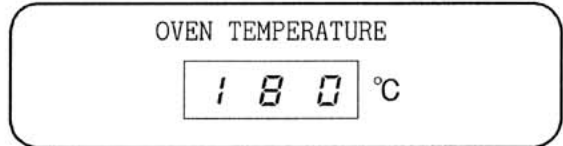


Then the Process variable correction value setting mode will be selected flashing the value on the display (TOP), and the Top heater output limit display indicates the character [4]. Simultaneously, the Oven temperature display indicates the temperature.

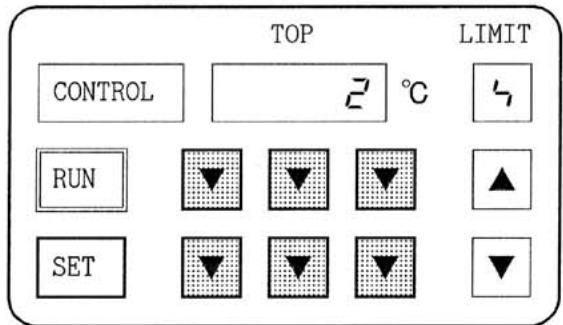


In case of Bottom heater temperature display, the decimal point at the first digit lights.

- (2) Set the Process variable correction value with the 《 ▲ 》 and 《 ▼ 》 keys to 2.



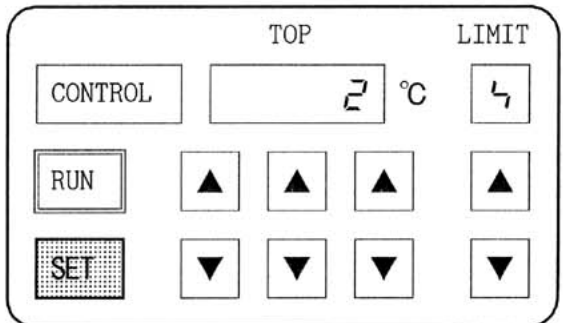
The indicating value on the Oven temperature display is added to the former value as many as the setting value.



When correcting to minus side, - sign will be displayed and the value on the Oven temperature display is subtracted from the former value as many as the setting value.

- (3) Press the 《 SET 》 key of the Top heater side.

Then the setting value indicated on the Top heater temperature setting display 2°C will be registered.



5.10 High limit alarm setting (Option code: AH)

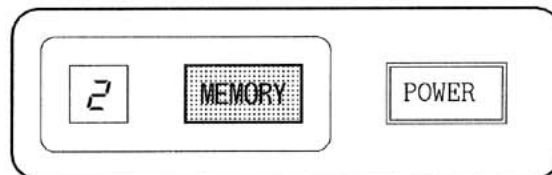
The setting method is deviation setting to the Top heater temperature setting value, and when the oven temperature exceeds the range, the output turns ON.

- Setting range: -100 to 100°C (off when set to 0)
- The setting method

When setting 10°C for the High limit alarm to the memory No. 2.

- (1) Press the 《 MEMORY 》 key to select the memory number 2.

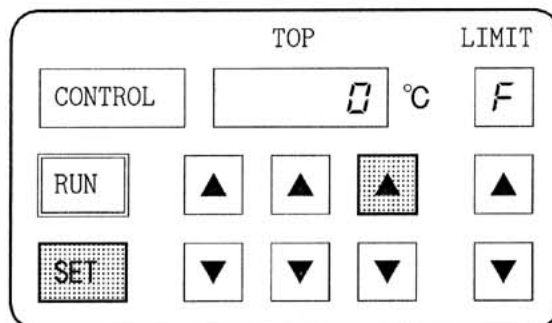
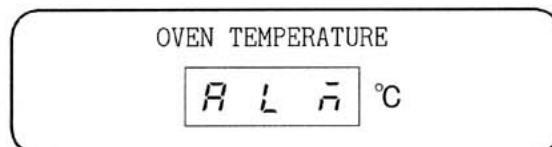
If the option M15 is specified, the number can be selected from 15-file. (See page 34)



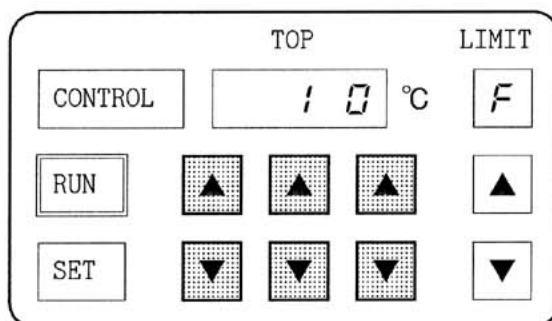
- (2) Press the 《 SET 》 key of the Top heater side for approx. 5sec. while the 《 ▲ 》 key of the Top heater temperature setting (the first digit) is being pressed.

Then the High limit alarm setting mode will be selected flashing the display (TOP).

Simultaneously, the character [AL \bar{a}] is indicated on the oven temperature display.

