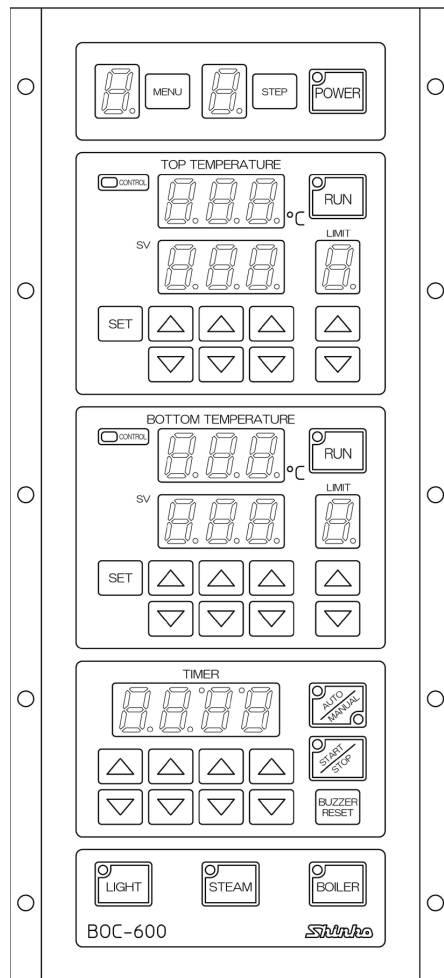


2ch OVEN CONTROLLER

BOC-600

INSTRUCTION MANUAL



Shinbo

Preface

Thank you for purchasing the 2ch oven controller BOC-600. This manual contains instructions for mounting, operation, functions and notes when operating the BOC-600. To ensure safe and correct use, thoroughly read and understand this manual before using this sensor. To prevent accidents arising from the misuse of this sensor, please ensure the operator receives this manual.

Characters used in this manual

Indication	1	0	1	2	3	4	5	6	7	8	9	℃	℉
Number, °C/°F	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Indication	A	B	C	D	E	F	G	H	I	J	K	L	M
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Notes

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

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

The safety precautions are classified into 2 categories: “Warning” and “Caution”.

Depending on the circumstances, procedures indicated by ⚠ Caution may result in serious consequences, so be sure to follow the directions for usage.



Warning

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



Caution

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



Warning

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

Safety Precautions

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protective equipment used for excessive rises in temperature, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Proper periodic maintenance is also 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.

1. Installation Precautions



Caution

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

Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 85 %RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or the vapors of these substances can come into direct contact with the unit.
- Take note that the ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 50°C (122°F) if mounted through the face of a control panel. Otherwise the life of electronic components (especially electrolytic capacitors) may be shortened.

2. Wiring Precautions



Caution

- Do not leave wire remnants in the instrument, as they may cause a fire and/or malfunction.
- Use a solderless terminal with an insulation sleeve in which the M4 screw fits when wiring the instrument.
- Tighten the terminal screw using the specified torque (1.4 N•m). If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- This instrument does not have a built-in power switch, circuit breaker and fuse. Therefore, it is necessary to install a power switch, circuit breaker and fuse externally near the controller.
(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- 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.
- Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
- When using a relay contact output type, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.
- To prevent the unit from the harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the coils of the external relay.
- For the Fan output, be sure to connect a fan to prevent excessive rise of oven internal temperature.
- Be sure to wire the Door Open Input to prevent malfunction. The Door Open/Closed switch is wired, Timer counting stops while door is opened.

3. Operation and Maintenance Precautions



Caution

- It is recommended that AT (auto-tuning) be performed during the trial run.
- Do not touch live terminals. This may cause electrical shock or problems in operation.
- Turn the power supply to the instrument OFF when retightening the terminal and cleaning. Working on or touching the terminal with the power switched ON may result in severe injury or death due to electrical shock.
- Use a soft, dry cloth when cleaning the instrument.
(Alcohol based substances may tarnish or deface the unit.)
- As the display section is vulnerable, be careful not to put pressure on, scratch or strike it with a hard object.

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This highly-functional oven controller has been developed for complicated controlling of ovens for baking and confectionery, performing 2-channel temperature control for Top Heater and Bottom Heater, including a Timer function for baking time management.

The Memory Function can hold 15 memories, the Program Function can hold 15 menus (8 steps per menu), and the Steam, Boiler Control functions are included.

If the M30 option is ordered, 30 memories can be set in the Memory Function, or 30 menus (8 steps per menu) can be set in the Program Function.

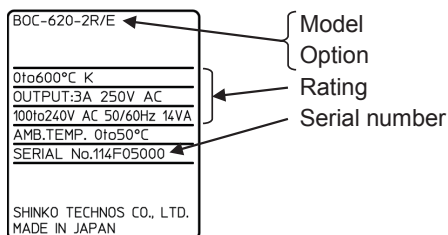
1. Model

1.1 Model

BOC - 6	<input type="checkbox"/>	0	-2	<input type="checkbox"/>	/E	, <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Control action	1						ON/OFF control
	2						PD control
I/O points		2					2 points
Output				R			Relay contact output
				S			Non-contact voltage output
				T			Non-contact output
Input					E		Thermocouple K, 0 to 600°C
Option						M30	30 memories
						RM	Remote input
						AH	High limit alarm output

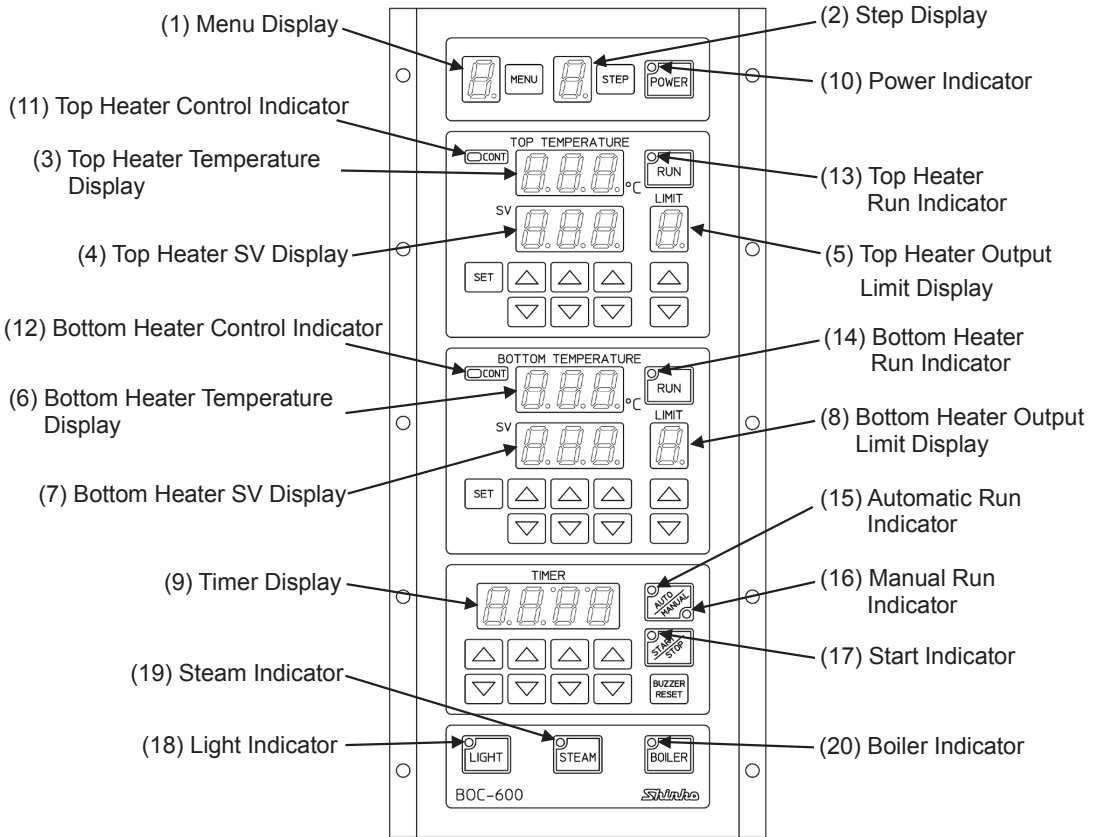
1.2 How to Read the Model Label

The model label is attached to the reverse side cover.



2. Names and Functions

2.1 Displays and Action Indicators



(Fig. 2.1-1)

Displays

- (1) Menu Display:** If the Memory Function is selected in [Control Type], the Memory Number is indicated in red.
 If the Program Function is selected in [Control Type], the Menu Number is indicated in red.

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

If '30 memories' (M30 option) is ordered, 30 memories or 30 menus are available.

Character	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory No./ Menu No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Character	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory No./ Menu No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

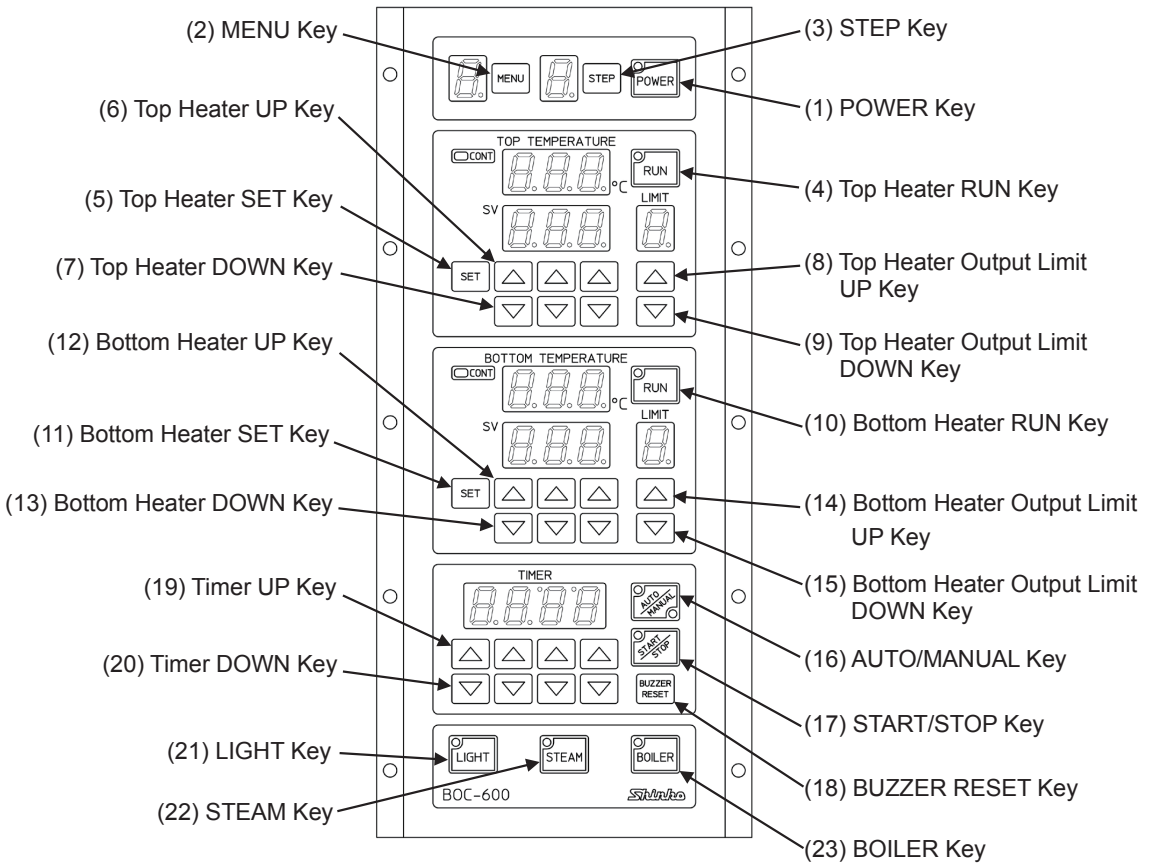
- (2) Step Display:** If the Memory Function is selected in [Control Type], \bar{n} is indicated in green.
 If the Program Function is selected in [Control Type], the Step Number (1 to 8) is indicated in green.

- (3) Top Heater Temperature Display:** Indicates Top Heater temperature in red.
Indicates each setting characters in red for Proportional Cycle, Hysteresis, High Limit Alarm (AH option), and Top Heater Basic Setting mode.
- (4) Top Heater SV Display:** Indicates Top Heater set value in green.
Indicates each set value in green for Proportional Cycle, Hysteresis, Top Heater Sensor Correction, High Limit Alarm (AH option), and Top Heater Basic Setting mode.
Turns off in Bottom Heater Basic Setting mode and Engineering mode.
- (5) Top Heater Output Limit Display:** Indicates Top Heater Control Output Limit value in red.
When setting the Top Heater Sensor Correction, the setting characters are indicated in red.
- (6) Bottom Heater Temperature Display:** Indicates Bottom Heater temperature in red.
Indicates each setting characters in red for Bottom Heater Basic Setting mode and Engineering mode.
Turns off in Top Heater Basic Setting mode.
- (7) Bottom Heater SV Display:** Indicates Bottom Heater set value in green.
Indicates each set value in green for Bottom Heater Sensor Correction, Bottom Heater Basic Setting mode and Engineering mode.
Turns off when setting Proportional Cycle, Hysteresis, Top Heater Sensor Correction, High Limit Alarm (AH option), and Top Heater Basic Setting mode.
- (8) Bottom Heater Output Limit Display:** Indicates Bottom Heater Output Limit value in red.
Indicates the setting characters in red when setting Bottom Heater Sensor Correction.
- (9) Timer Display:** Indicates Timer value in red.
Turns off when setting Proportional Cycle, Hysteresis, Top Heater Sensor Correction, Top Heater Basic Setting mode, Bottom Heater Sensor Correction, Bottom Heater Basic Setting mode, and Engineering mode.

Action Indicators

- (10) Power Indicator:** Lights in green when power to the instrument is turned ON.
- (11) Top Heater Control Indicator:** Lights in red when Top Heater control output is ON.
- (12) Bottom Heater Control Indicator:** Lights in red when Bottom Heater control output is ON.
- (13) Top Heater Run Indicator:** Lights in green when Top Heater is operating.
- (14) Bottom Heater Run Indicator:** Lights in green when Bottom Heater is operating.
- (15) Automatic Run Indicator:** Lights in red in Automatic operation.
- (16) Manual Run Indicator:** Lights in green in Manual operation.
- (17) Start Indicator:** Flashes in green while Timer is working.
Lights in green when Timer is temporarily suspended or when time is up.
- (18) Light Indicator:** Lights in green when Lighting output is ON.
- (19) Steam Indicator:** Lights in green when Steam output is ON.
- (20) Boiler Indicator:** Lights in green when Boiler output is ON.
If the High Limit Alarm (AH option) is ordered, lights in green when the High Limit Alarm output is ON.

2.2 Keys



(Fig. 2.2-1)

Keys

- (1) **POWER Key**
Turns the power to the instrument ON or OFF.
- (2) **MENU Key**
Retrieves the menu by number.
However, cannot retrieve during each setting mode or while in operation.
- (3) **STEP Key**
Retrieves the step number.
However, cannot retrieve during each setting mode or while Timer is counting.
- (4) **Top Heater RUN Key**
Starts or stops Top Heater operation.
- (5) **Top Heater SET Key**
Retrieves Top Heater Setting mode, or registers the set value.
- (6) **Top Heater UP Key**
Increases the Top Heater temperature.
Increases the set value digit in each setting mode.
- (7) **Top Heater DOWN Key**
Decreases the Top Heater temperature.
Decreases the set value digit in each setting mode.

- (8) **Top Heater Output Limit UP Key**
Increases the Top Heater Output Limit value.
- (9) **Top Heater Output Limit DOWN Key**
Decreases the Top Heater Output Limit value.
- (10) **Bottom Heater RUN Key**
Starts or stops Bottom Heater operation.
- (11) **Bottom Heater SET Key**
Retrieves Bottom Heater Setting mode, or registers the set value.
- (12) **Bottom Heater UP Key**
Increases the Bottom Heater temperature.
Increases each digit of the set value in each setting mode.
- (13) **Bottom Heater DOWN Key**
Decreases the Bottom Heater temperature.
Decreases each digit of the set value in each setting mode.
- (14) **Bottom Heater Output Limit UP Key**
Increases the Bottom Heater Output Limit value.
- (15) **Bottom Heater Output Limit DOWN Key**
Decreases the Bottom Heater Output Limit value.
- (16) **AUTO/MANUAL Key**
Switches Automatic or Manual operation.
- (17) **START/STOP Key**
Starts the Timer.
Suspends temporarily while Timer is counting.
Resumes the Timer from the stopped position by pressing again.
- (18) **BUZZER RESET Key**
Turns the Buzzer output OFF, and resets the Timer.
- (19) **Timer UP Key**
Increases the Timer set value
- (20) **Timer DOWN Key**
Decreases the Timer set value.
- (21) **LIGHT Key**
Turns the Lighting output ON or OFF.
- (22) **STEAM Key**
If Steam output time is set, the Steam output is turned ON for the time Steam output is set.
If this key is pressed again while the steam output is ON, the Steam output is turned OFF.
- (23) **BOILER Key**
Turns the Boiler output ON or OFF.
If High Limit Alarm output (AH option) is ordered, this key is disabled.

3. Mounting

3.1 Site Selection

⚠ Caution

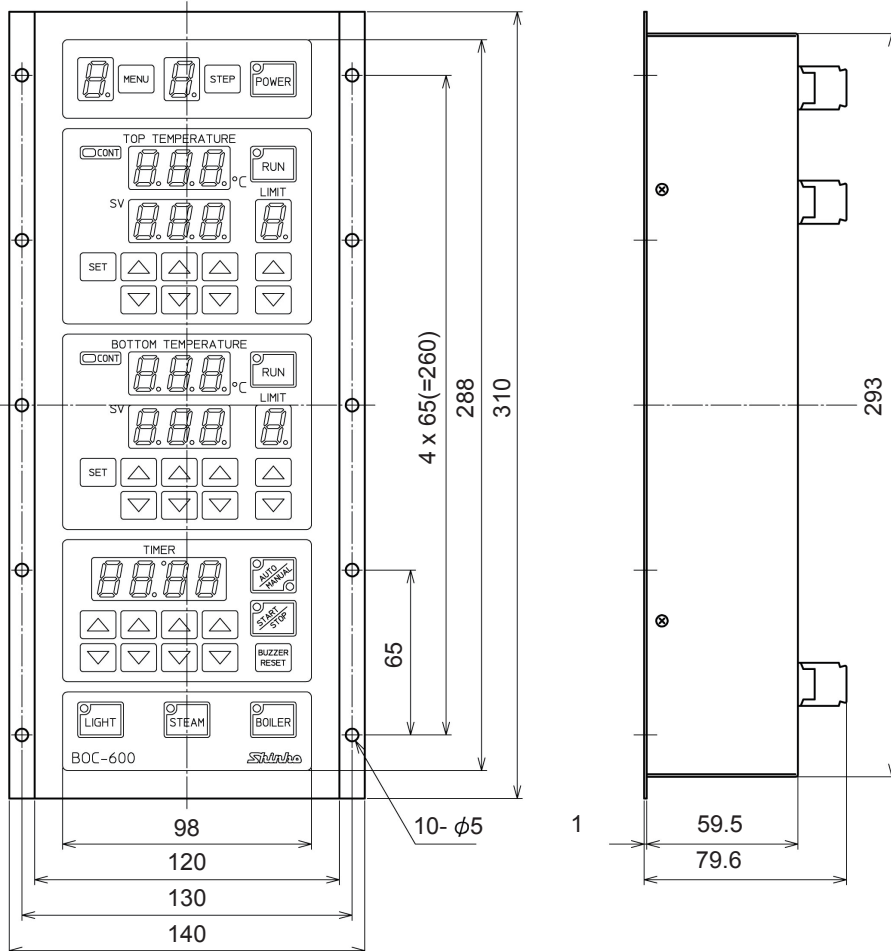
Use within the following temperature and humidity ranges.
 Temperature: 0 to 50°C (32 to 122°F) (No icing), Humidity: 35 to 85%RH (Non-condensing)
 If the controller is installed within a control panel, the ambient temperature of the unit – not the ambient temperature of the control panel – must be kept under 50°C. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

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

Ensure the mounting location corresponds to the following conditions:

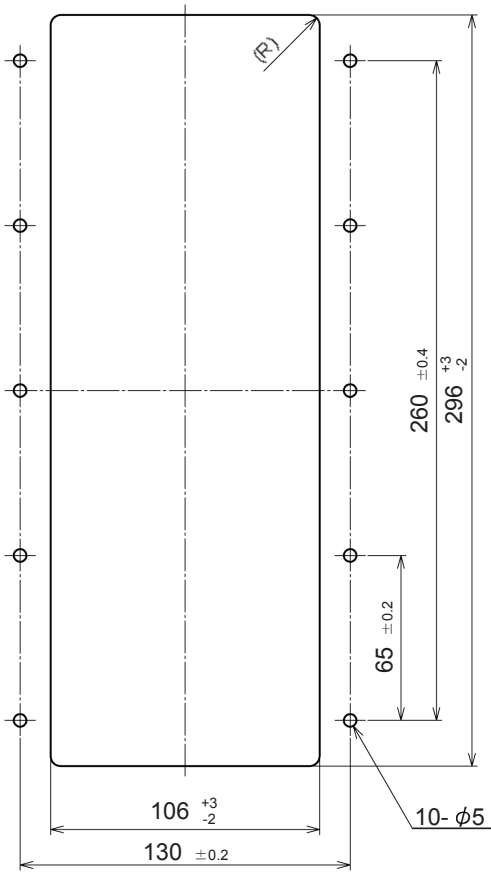
- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly
- An ambient non-condensing humidity of 35 to 85 %RH
- No large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

3.2 External Dimensions (Scale: mm)



(Fig. 3.2-1)

3.3 Panel Cutout (Scale: mm)



(Fig. 3.3-1)