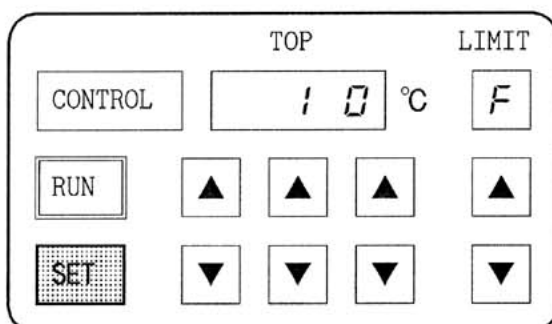


- (3) Set the High limit alarm setting value with the 《 ▲ 》 and 《 ▼ 》 keys to 10.



- (4) Press the 《 SET 》 key of the Top heater side.

Then the High limit alarm setting value being indicated on the Top heater temperature setting display 10°C will be registered.



Note: When this option High limit alarm (code: AH) is applied, the Boiler output is not available.

6. Running operation

6.1 Confirmation before running

- Is the oven door closed certainly ?
- Is each setting item set correctly ?

6.2 Operation procedure

(1) Power for the BOC-200 ON

When the power supplied to the BOC-200 is turned ON, the character [*boC*] is indicated on oven temperature display for approx. 5 seconds, and the functions of the BOC-200 are checked simultaneously.

When the 《 POWER 》 key is pressed, the power indicator and each display light, and the external fan works.

(External fan to prevent the BOC-200 from heating must be installed.)

(2) Setting value memory number selection

Press the 《 MEMORY 》 key to select the setting value memory number to be controlled from [*!*] to [*E*] indicated on memory number display.

In case the option M15 is specified, from [*!*] to [*F*] will be indicated. (Page 34)

The registered setting values to the memory are indicated on,

- Top heater temperature setting display
- Top heater output limit display
- Bottom heater temperature setting display
- Bottom heater output limit display
- Timer display.

(3) Top heater running start

Press the 《 RUN 》 key of the Top heater, then it starts the control with the setting values registered on the selected setting value memory number.

(4) Bottom heater running start

Press the 《 RUN 》 key of the Bottom heater, then it starts the control with the setting values registered on the selected setting value memory number.

(5) Baking time (Timer) start

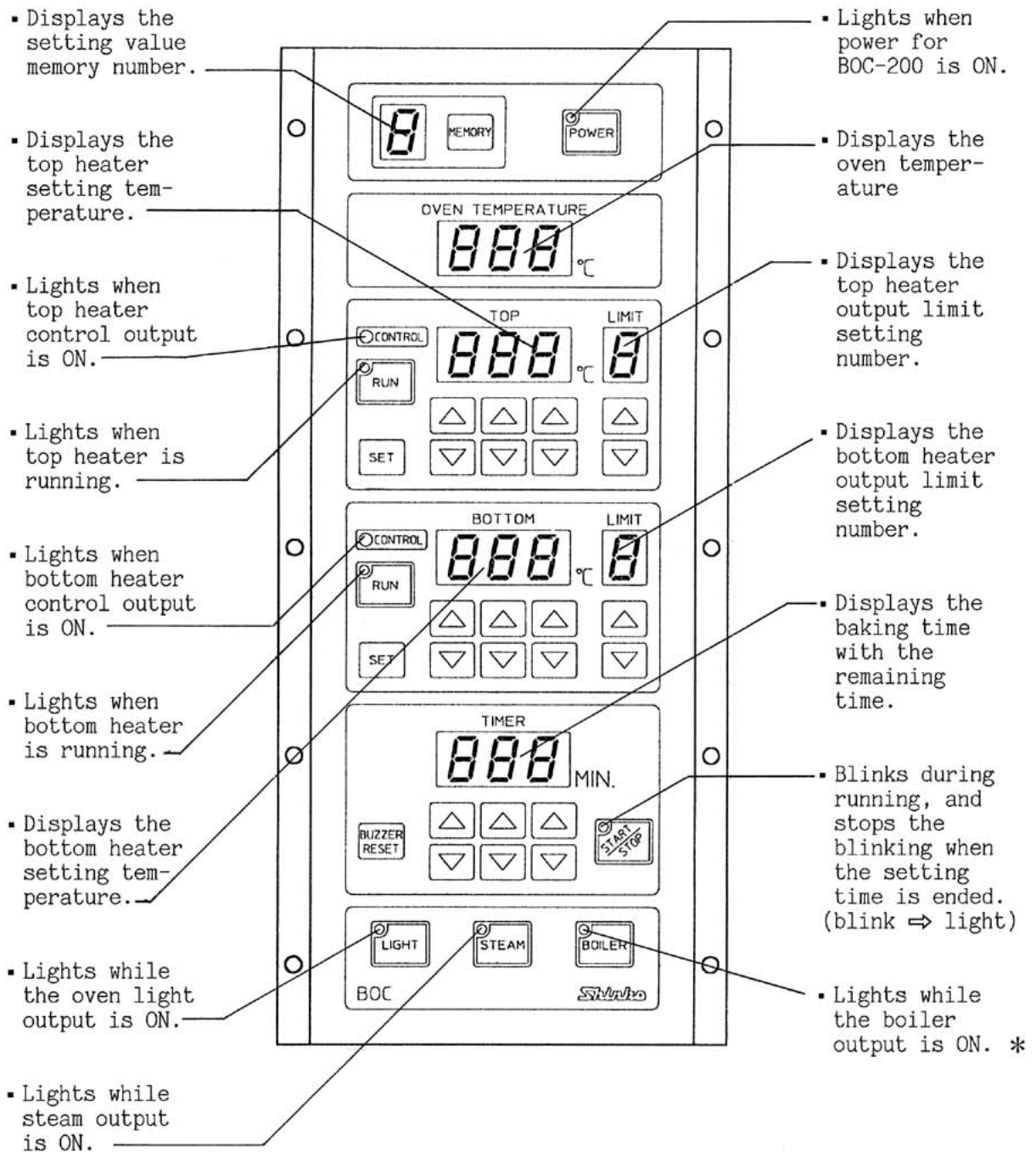
Press the 《 START/STOP 》 key to start the baking time, then the timer starts the count (indicating the rest time) with the baking time registered on the selected setting value memory number, and baking time indicator blinks.