4. Wiring

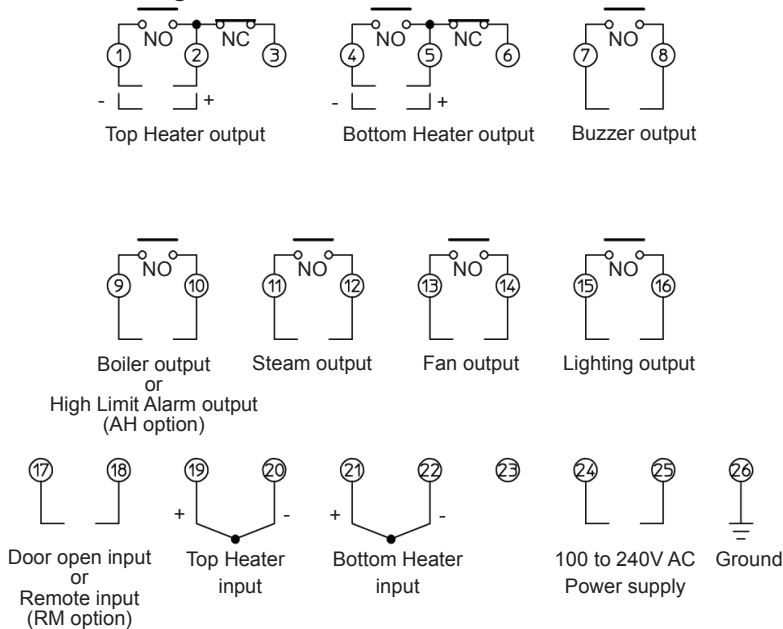
⚠ Warning

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

⚠ Caution

- Do not leave wire remnants in the instrument, as they may cause a fire or malfunction.
- Use the solderless terminal with an insulation sleeve in which the M4 screw fits when wiring the BOC-600.
- Tighten the terminal screw using the specified torque (1.4 N•m). If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This instrument does not have a built-in power switch, circuit breaker and fuse. Therefore, it is necessary to install a power switch, circuit breaker and fuse externally near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- 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.
- Use a thermocouple and compensating lead wire according to the sensor input specifications of this controller.
- When using a relay contact output type, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.
- To prevent the unit being damaged by the harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the external relay coils.
- For the Fan output, be sure to connect a suitable fan to prevent excessive temperature rise inside the controller.
- For Door Open input, be sure to connect the input to prevent malfunction.
If Door Open/Closed switch is wired, Timer counting stops while door is opened.

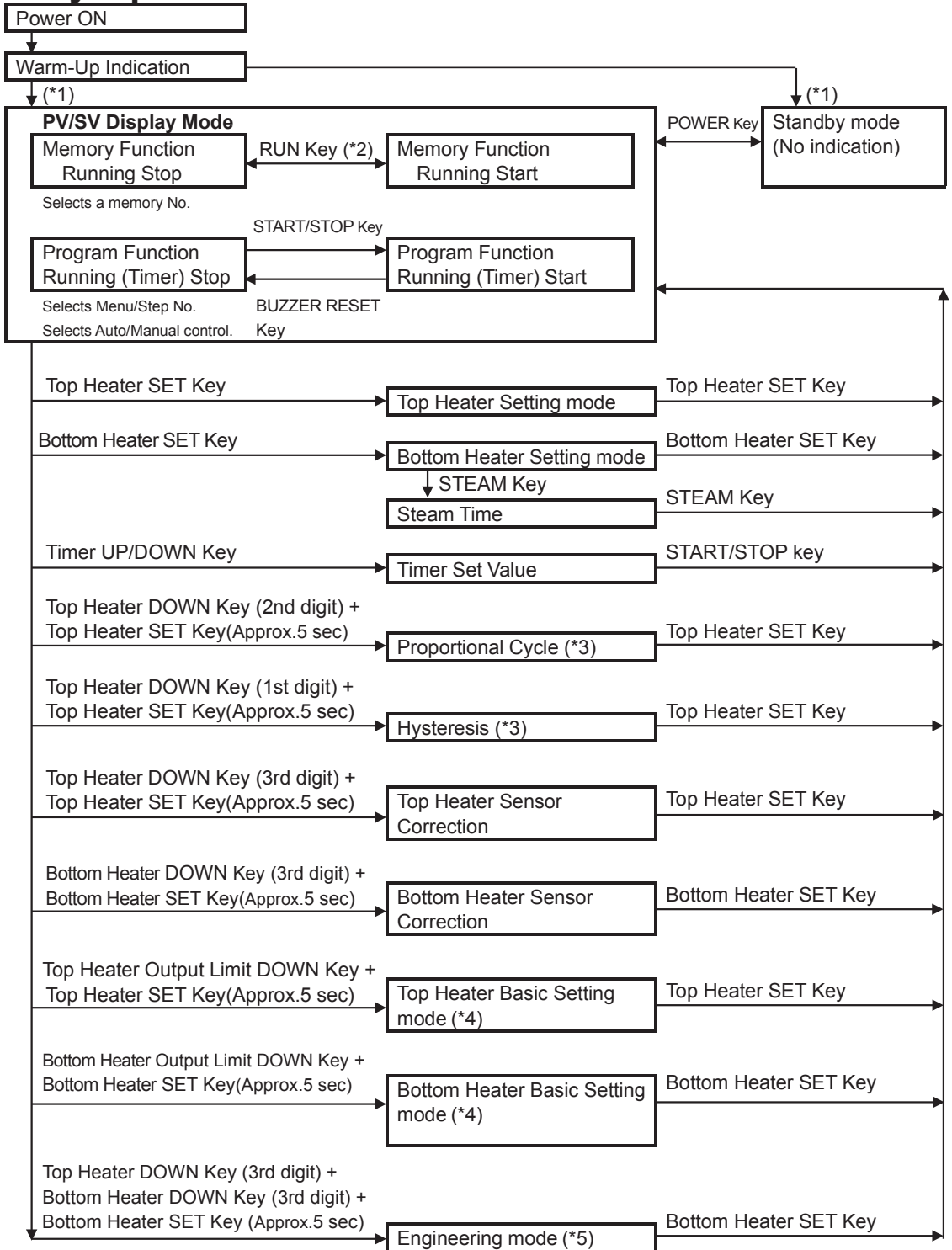
4.1 Terminal Arrangement



- If High Limit Alarm output (AH option) is ordered, the Boiler output is not available.
- If Remote Input (RM option) is ordered, the Door Open Input is disabled.

(Fig. 4.1-1)

5. Key Operation Flowchart



An arrow below each key means that if the key is pressed, the unit proceeds to the next item, illustrated by an arrow.
 (*1) Starts from the previous power-off status.
 (*2) Individually Top and Bottom Heaters can start or stop operation.
 (*3) Common to Top and Bottom Heaters
 (*4) Individually Top and Bottom Heaters have the following setting items: Proportional Band, Derivative Time, Manual Reset, Sensor Correction.
 (*5) Includes Set Value Lock, Control Type, Top Heater Temperature High Limit/Low Limit, Bottom Heater Temperature High Limit/Low Limit.

6. Setup

Setup should be done before using this controller according to the user's conditions:

Setting the Control Type, Top Heater Temperature High Limit, Top Heater Temperature Low Limit, Bottom Heater Temperature High Limit and Bottom Heater Temperature Low Limit

Setup is conducted in Engineering mode, Top and Bottom Heater Basic Setting modes.

The following shows factory default values for each setting item.

Engineering mode

Setting Item	Factory Default
Set value lock	Unlock
Control type	Memory function
Top Heater temperature high limit	400°C
Top Heater temperature low limit	0°C
Bottom Heater temperature high limit	400°C
Bottom Heater temperature low limit	0°C

Top and Bottom Heater Basic Setting modes

Setting Item	Factory Default
Top and Bottom Heater proportional band	BOC-620-2□/E: 10.0°C BOC-610-2□/E: 0.0°C
Top and Bottom Heater derivative time	32 seconds
Top and Bottom Heater manual reset	5.0°C
Top and Bottom Heater sensor correction	0.0°C

If the user's specification is the same as the factory default of the BOC-600, it is not necessary to set up the controller. Proceed to Section "7. Setting Memory Function".

6.1 Turn the Power ON

After the power is turned on, [b o c] is indicated on the Top Heater Temperature Display for 3 seconds.

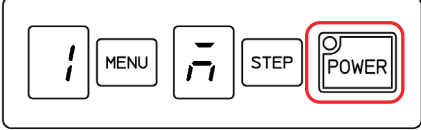
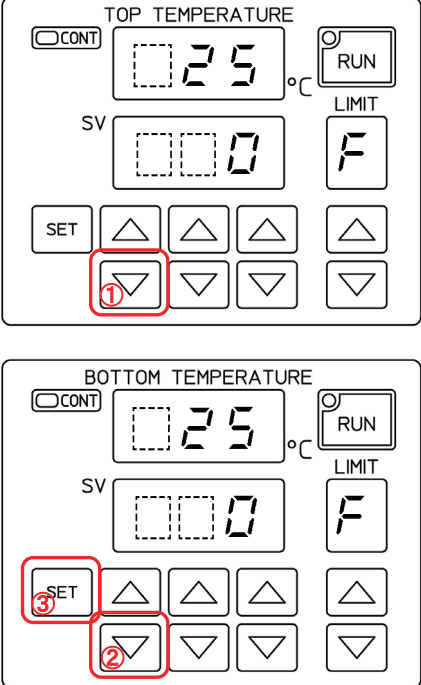
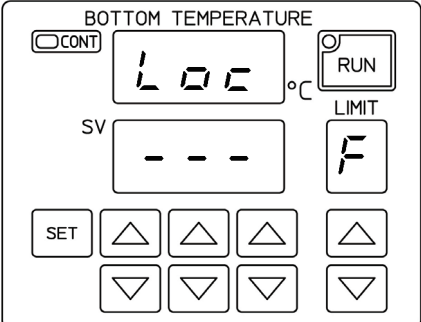
After that, the unit enters Standby mode or PV/SV Display Mode.

[Starts from previous power-OFF status (from last shutdown).]

Status	Description
Standby mode	Unit is OFF, no indication.
PV/SV Display Mode	Shows status when the power to the unit is turned ON with the POWER Key. The Power indicator and all Displays turn ON.

6.2 Engineering Mode

To enter Engineering mode, follow the procedure below.

Setting Procedure	Display and Key
<p>(1) If the unit is in Standby mode, press the POWER Key. The unit proceeds to PV/SV Display Mode.</p>	
<p>(2) Press and hold the Top Heater DOWN Key (3rd digit) ①, the Bottom Heater DOWN Key (3rd digit) ②, and the Bottom Heater SET Key ③ (in that order) together for approx. 5 seconds.</p>	
<p>(3) The unit proceeds to Engineering mode, then the Set Value Lock characters are indicated on the Bottom Heater Temperature Display, and the selected item is indicated on the Bottom Heater SV Display.</p>	

Use the Bottom Heater UP and DOWN Keys for setting values.

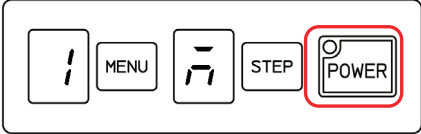
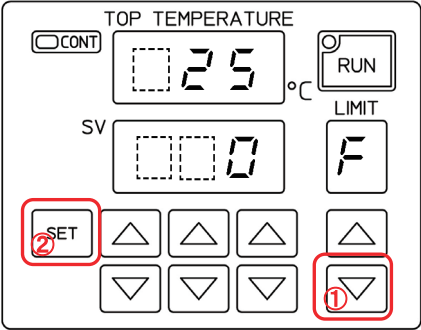
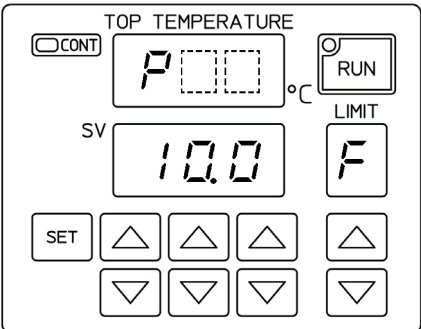
Pressing the Bottom Heater SET Key registers the set value, and proceeds to the next setting item.

Setting items in Engineering mode are described below.

Character	Name, Function, Setting Range	Factory Default
<i>L o c</i> - - -	Set Value Lock • Locks the set values to prevent setting errors. • Selection item - - - (Unlock): All set values can be changed. <i>L o c</i> (Lock): None of the set values can be changed.	Unlock
<i>P r o</i> <i>ñ E ñ</i>	Control Type • Selects either Memory Function or Program Function. Memory Function 15 memories (30 memories are available if the M30 option is ordered) can be set. Program Function 15 menus (30 menus are available if the M30 option is ordered) and 8 steps per menu can be set. • Selection item <i>ñ E ñ</i> : Memory Function <i>P r o</i> : Program Function	Memory Function
<i>4 H 1</i> <i>4 0 0</i>	Top Heater Temperature High Limit • Sets the Top Heater temperature high limit value. • Setting range Top Heater temperature low limit to 600°C	400°C
<i>4 L 1</i> <i>□ □ 0</i>	Top Heater Temperature Low Limit • Sets the Top Heater temperature low limit value. • Setting range 0°C to Top Heater temperature high limit	0°C
<i>4 H 2</i> <i>4 0 0</i>	Bottom Heater Temperature High Limit • Sets the Bottom Heater temperature high limit value. • Setting range Bottom Heater temperature low limit to 600°C	400°C
<i>4 L 2</i> <i>□ □ 0</i>	Bottom Heater Temperature Low Limit • Sets the Bottom Heater temperature low limit value. • Setting range 0°C to Bottom Heater temperature high limit	0°C

6.3 Top Heater Basic Setting Mode

To enter Top Heater Basic Setting mode, follow the procedure below.

Setting Procedure	Display and Key
<p>(1) Press the POWER Key in Standby mode. The unit will proceed to PV/SV Display Mode.</p>	
<p>(2) Press and hold the Top Heater Output Limit DOWN Key ① and the Top Heater SET Key ② (in that order) together for approx. 5 seconds.</p>	
<p>(3) The unit enters Top Heater Basic Setting mode. The Top Heater Proportional Band character is indicated on the Top Heater Temperature Display, and the set value is indicated on its SV Display.</p>	

Use the Top Heater UP and DOWN Keys for setting values.

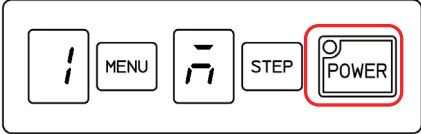
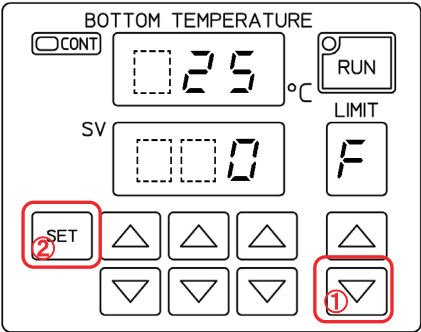
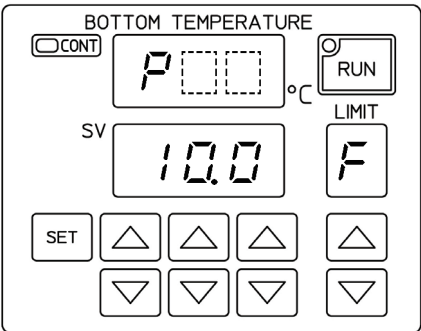
Pressing the Top Heater SET Key registers the set value, and proceeds to the next setting item.

Setting items in Top Heater Basic Setting mode are described below.

Character	Name, Function, Setting Range	Factory Default
P□□ 100	Top Heater Proportional Band	BOC-620-2□□/E: 10.0°C BOC-610-2□□/E: 0.0°C
	<ul style="list-style-type: none"> • Sets the Top Heater Proportional Band. ON/OFF Control when set to 0.0°C. • Setting range 0.0 to 99.9°C 	
d□□ □32	Top Heater Derivative Time	32 seconds
	<ul style="list-style-type: none"> • Sets the Top Heater Derivative Time. Not available for ON/OFF Control. • Setting range 0 to 300 seconds 	
rE4 □50	Top Heater Manual Reset	5.0°C
	<ul style="list-style-type: none"> • Sets the Top Heater Manual Reset value. Not available for ON/OFF Control. • Setting range -19.9 to 99.9°C 	
40□ □00	Top Heater Sensor Correction	0.0°C
	<ul style="list-style-type: none"> • Sets the Top Heater Sensor Correction value. Only the Top Heater temperature indication value is adjusted, and makes the Top Heater set value equal to the Top Heater indication value. Control is carried out using the input value before Sensor Correction. This setting item is common to Section “7.9 Top and Bottom Heater Sensor Correction Setting (P.31)”. • Setting range -19.9 to 30.0°C 	

6.4 Bottom Heater Basic Setting Mode

To enter Bottom Heater Basic Setting mode, follow the procedure below.

Setting Procedure	Display and Key
<p>(1) Press the POWER Key in Standby mode. The unit will proceed to PV/SV Display Mode.</p>	 <p>The diagram shows a control panel with four buttons: a vertical bar key, a MENU key, a key with a horizontal bar and a vertical bar, and a STEP key. The POWER key, which has a power symbol, is highlighted with a red rectangular box.</p>
<p>(2) Press and hold the Bottom Heater Output Limit DOWN Key ① and the Bottom Heater SET Key ② (in that order) together for approx. 5 seconds.</p>	 <p>The diagram shows the control panel with two digital displays. The top display is labeled 'BOTTOM TEMPERATURE' and shows '25 °C'. The bottom display is labeled 'SV' and shows '000'. To the right of the displays are 'CONT', 'RUN', and 'LIMIT' indicators. Below the displays is a keypad with a 'SET' key (circled with a red box and labeled ②), four UP arrow keys, four DOWN arrow keys, and a 'LIMIT' key. The DOWN arrow key in the bottom right corner of the keypad is circled with a red box and labeled ①.</p>
<p>(3) The unit enters Bottom Heater Basic Setting mode. The Bottom Heater Proportional Band character is indicated on the Bottom Heater Temperature Display, and the set value is indicated on its SV Display.</p>	 <p>The diagram shows the control panel in the setting mode. The 'BOTTOM TEMPERATURE' display now shows 'P' followed by two blank boxes. The 'SV' display shows '10.0'. The 'CONT', 'RUN', and 'LIMIT' indicators are present. The keypad is shown without the red boxes from the previous step.</p>

Use the Bottom Heater UP and DOWN Keys for setting values.

Pressing the Bottom Heater SET Key registers the set value, and proceeds to the next setting item.

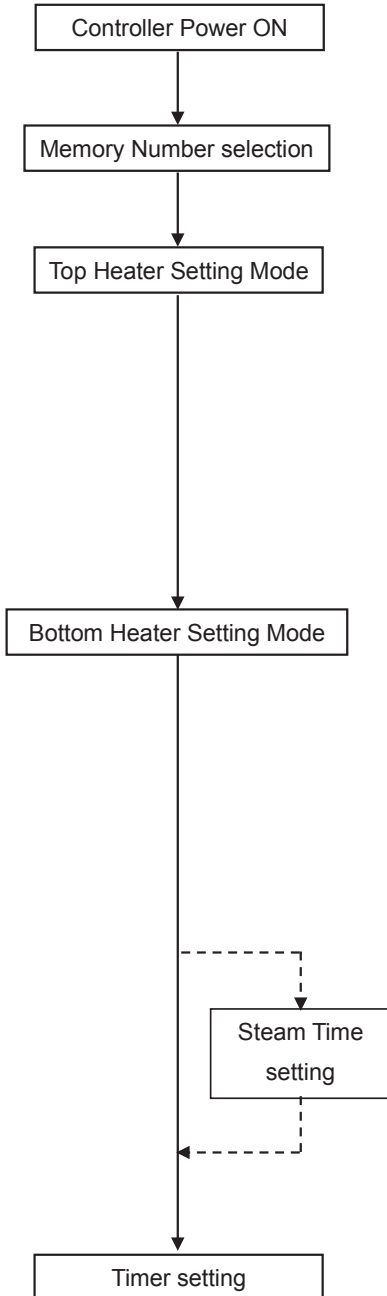
Setting items in Bottom Heater Basic Setting mode are described below.

Character	Name, Function, Setting Range	Factory Default
P□□ 100	Bottom Heater Proportional Band	BOC-620-2□□/E: 10.0°C BOC-610-2□□/E: 0.0°C
	<ul style="list-style-type: none"> • Sets the Bottom Heater Proportional Band ON/OFF Control when set to 0.0°C. • Setting range 0.0 to 99.9°C 	
d□□ □32	Bottom Heater Derivative Time	32 seconds
	<ul style="list-style-type: none"> • Sets the Bottom Heater Derivative Time. Not available for ON/OFF Control. • Setting range 0 to 300 seconds 	
rE□ □50	Bottom Heater Manual Reset	5.0°C
	<ul style="list-style-type: none"> • Sets the Bottom Heater Manual Reset value. Not available for ON/OFF Control. • Setting range -19.9 to 99.9°C 	
40□ □00	Bottom Heater Sensor Correction	0.0°C
	<ul style="list-style-type: none"> • Sets the Bottom Heater Sensor Correction value. Only the Bottom Heater temperature indication value is adjusted, and makes the Bottom Heater set value equal to the Bottom Heater indication value. Control is carried out using the input value before Sensor Correction. This setting item is common to Section “7.9 Top and Bottom Heater Sensor Correction Setting (P.31)”. • Setting range -19.9 to 30.0°C 	

7. Setting Memory Function

To select the Memory Function in [Control Type] in Engineering mode (P.18), follow the steps below.

7.1 Memory Function Key Operation



Press the POWER Key in Standby mode. The unit will proceed to PV/SV Display Mode.

Press the MENU Key to select Memory Number (1 to 15) to be registered (Indication: 1 to F).

Press the Top Heater SET Key. The unit moves to Top Heater Setting mode.

In Top Heater Setting mode, the Top Heater SV Display and Top Heater Output Limit Display flash.

To set the Top Heater temperature, use the Top Heater UP or DOWN Key.

To set the Top Heater Output Limit value, use the Top Heater Output Limit UP or DOWN Key.

Press the Bottom Heater SET Key to enter Bottom Heater Setting mode.

In Bottom Heater Setting mode, the Bottom Heater SV Display and Bottom Heater Output Limit Display flash.