If this key is not pressed, the timer does not start the count but only controls the temperature.

(6) During baking

After the running is started, confirm the status whether the displays and indicators are correctly working.

• Status of displays and indicators during baking



* If the option High limit alarm output (code: AH) is specified, the Boiler indicator lights when the alarm output is ON.

• When the oven door is opened while the baking time is being counted, the count is halted. If the door is closed again and the 《 START/STOP 》 key is pressed, it starts the count from the point the count was halted.

(7) Baking completion

Baking completion buzzer output is ON when the count of baking time which has been set is finished (baked).

To make the buzzer output OFF, there are 2 ways.

- ① Press the 《 BUZZER RESET 》 key, then the buzzer output turns OFF and the baking time is reset (the setting time starting status). The running will be continued with only temperature control.
 - ② Open the oven door (Door open input terminal open), and the buzzer output is OFF.
- When the operation is terminated, press the 《 POWER 》 key to make the power for the BOC-200 OFF.

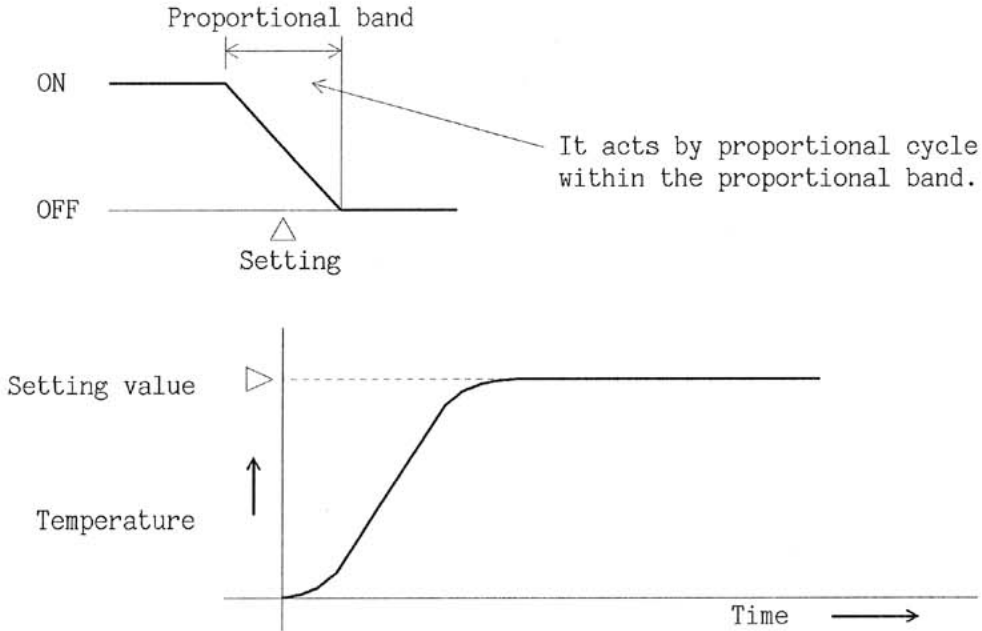
6.3 Various functions

- Data back-up function (Power failure compensation)
In case the power failure time exceeds 30ms, the data are kept with lithium battery. The life of the lithium battery is 10 years or greater at 20°C.
- Automatic cold junction temperature compensation
It detects the temperature at the terminal between thermocouple and BOC-200, and always makes it the same status at which the reference junction is located at 0°C.
- Burnout function
When abnormal input such as thermocouple burnout is occurred, the oven temperature display indicates the top heater upscale display [$\text{H} \text{---}$] or bottom heater upscale display [$\text{L} \text{---}$] to inform the abnormal, and it makes the control output (the side abnormal is occurred) OFF.