To set the Bottom Heater temperature, use the Bottom Heater UP or DOWN Key.

To set the Bottom Heater Output Limit value, use the Bottom Heater Output Limit UP or DOWN Key.

If the STEAM Key is pressed in Bottom Heater Setting mode, the Steam Time can be set.

In Steam Time Setting mode, the Bottom Heater Temperature Display indicates [L, F, h], and its SV Display flashes steam time.

To set the Steam Time, use the Bottom Heater UP or DOWN Key.

Press the Timer UP or DOWN Key. The Timer Display flashes, and the unit enters Timer Setting mode.

Timer can be set with the Timer UP or DOWN Key.

7.2 Memory Number Selection

In the Memory Function, one file can include Top and Bottom Heater temperature values, Timer Set value, Top and Bottom Heater Output Limits, High Limit Alarm value (AH option), and Steam Time set value. Up to 15 files can be registered.

If '30 memories' (M30 option) is ordered, Up to 30 files can be registered.

By using this Memory Function, control can be started by selecting Memory Number and pressing only the RUN Key (without input operation) under any setting conditions.

Character Indication and Memory Number

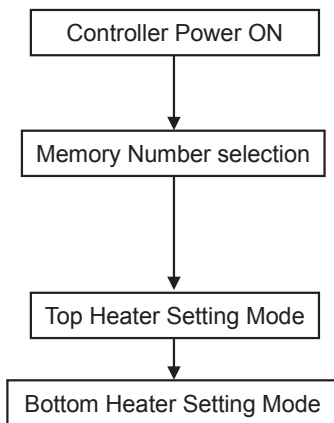
Standard Specification

Character	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

When '30 memories' (M30 option) is ordered

Character	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Character	1	2	3	4	5	6	7	8	9	A	b	c	d	E	F
Memory Number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

① Set value registration



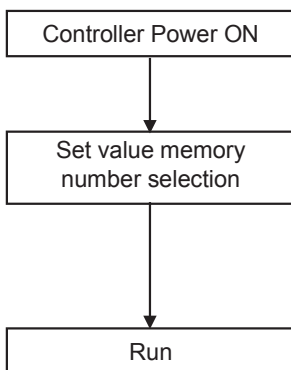
In Standby mode, press the POWER Key.
The unit moves to PV/SV Display Mode.

By pressing the MENU Key, Memory Numbers 1 to 15 (indicated as 1 to F) will appear in numeric order.
If '30 memories' (M30 option) is ordered, Memory Numbers 1 to 30 (indicated as 1 to F.) can be retrieved.

Select a Memory Number to be registered, and set each value.

After settings are complete, each set value is automatically registered in the Memory Number.

② Operation with Memory Function



Press the POWER Key in Standby mode.
The unit enters PV/SV Display Mode.

By pressing the MENU Key, Memory Numbers 1 to 15 (indicated as 1 to F) will appear in numeric order.
Select a Memory Number to be operated.
If '30 memories' (M30 option) is ordered, Memory Numbers 1 to 30 (indicated as 1 to F.) can be retrieved.

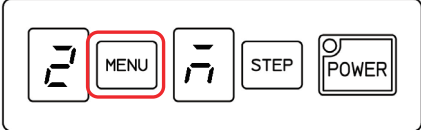
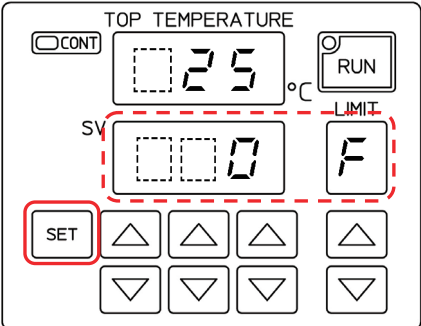
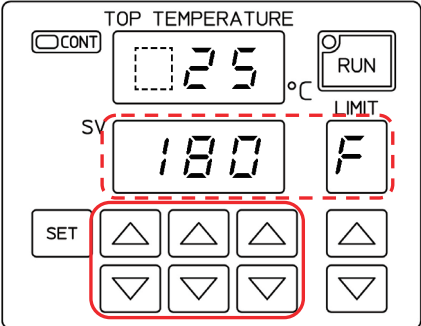
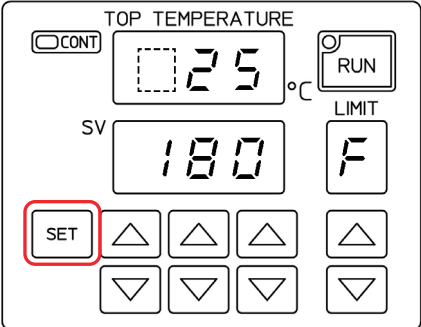
If the Top and Bottom Heater RUN Keys are pressed, operation starts with the set values registered in the selected Memory Number.

Memory Numbers cannot be changed while running.

7.3 Top and Bottom Heater Temperatures Setting

Sets the Top and Bottom Heater temperatures, and registers them in the memory.

- Setting range: Top Heater temperature Low Limit to High Limit,
Bottom Heater temperature Low Limit to High Limit
- Setting method: (e.g.) When setting the Top Heater temperature to 180°C for Memory Number 2

Setting Procedure	Display and Key
(1) Select Memory Number 2 using the MENU Key.	
(2) Press the Top Heater SET Key. The Top Heater SV Display and Top Heater Output Limit Display flash, and the unit enters Top Heater Setting mode.	
(3) Set the Top Heater temperature to 180°C, using the Top Heater UP or DOWN Key. Every digit can be independently changed, however, the digits are also interrelated.	
(4) Press the Top Heater SET Key. The Top Heater temperature 180°C will be registered in Memory Number 2 selected from Step (1).	

If 30 seconds pass without pressing the Top Heater UP or DOWN Key after a set value has been changed, the set value at the given time will be registered.

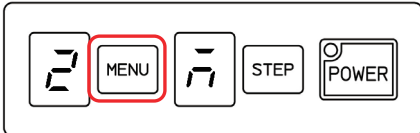
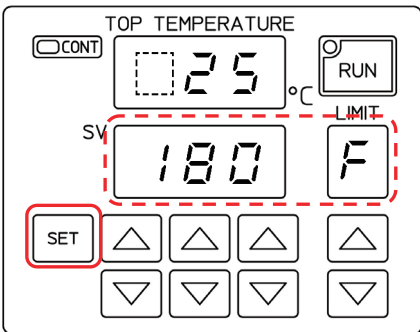
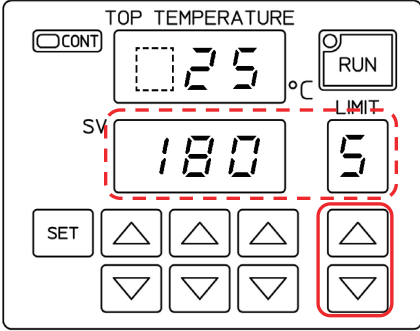
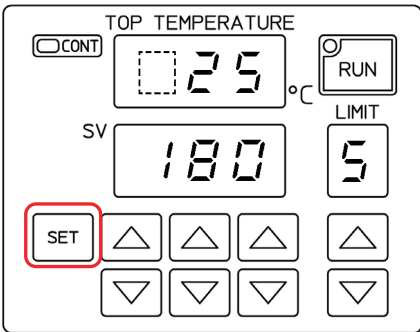
7.4 Top and Bottom Heater Output Limit (High Limit value) Setting

The Output Limit function sets a limit (controls temperature rise speed) to the amount of power supply (High Limit value) to the heater, so that oven performance can match the products to be baked.

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

Character	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%

- Setting method: (e.g.) When setting the Top Heater Output Limit to 5 (50%) for Memory Number 2

Setting Procedure		Display and Key
(1)	Select Memory Number 2 to be registered with the MENU Key.	
(2)	Press the Top Heater SET Key. The Top Heater SV Display and Top Heater Output Limit Display flash, and the unit enters Top Heater Setting mode.	
(3)	Set the Top Heater Output Limit to 5 (50%), using the Top Heater Output Limit UP or DOWN Key.	
(4)	Press the Top Heater SET Key. The Top Heater Output Limit value 5 (50%) will be registered in Memory Number 2 selected from Step (1).	

If 30 seconds pass without pressing the Top Heater Output Limit UP or DOWN Key after a set value has been changed, the set value at the given time will be registered.

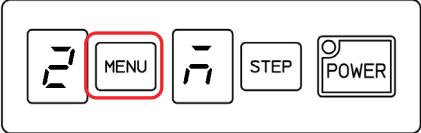
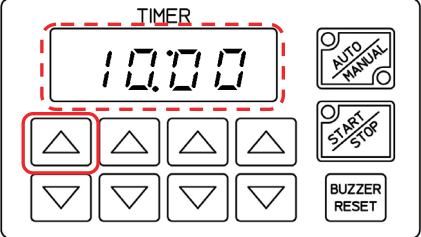
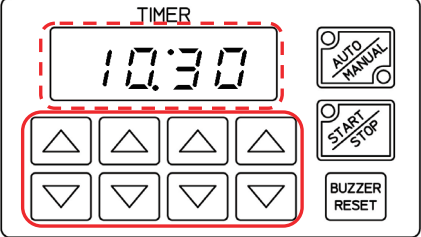
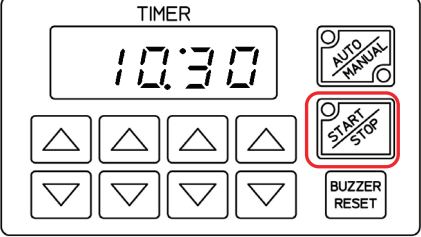
The Output Limit can be changed even if the unit is not in Top and Bottom Heater Setting mode. However, if 2 seconds pass without pressing the Top Heater Output Limit UP or DOWN Key after the Output Limit value has been changed, the value at the given time will be registered.

7.5 Timer Setting

Sets the Timer.