7. Control actions

7.1 Time proportion (P) and Derivative (D) control action

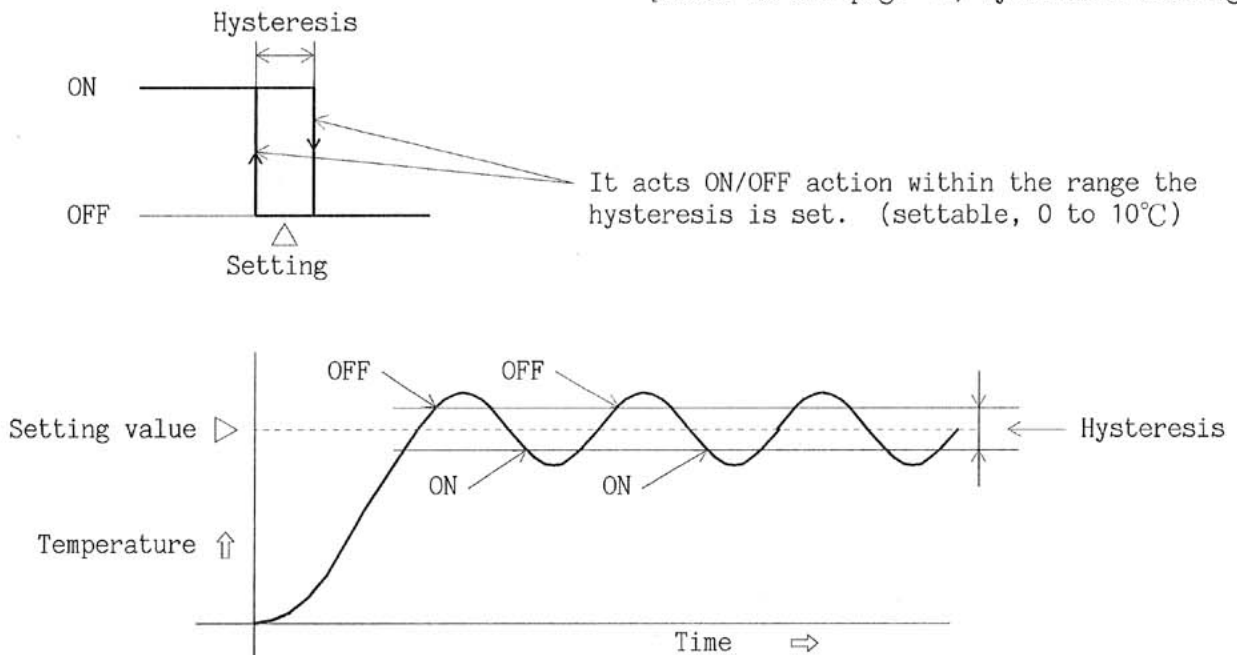
This control action allows a good control by the time proportion (P) and the proportional cycle in the proportional band, and by the derivative (D) control, the stable control result can be got by minimizing the overshoot or oscillation due to the disturbance or when the power is turned on.



7.2 ON/OFF control action

The control is performed within the hysteresis set in advance.

[Refer to the page 18, hysteresis setting]



8. External input

8.1 Door open input

To make the baking time count surely, if the oven door switch is connected to the door open input terminal, the timer count is halted when the door is opened while the baking time is being counted.

If the door is closed again and the 《 START/STOP 》 key is pressed, it starts the count from the point the count was halted.

Further, when the buzzer output is ON, if the door is opened (door open input terminal open), the buzzer output turns OFF.

8.2 Remote input (Option code: RM)

By connecting with the calendar timer, this function allows the BOC-200 to start running automatically without pressing the 《 POWER 》 key, thus the oven can be preheated before work.

When the Remote input is turned ON (closed).

- The displays are indicated even if the status was in non-indication, and the BOC-200 starts running.
- If the 《 POWER 》 key is pressed, the displays turn to non-indication, and it stops running. If the key is pressed again, it will indicate the displays, however, it keeps the stopping status.
- When the power supplied to the BOC-200 is turned off, the displays turn to non-indication, and it stops running. If the power supplied to the BOC-200 is turned on again, the displays turn to indication status and it starts running again.
- At this time, in case the option Program function (code: PC) is applied, the timer works continuously. However, if the power is turned off in the status the timer is 0.0 sec., the timer will not work from the reset status.

When the Remote input is turned OFF (open).

- The displays turn off, and it stops running.
- If the 《 POWER 》 key is pressed, the displays are indicated, however, it keeps stopping status. If the key is pressed again, the displays turn off again.