Common to the Top and Bottom Heater setting items

- Setting range: 00 min 00 sec to 99 min 50 sec (in units of 1 second)
- Setting method: (e.g.) When setting the Timer to 10 minutes 30 seconds for Memory Number 2

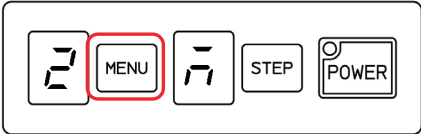
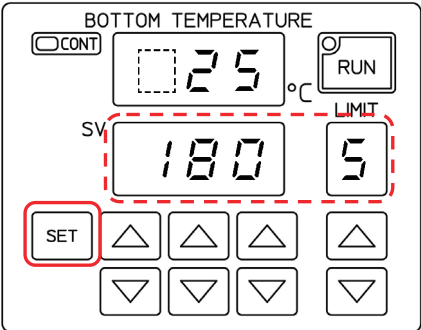
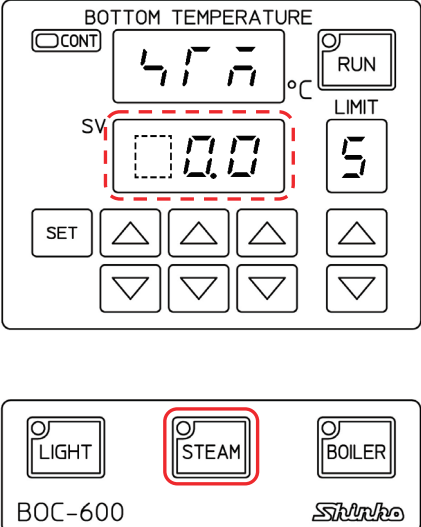
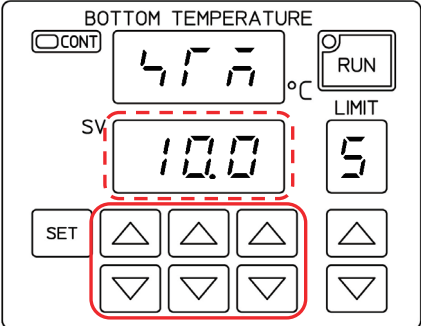
Setting Procedure		Display and Key
(1)	Select Memory Number 2 to be registered, using the MENU Key.	
(2)	Press the Timer UP or DOWN Key. The Timer Display flashes, and the unit enters Timer Setting mode.	
(3)	Set the Timer to 10 minutes 30 seconds with the Timer UP or DOWN Key.	
(4)	Press the START/STOP Key. The Timer value will be registered in Memory Number 2 selected from Step (1). The Start indicator flashes, and Timer counting starts. To register the value only, press the BUZZER RESET Key. The Start indicator will turn off, and the value will be registered in Memory Number 2 selected from Step (1).	


If 30 seconds pass without pressing the Timer UP or DOWN Key after a set value has been changed, the set value at the given time will be registered.

7.6 Steam Time Setting

Sets the Steam Time.

- Setting range: 0.0 to 99.9 seconds (in units of 0.1 second)
- Setting method: (e.g.) When setting the Steam Time to 10.0 seconds for Memory Number 2

Setting Procedure	Display and Key
(1) Select Memory Number 2 to be registered, using the MENU Key.	
(2) Press the Bottom Heater SET Key. The Bottom Heater SV Display and Bottom Heater Output Limit Display flash, and the unit enters Bottom Heater Setting mode.	
(3) Press the STEAM Key. [47.7] is indicated on the Bottom Heater Temperature Display, Steam Time flashes on the Bottom Heater SV Display, and the unit enters Steam Time Setting mode.	
(4) Sets the Steam Time to 10.0 seconds with the Bottom Heater UP or DOWN Key.	

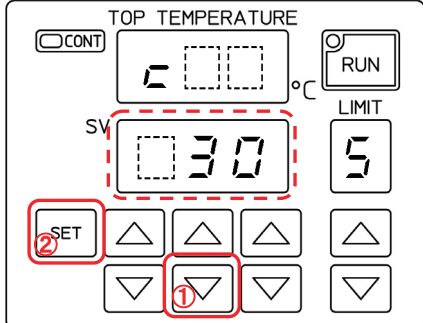
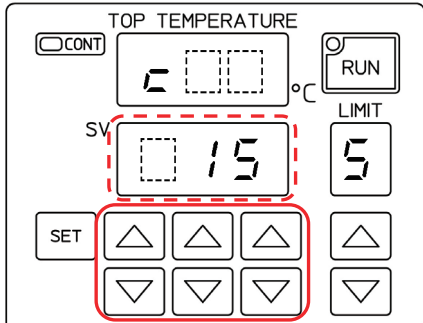
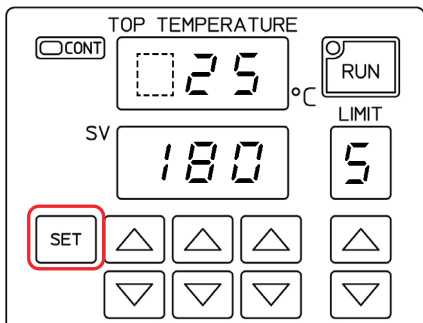
<p>(5) Press the STEAM Key. The Steam Time 10.0 seconds will be registered in Memory Number 2 selected from Step (1).</p>	
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7.7 Proportional Cycle Setting

For the PD control action, you can set the Proportional Cycle to turn the output ON/OFF within the proportional band.

For the ON/OFF control action, ON time is determined based on the Proportional Cycle Output Limit. Common to all Memory Numbers as well as Top and Bottom Heater setting items

- Setting range: 1 to 120 seconds (Default: Relay contact output: 30 seconds, Non-contact voltage output: 3 seconds, Non-contact output: 3 seconds)
- Setting method: (e.g.) When setting the Proportional Cycle to 15 seconds

Setting Procedure	Display and Key
<p>(1) Press and hold the Top Heater DOWN Key (2nd digit) ① and the Top Heater SET Key ② (in that order) together for approx. 5 seconds. [c] is indicated on the Top Heater Temperature Display, and the set value on the Top Heater SV Display flashes, and the unit enters Proportional Cycle Setting mode.</p>	
<p>(2) Set the Proportional Cycle to 15 seconds with the Top Heater UP or DOWN Key.</p>	
<p>(3) Press the Top Heater SET Key. A Proportional Cycle of 15 seconds will be registered.</p>	

For relay contact output, if the Proportional Cycle time is decreased, the frequency of the ON/OFF action increases, and the life of the relay contact is shortened.

7.8 Hysteresis Setting

For the ON/OFF control action of this controller, you can set the ON/OFF Hysteresis.

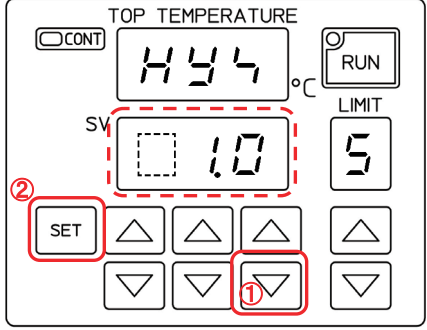
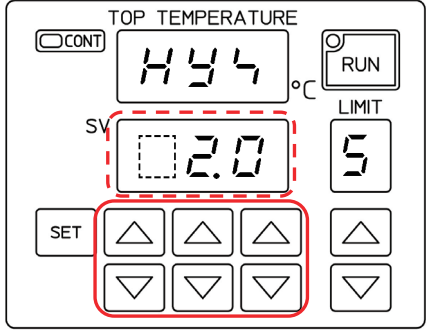
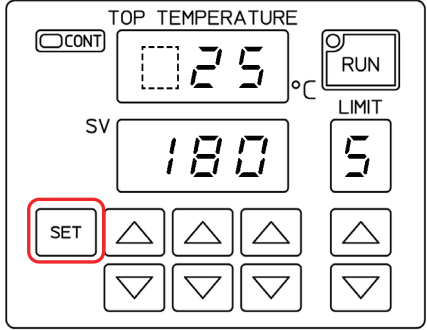
Common to all Memory Numbers as well as Top and Bottom Heater setting items

Available only for the ON/OFF control action.

To set ON/OFF control action, set the Top and Bottom Heater Proportional Bands to 0.0

in Top and Bottom Heater Basic Setting modes. (pages 20, 22)

- Setting range: 0.1 to 10.0°C (Default: 1.0°C)
- Setting method: (e.g.) When setting the Hysteresis to 2.0°C.

Setting Procedure	Display and Key
<p>(1) Press and hold the Top Heater DOWN Key (1st digit) ① and the Top Heater SET Key ② (in that order) together for approx. 5 seconds.</p> <p>[H44] is indicated on the Top Heater Temperature Display, and the set value on the Top Heater SV Display flashes, and the unit has now entered Hysteresis Setting mode.</p>	
<p>(2) Set the Hysteresis to 2.0°C with the Top Heater UP or DOWN Key.</p>	
<p>(3) Press the Top Heater SET Key. The Hysteresis 2.0°C will be registered.</p>	


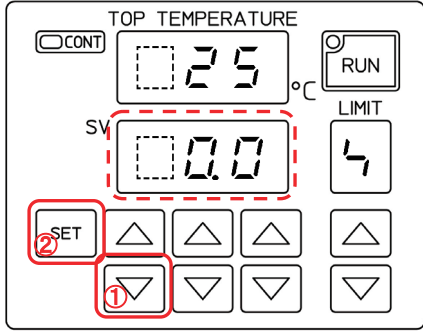
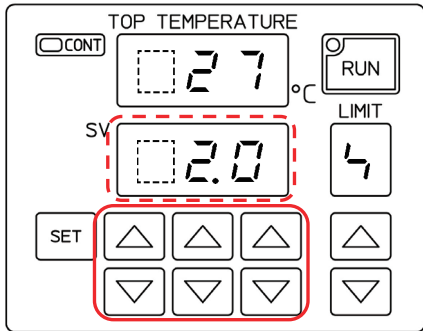
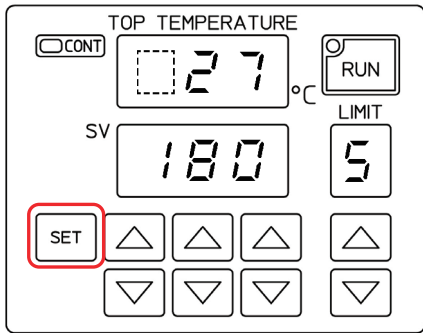
7.9 Top and Bottom Heater Sensor Correction Setting

The Sensor Correction function adjusts the Top and Bottom Heater temperature indication values, and makes the Top and Bottom Heater set values equal to the Top and Bottom Heater indication values.

Control is performed using an input value before Sensor Correction.

Common to Top and Bottom Sensor Correction setting (pages 20, 22) in Top and Bottom Heater Basic Setting modes.

- Setting range: -19.9 to 30.0°C
- Setting method: (e.g.) When setting the Top Heater Sensor Correction value to 2.0°C.