9. Programming function (Option code: PC)

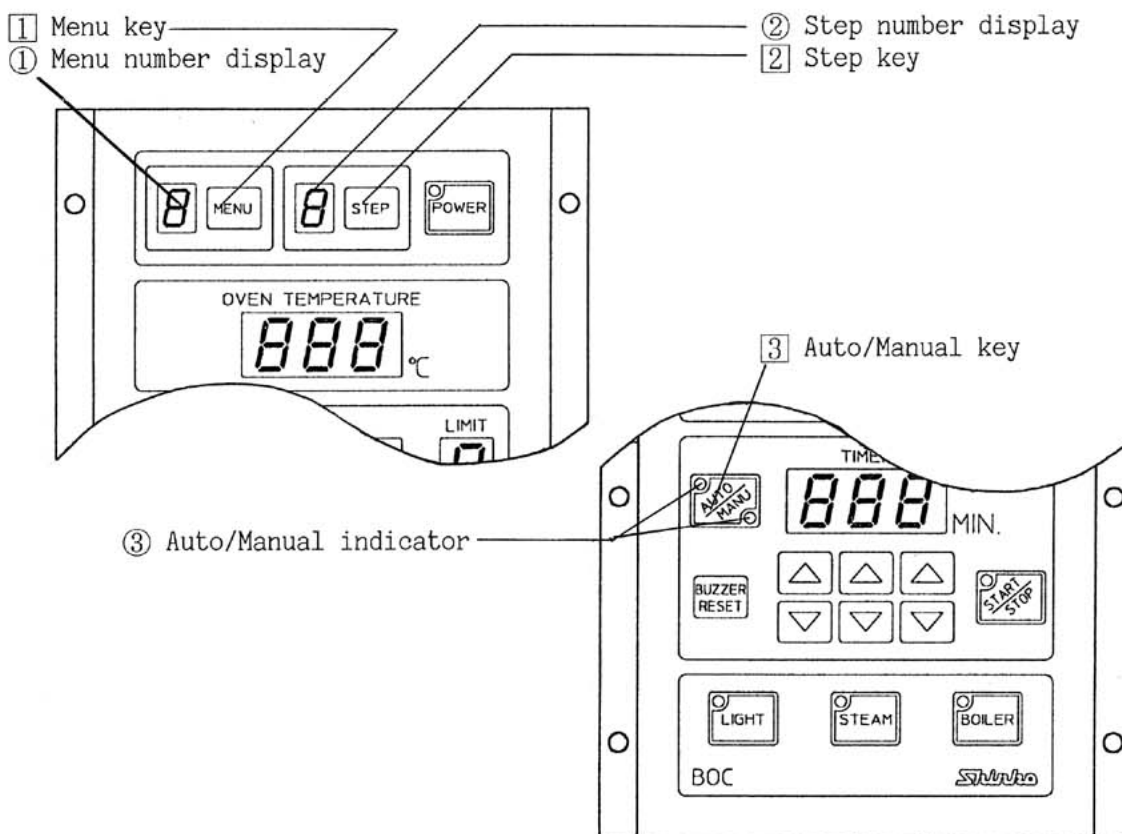
Up to 8 steps of process can be registered to each menu (pattern) and maximum 8 files of menus are settable.

In one (1) step, the values: Step temperature (Top heater, Bottom heater), Step time, Output limit (Top heater, Bottom heater), Steaming time and High limit alarm (in case the option AH is specified) are included.

When running by automatic operation, it performs 8 steps automatically, and when by manual, it performs the step one by one.

When the option M15 is specified, maximum 15 files of menu can be registered.




9.1 Name of sections (only the sections different from the page 4.)



9.2 Displays and Indicators

- ① Menu number display : It displays the menu number with red display.
- ② Step number display : It displays the step number with green display.
- ③ Automatic/Manual indicator : Red indicator lights when automatic control, and green indicator lights when manual control.

9.3 Key functions

- ①  Menu key : It calls the menu number. (No.1 to 8)
When option M15 is applied, it calls No.1 to 15. (Display: 1 to F)
- ②  Step key : It calls the step number.
- ③  Automatic/Manual key: It changes the control type automatic and manual.

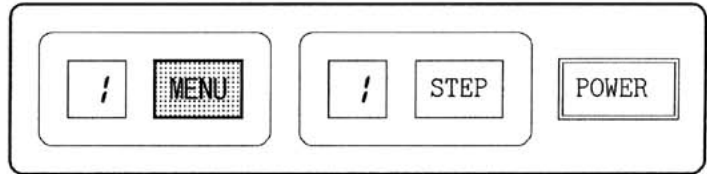
10. Program setting

Select the menu number according to the baking product, and register the setting values.

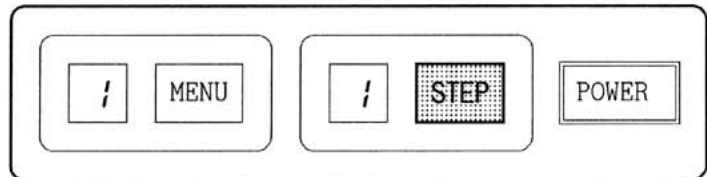
▪ Registering method

- (1) Press the 《 MENU 》 key to select the menu number.

If the option M15 is specified, the number can be selected from 15 files of menu. (See page 34)



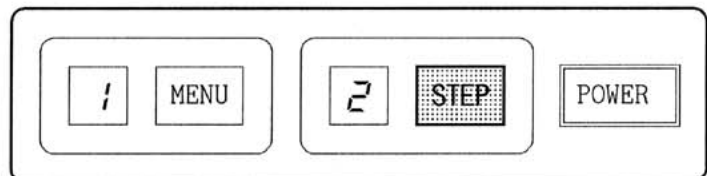
- (2) Press the 《 STEP 》 key to select the step number to be registered.



- (3) Input each setting value necessary for the step.

- ① Top and Bottom heater temperature setting (Page 12)
- ② Top and Bottom heater output limit setting (Page 13)
- ③ Baking time setting (Page 14)
- ④ Steaming time setting (Page 15)
- ⑤ High limit alarm setting (Page 21)

- (4) Press the 《 STEP 》 key to advance the step number.



- (5) Repeat the procedure (3) and (4) to set each setting value as many steps as necessary. If the 《 SET 》 key is pressed when necessary steps are completed, the setting for the menu (pattern) is finished.

- (6) Register the menus as many as necessary by the same manner from (1) to (5).

11. Program running

11.1 Confirmation before running

- Is the oven door closed certainly ?
- Is each setting item set correctly ?

11.2 Operation procedure

(1) Power for the BOC-200 ON

When the power supplied to the BOC-200 is turned ON, the character [*boc*] is indicated on oven temperature display for approx. 5 seconds, and the functions of the BOC-200 are checked simultaneously.

When the 《 POWER 》 key is pressed, the power indicator and each display light, and the external fan works.

(External fan to prevent the BOC-200 from heating must be installed.)

(2) Menu number selection

Press the 《 MENU 》 key to select the menu number to be controlled from [!] to [8] indicated on menu number display.

In case the option M15 is specified, from [!] to [F] will be indicated (Page 34).

(3) Step number selection

Press the 《 STEP 》 key to select the step number to be controlled from [!] to [8] indicated on step number display.

- When starting control from the first step, select [!].
- The control can be started from the step desired by selecting the step number.
- The registered setting values selected are indicated on,
 - Top heater temperature setting display
 - Top heater output limit display
 - Bottom heater temperature setting display
 - Bottom heater output limit display
 - Timer display.

(4) Top heater and Bottom heater running start

Press the 《 RUN 》 keys of the Top heater and Bottom heater, then it starts the control with the setting values registered on the selected step number.

(5) Baking time (Timer) start

Press the 《 START/STOP 》 key to start the baking time, then the timer starts the count (indicating the rest time) with the baking time registered on the selected step number, and baking time indicator blinks.

If this key is not pressed, the timer does not start the count but only controls the temperature.

(6) Automatic/Manual control selection

Press the 《 AUTO/MANU 》 key to select the control type automatic or manual.

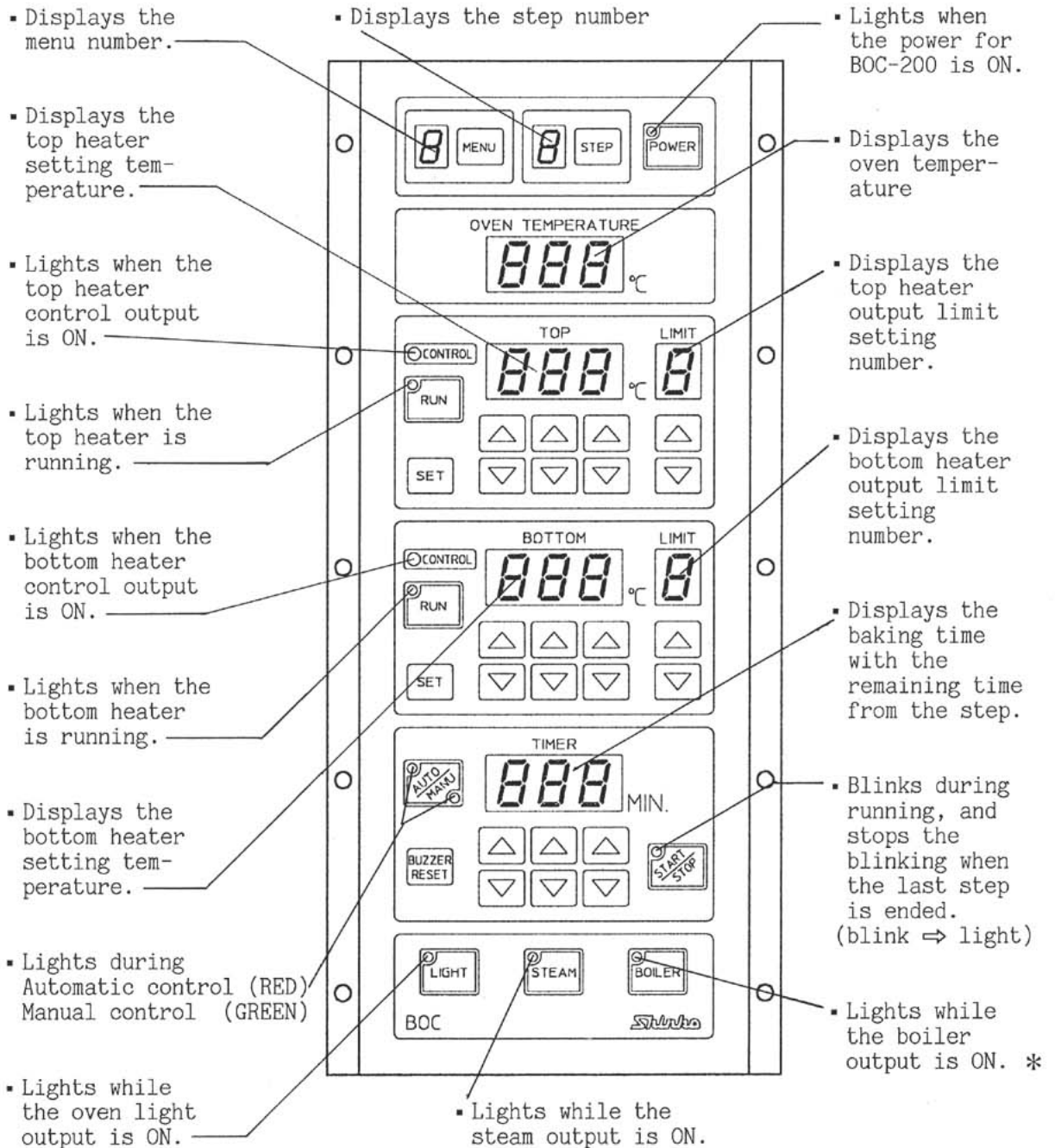
When controlling by automatic, it performs the control from the selected step number to the last step.