Setting Procedure	Display and Key
<p>(1) Press and hold the Top Heater DOWN Key (3rd digit) ① and the Top Heater SET Key ② (in that order) together for approx. 5 seconds.</p> <p>[] is indicated on the Top Heater Output Limit Display, the set value on the Top Heater SV Display flashes, and the unit enters Top Heater Sensor Correction mode. The Top Heater Temperature Display indicates Top Heater temperature.</p>	 <p>The display shows TOP TEMPERATURE at 25°C and SV at 00. The LIMIT is 4. The SET key is circled with a '2' and the DOWN key with a '1'.</p>
<p>(2) Set the Sensor Correction value to 2.0°C with the Top Heater UP or DOWN Key. The Top Heater Temperature Display indicates the value to which the set Sensor Correction value is added. For the negative Sensor Correction value, Top Heater Temperature Display indicates the value to which the negative Sensor Correction value is added.</p>	 <p>The display shows TOP TEMPERATURE at 27°C and SV at 2.0. The LIMIT is 4. The SET key is circled.</p>
<p>(3) Press the Top Heater SET Key. The Sensor Correction value 2.0°C will be registered.</p>	 <p>The display shows TOP TEMPERATURE at 27°C and SV at 18.0. The LIMIT is 5. The SET key is circled.</p>

When setting Bottom Heater Sensor Correction Value:

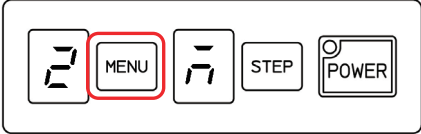
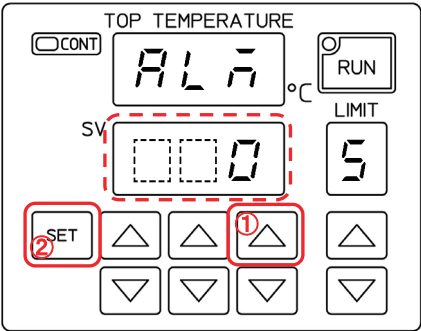
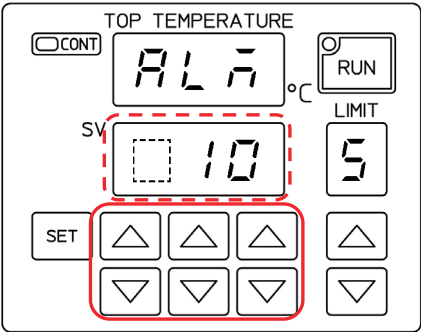
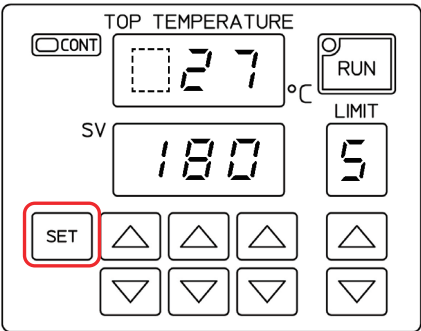
- (1) Press and hold the Bottom Heater DOWN Key (3rd digit) and the Bottom Heater SET Key (in that order) together for approx. 5 seconds.
- (2) Set the Sensor Correction value with the Bottom Heater UP or DOWN Key.
- (3) Press the Bottom Heater SET Key. The Sensor Correction value will be registered.

7.10 High Limit Alarm Setting (AH option)

The alarm action point is set as a deviation value from the set temperature, and if the temperature during operation exceeds the setting range, the alarm output is turned ON.

Common to Top and bottom setting items

- Setting range: -100 to 100°C (Setting to 0 disables the function.)
- Setting method: (e.g.) When setting the High Limit Alarm for Memory Number 2 to 10°C.

Setting Procedure	Display and Key
(1) Select Memory Number 2 with the MENU Key.	
(2) Press and hold the Top Heater UP Key (1st digit) ① and the Top Heater SET Key ② (in that order) together for approx. 5 seconds. [AL \bar{n}] is indicated on the Top Heater Temperature Display, the set value on the Top Heater SV Display flashes, and the unit enters High Limit Alarm Setting mode.	
(3) Set the High Limit Alarm value to 10°C, using the Top Heater UP or DOWN Key.	
(4) Press the Top Heater SET Key. The High Limit Alarm value 10°C will be registered.	

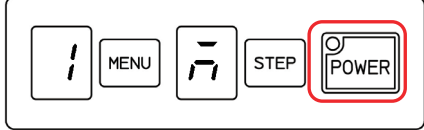
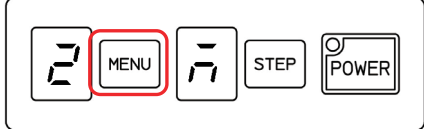
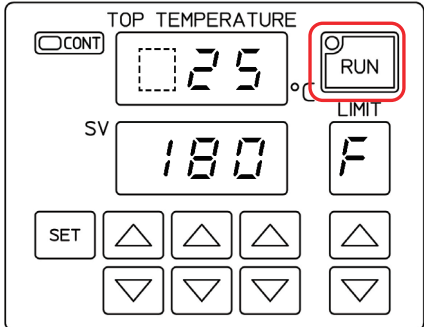
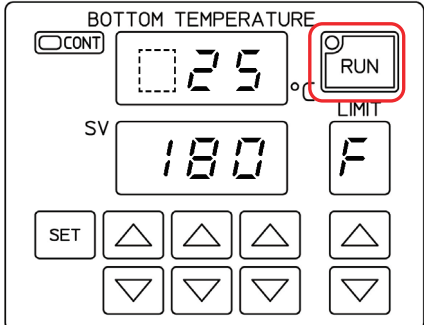
8. Operating Memory Function

8.1 Confirmation before Operating Memory Function

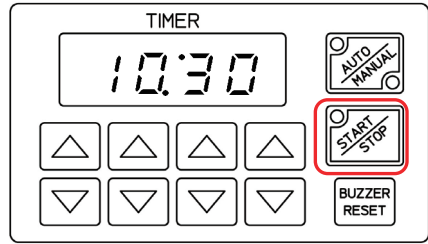
Confirm the following before operating the Memory Function.

- The oven door is securely closed.
- Every setting item is set to a suitable value.

8.2 Procedures to Operate Memory Function

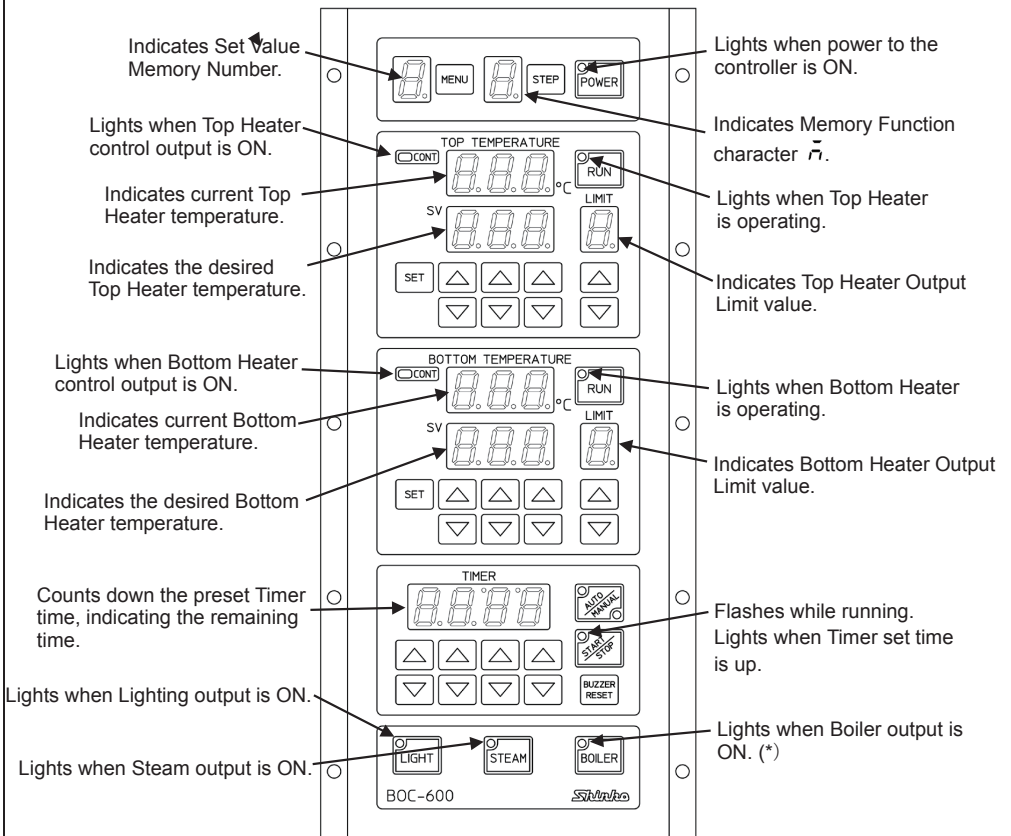
Setting Procedure	Display and Key
<p>(1) Turn the power to the controller ON.</p> <p>After the power is turned ON, [b0c] is indicated on the Top Heater Temperature Display for approx. 3 seconds.</p> <p>Pressing the POWER Key turns ON the Power indicator and all Displays, and the external Fan starts to rotate. (Be sure to install a fan externally.)</p>	
<p>(2) Select a Set Value Memory Number.</p> <p>Select a Set Value Memory Number (/ to F) to be indicated on the Menu Display for operation, using the MENU Key.</p> <p>If '30 memories' (M30 option) is ordered, Memory Numbers (/ to F.) are indicated on the Menu Display.</p> <p>The set values registered in the Memory Number will be indicated on the Displays (Top Heater Temperature Display, Top Heater SV Display, Top Heater Output Limit Display, Bottom Heater Temperature Display, Bottom Heater SV Display, Bottom Heater Output Limit Display and Timer Display).</p>	
<p>(3) Start Top Heater operation.</p> <p>Press the Top Heater RUN Key.</p> <p>Operation (control) will start using the set values registered in the selected Memory Number.</p>	
<p>(4) Start Bottom Heater operation.</p> <p>Press the Bottom Heater RUN Key.</p> <p>Operation (control) will start using the set values registered in the selected Memory Number.</p>	

(5) **Start the Timer.**
 Press the START/STOP Key.
 The Start indicator flashes, and Timer starts counting down using the set value registered in the selected Memory Number.
 If the START/STOP Key is not pressed, Timer counting will not start, and only temperature control will be carried out.

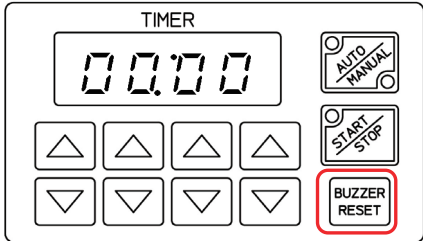


(6) **While running**
 After operation starts, check if each Display and indicator is working properly.
 If the door is opened (Door Open input terminals are opened) while Timer is counting (counting down), the counting will be temporarily suspended. If the door is closed and the START/STOP Key is pressed, counting will resume from the stopped value.

Status of Displays and indicators while running



(*) If the High Limit Alarm output (AH option) is ordered, the Boiler indicator turns ON when the Alarm output is ON

<p>(7) Running completed</p> <p>When the preset Timer counting is completed, the Buzzer output is turned ON.</p> <p>There are 2 ways to turn OFF the Buzzer output.</p> <p>① Press the BUZZER RESET Key. The Buzzer output is turned OFF, the Timer is reset (preset time start status), and only temperature control continues.</p> <p>② Open the door (Door Open input terminals are opened). The Buzzer output will be turned OFF.</p> <p>To stop all operations, press the POWER Key to turn OFF the power to the controller.</p>	
--	--

9. Setting Program Function

To set the Program Function selected in [Control Type] in Engineering mode (P.18), follow the steps below.

9.1 About Program Function

A maximum of 15 menus (8-steps per menu) can be set. If '30 memories' (M30 option) is ordered, up to 30 menus can be set.

Automatic Operation performs 8 steps automatically.

If either Top or Bottom Heater temperature is 0 (zero), and if Timer is set to a value other than 0 (zero), operation will be performed.

However, if Top and Bottom Heater temperatures of all remaining steps are 0 (zero), the unit will not proceed to the next step, but control is performed with the Top and Bottom Heater temperatures of the last step.

(e.g.) After Steps 1 to 4 are performed, the unit will not proceed to Step 5, but continues to control with Top and Bottom Heater temperatures of Step 4.

Step	1	2	3	4	5	6	7	8
Top heater temperature	100	200	300	400	0	0	0	0
Bottom heater temperature	80	180	0	380	0	0	0	0
Timer set value	30	30	60	60	0	0	0	0

If Timer value is set to 0, the step will be skipped, and will proceed to the next step.