When controlling by manual, it performs the control only the selected step number.

(7) During baking

After the running is started, confirm the status whether the displays and indicators are correctly working.

● Status of displays and indicators during baking



* If the option High limit alarm output (code: AH) is specified, the Boiler output lights when the alarm output is ON.

● When the oven door is open while the baking time is being counted, the count is halted. If the door is closed again and the 《 START/STOP 》 key is pressed, it starts the count from the point the count was halted.

(8) Baking completion

Baking completion buzzer output is ON,
when the last step is finished. ⇐ In case of automatic control
when the step is finished. ⇐ In case of manual control

To make the buzzer output OFF, there are 2 ways.

- ① Press the 《 BUZZER RESET 》 key, then the buzzer output turns OFF and the baking time is reset (the setting time starting status). The running will be continued with only temperature control.
 - ② Open the oven door (Door open input terminal open), and the buzzer output is OFF.
 - When the operation is terminated, press the 《 POWER 》 key to make the power for the BOC-200 OFF.
- If the power failure was occurred during running and when it was restored, the BOC-200 will be also restored automatically, and it continues the control from the step time at which the power failure was occurred.

12. Specifications

Standard specifications

Mounting method	Flush			
Setting	Membrane sheet key			
Display	Memory number	7-segment, red	LED 1-digit, 14.3×8mm (H × W)	
	Oven temperature	7-segment, red	LED 3-digit, 14.3×8mm	
	Top heater temperature setting	7-segment, green	LED 3-digit, 14.3×8mm	
	Bottom heater temperature setting	7-segment, green	LED 3-digit, 14.3×8mm	
	Top heater output limit	7-segment, red	LED 1-digit, 14.3×8mm	
	Bottom heater output limit	7-segment, red	LED 1-digit, 14.3×8mm	
	Timer	7-segment, red	LED 3-digit, 14.3×8mm	
	When the Program function (option code: PC) is applied.			
	Memory number display is not available.			
Action indicator	Menu number	7-segment, red	LED 1-digit, 10×5.5mm	
	Step number	7-segment, green	LED 1-digit, 10×5.5mm	
	When the power is ON,		Green LED lights	
	When the top heater or bottom heater control is ON,		Red LED lights	
	When the top heater or bottom heater is running,		Green LED lights	
	When the timer is ON,		Green LED blinks	
	When the steaming output is ON,		Green LED lights	
	When the boiler output is ON,		Green LED lights	
	When the lighting output is ON,		Green LED lights	
When the high limit alarm output is ON,		Green LED lights		
When the Program function (option code: PC) is applied.				
Scale range	During automatic control,		Red LED lights	
	During manual control,		Green LED lights	
	0 to 400°C			
	Thermocouple, K (100Ω or less) 2 channels			
	10sec. to 99min. 50sec. (10sec. unit)			
	Indication (Temperature) Within±0.5% of full scale ±1digit			
	Indication (Time) Within±0.1% of setting time			
	Setting Within±0.5% of full scale ±1digit			
	Control output	Relay contact, 1c×2 (-2R/E)		
Control capacity, 220Vac 3A (resistive load)				
220Vac 1A (inductive load, cos φ=0.4)				
Non-contact voltage (-2S/E) for SSR drive				
Lighting output	Controlling voltage, (12Vdc ^{+3%} V)×2			
	maximum, 40mA (short circuit protected)			
	Relay contact, 1a			
	Control capacity, 220Vac 3A (resistive load)			
Buzzer output	220Vac 1A (inductive load, cos φ=0.4)			
	Relay contact, 1a			
	Control capacity, 220Vac 3A (resistive load)			
	220Vac 1A (inductive load, cos φ=0.4)			

Boiler output	Relay contact, 1a Control capacity, 220Vac 3A (resistive load) 220Vac 1A (inductive load, $\cos \phi = 0.4$)
Steaming output	Relay contact, 1a Control capacity, 220Vac 3A (resistive load) 220Vac 1A (inductive load, $\cos \phi = 0.4$)
Fan output	Relay contact, 1a Control capacity, 220Vac 3A (resistive load) 220Vac 1A (inductive load, $\cos \phi = 0.4$)
Oven door open input	Contact or Non-contact input
Control system	[Changeable between PD and ON/OFF action by internal switch] PD action Proportional band (P) 2.5% Derivative time (D) 32 seconds Proportional cycle 1 to 120 seconds (changeable) Factory adjusted as 30 seconds (for Relay contact output type) or 3 seconds (for Non-contact voltage output type) ON/OFF action Dead band 0 to 10°C (changeable) Factory adjusted as 1°C.
Insulation resistance	100M Ω or greater at 500Vdc
Dielectric strength	Between Input terminal and Ground terminal 500Vac for 1min. Between Input terminal and Power terminal 500Vac for 1min. Between Power terminal and Ground terminal 1.5kVac for 1min. *1 Between Output terminal and Ground terminal 1.5kVac for 1min. *1 Between Output terminal and Power terminal 1.5kVac for 1min. *2 Between Output terminal and Ground terminal 500Vac for 1min. *2 Between Output terminal and Power terminal 500Vac for 1min. *1: 2R/E, Relay contact output type *2: 2S/E, Non-contact voltage output type
Supply voltage	100 to 240Vac, 50/60Hz
Allowable voltage fluctuation	85 to 264Vac
Power consumption	Approx. 15VA
Ambient temperature	0 to 55°C (32 to 131°F)
Ambient humidity	35 to 85%RH (non-condensing)
Weight	Approx. 1.6kg
Attached function	Process variable (PV) correction function Data back-up function (when power failure) Automatic cold junction temperature compensation Burnout function (Upscale),
Accessories	Mounting screws: \oplus 4 \times 10mm 10 pieces Washers : WB 4mm 10 pieces Spring washers : SA 4mm 10 pieces Nuts : NA 4mm 10 pieces Instruction manual 1 copy

Optional specifications

Program function (code: PC)

8 steps of process are settable to each menu up to 8 menus (when the option M15 is specified, up to 15 menus).

During automatic control, it performs the control for 8 steps automatically, and during manual control, it performs the control one by one step.

Step temperature (Top heater and Bottom heater), Step time, Output limit (Top heater and Bottom heater), Steaming time and High limit alarm (when option AH is applied) can be set for a step.

Programming performance

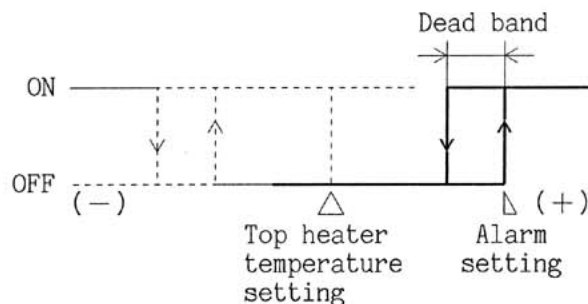
Number of program pattern (menu):	8 (when the option M15: 15)
Number of step	: 8
Program time	: 10sec. to 99min. 50sec. (10sec. unit)/step
Time setting accuracy	: Within $\pm 0.1\%$ of setting time
Setting resolution	: Temperature, 1°C
	Time, 10sec.

Remote input (code: RM)

In the status the external contact connected to the remote input terminal is OFF, usual key operation can be performed, and in the status it is ON, it starts the temperature control automatically.

High limit alarm output (code: AH)

The setting method is deviation setting to the Top heater temperature setting value, and when the oven temperature exceeds the range, the output turns ON. Setting range: -100 to 100°C (off when set to 0)



15 memories (code: M15)

It can register as many menus as 15 files of memories, Setting temperature (Top heater and Bottom heater), Baking time, Output limit (Top heater and Bottom heater), Steaming time and High limit alarm (when option AH is applied) as 1 file.

Display	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

13. When troubled

Problem	Solution
The power is on, however, the BOC-200 does not operate.	<ul style="list-style-type: none"> ▪ Press the 《 POWER 》 key, after confirmed the power line.
Setting value memory No. (When the option PC is specified, the Menu No.) cannot be changed.	<ul style="list-style-type: none"> ▪ If the mode is in setting, press the 《 SET 》 key to end the setting. ▪ If the running indicator is lighting, or the baking time indicator is lighting or blinking, press the 《 RUN 》 key or the 《 BUZZER RESET 》 key to stop the running or the timer.
Step No. cannot be changed. (When option PC is specified.)	<ul style="list-style-type: none"> ▪ If the mode is in setting, press the 《 SET 》 key to end the setting. ▪ If the baking time indicator is lighting or blinking, press the 《 BUZZER RESET 》 key to stop the timer.
The 《 START/STOP 》 key does not function. (The count does not start.)	<ul style="list-style-type: none"> ▪ If the baking time (step time) is not set yet, set the time. ▪ If the oven door is open, close the door.
Temperature does not rise, or oven temperature is unstable.	<p>Check and remedy the following items.</p> <ul style="list-style-type: none"> ▪ Whether the thermocouple or compensating lead wire is not burnout. ▪ Whether the connection at the input terminal is sure. ▪ Whether the polarity of the thermocouple or compensating lead wire is not reverse. ▪ Whether the heater is not burnout, and the connection is sure. ▪ Whether the electromagnetic switch is not troubled. ▪ Whether the BOC-200 is not influenced by inductive fault or noise.
Oven temperature display indicates [U - -] or [L - -].	<ul style="list-style-type: none"> ▪ If the thermocouple or compensating lead wire is burnout, renew it. ▪ If the connection at the input terminal is not sure, make it sure.
Oven temperature display indicates [E - -].	<ul style="list-style-type: none"> ▪ The lithium battery for memory back-up must be exhausted. Make inquiries about the battery to us.

If happened unclear phenomenon other than above mentioned, make inquiries about the matters at our agency or your shop where purchased.

. . . Inquiry . . .

For any inquiry of the BOC-200, after checking the following as to the equipment, please contact your shop where purchased, or our agent.

[Example]

- Model BOC-220-2R/E
- Equipment number No. XXXXXX

In addition to the above, let us know the details of malfunction, if any, and the operating conditions specifically on job site.

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