(e.g.) After Steps 1 and 2 are performed, Step 3 is skipped, and the unit proceeds to Step 4.

After Step 4 is performed, the unit does not proceed to Step 5, but continues to control with Top and Bottom Heater temperatures of Step 4.

Step	1	2	3	4	5	6	7	8
Top heater temperature	100	200	300	400	0	0	0	0
Bottom heater temperature	80	180	280	380	0	0	0	0
Timer set value	30	30	0	60	0	0	0	0

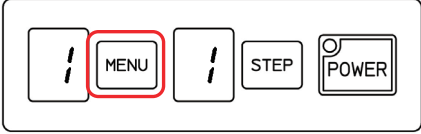
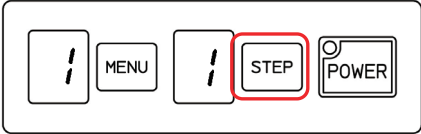
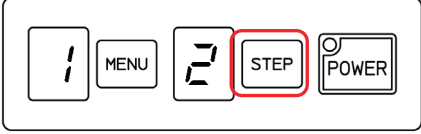
Manual Operation performs steps one by one. Even if Timer time has passed, the unit will not proceed to the next step.

One step can include Step Temperatures (Top and Bottom Heater temperatures), Timer set time, Output Limits (Top and bottom outputs), High Limit Alarm value (AH option) and Steam Time.

9.2 Procedure for Program Function Setting

Select a Menu Number for products to be baked, and register each set value.

• Setting Method

Setting Procedure		Display and Key
(1)	Select a Menu Number with the MENU Key. If '30 memories' (M30 option) is ordered, a desired menu is selectable from 30 menus.	
(2)	Select a Step Number to be registered with the STEP Key.	
(3)	Input each set value necessary for the step. ① Top and Bottom Heater temperatures (P.25) ② Top and Bottom Heater Output Limits (P.26) ③ Timer set value (P.27) ④ Steam Time (P.28) ⑤ High Limit Alarm value (P.32)	
(4)	Press the STEP Key to move to the next number.	
(5)	Repeat steps (3), (4) to set each value for the necessary steps.	
(6)	Start from step (1), and set the necessary menus.	

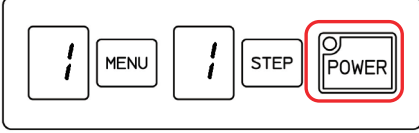
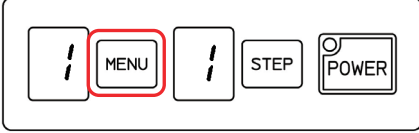
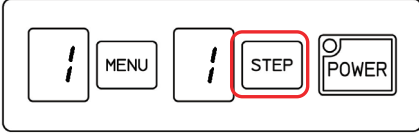
10. Operating Program Function

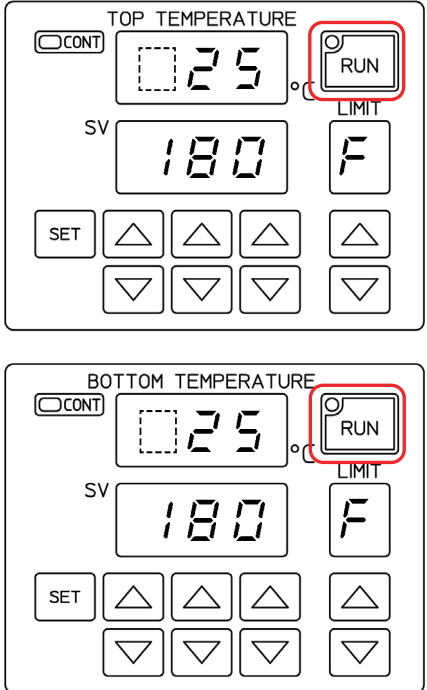
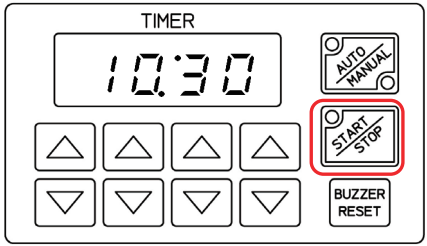
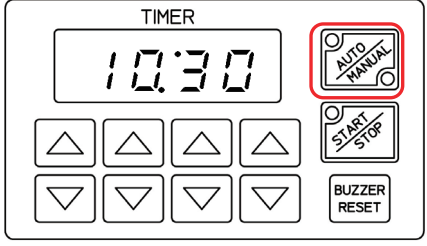
10.1 Confirmation before Operating Program Function

Confirm the following before operating the Program Function.

- The oven door is securely closed.
- Each setting item is set to a suitable value.

10.2 Procedure for Program Function Operation

	Setting Procedure	Display and Key
(1)	<p>Turn the power supply to the controller ON.</p> <p>After power is turned ON, [b o c] is indicated for approx. 3 seconds on the Top Heater Temperature Display.</p> <p>By pressing the POWER Key, the Power indicator and every Display turns on, and the external Fan starts to rotate. (Be sure to install a fan externally.)</p>	 <p>The diagram shows a control panel with four buttons: a button with a vertical bar and exclamation mark, a button labeled 'MENU', another button with a vertical bar and exclamation mark, a button labeled 'STEP', and a button labeled 'POWER'. The 'POWER' button is highlighted with a red rectangular border.</p>
(2)	<p>Select a Menu Number.</p> <p>By pressing the MENU Key, select a Menu Number to be operated (controlled) from [i] to [F], which is indicated on the Menu Display.</p> <p>If '30 memories' (M30 option) is ordered, Menu Numbers from [i] to [F] can be indicated on the Menu Display.</p>	 <p>The diagram shows the same control panel as in step 1. The 'MENU' button is highlighted with a red rectangular border.</p>
(3)	<p>Select a Step Number.</p> <p>By pressing the STEP Key, select a Step Number to be operated (controlled) from [i] to [E], which is indicated on the Step Display.</p> <p>To start a step from the beginning, select [i].</p> <p>By selecting a Step Number, operation can be started freely from any step.</p> <p>The set values registered in the selected Step Number are indicated on the Displays: Top Heater Temperature Display, Top Heater SV Display, Top Heater Output Limit Display, Bottom Heater Temperature Display, Bottom Heater SV Display, Bottom Heater Output Limit Display, Timer Display.</p>	 <p>The diagram shows the same control panel as in step 1. The 'STEP' button is highlighted with a red rectangular border.</p>

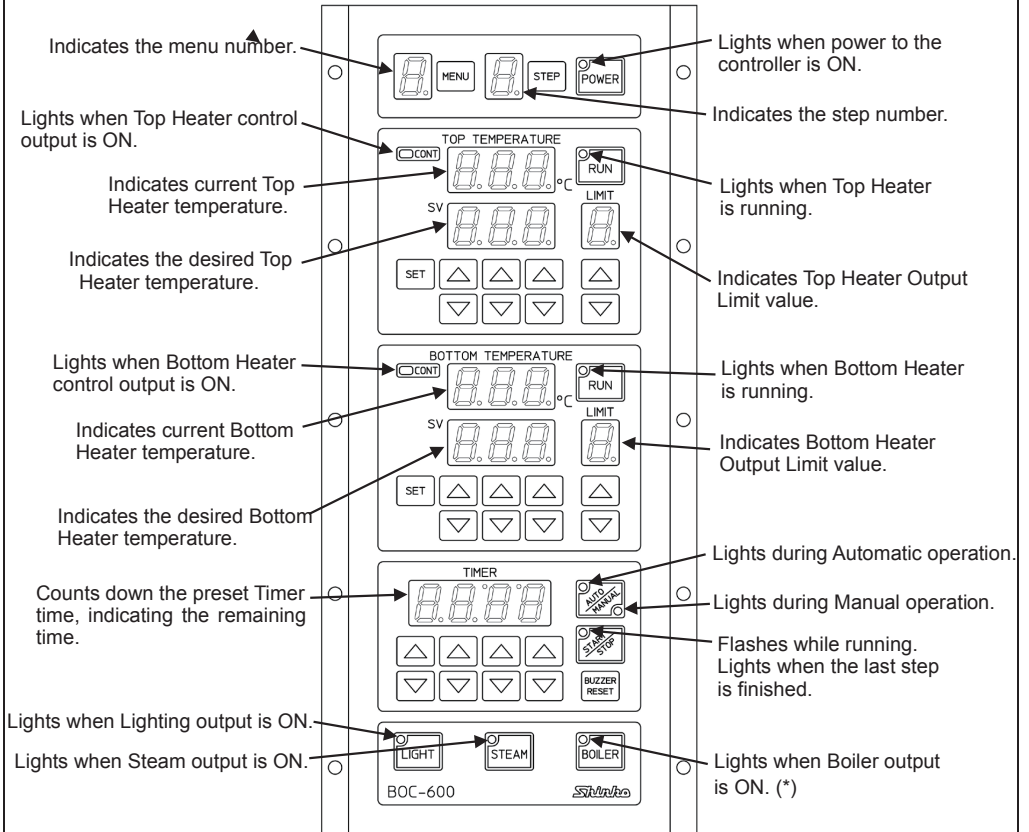
<p>(4)</p>	<p>Start Top and Bottom Heaters operation. By pressing the Top and Bottom Heater RUN Keys, operation (control) starts with the set values registered in the selected Step Number.</p>	 <p>The image shows two identical control panels for temperature control. The top panel is labeled 'TOP TEMPERATURE' and the bottom panel is labeled 'BOTTOM TEMPERATURE'. Both panels feature a 'CONT' indicator, a digital display showing '25', an 'SV' (Set Value) display showing '180', and a 'LIMIT' display showing 'F'. Below the displays are four directional arrow keys (up, down, left, right) and a 'SET' key. A 'RUN' key is located to the right of the 'LIMIT' display and is highlighted with a red box in both panels.</p>
<p>(5)</p>	<p>Start the Timer. By pressing the START/STOP Key, the Timer starts counting down using the Timer set value registered in the selected Step Number, and the Start indicator flashes. If the START/STOP Key is not pressed, only temperature control will start, without starting the Timer count down.</p>	 <p>The image shows a 'TIMER' control panel. It features a digital display showing '10:30'. To the right of the display are two keys: 'AUTO/MANUAL' and 'START/STOP'. The 'START/STOP' key is highlighted with a red box. Below the display are four directional arrow keys (up, down, left, right) and a 'BUZZER RESET' key.</p>
<p>(6)</p>	<p>Select Auto/Manual Operation. Press the AUTO/MANUAL Key to select Automatic or Manual operation. If Automatic operation is selected, operation will be automatically carried out from the selected Step Number to the last step. If Manual operation is selected, only the selected Step Number will be carried out.</p>	 <p>The image shows a 'TIMER' control panel, identical to the one in the previous row. It features a digital display showing '10:30'. To the right of the display are two keys: 'AUTO/MANUAL' and 'START/STOP'. The 'AUTO/MANUAL' key is highlighted with a red box. Below the display are four directional arrow keys (up, down, left, right) and a 'BUZZER RESET' key.</p>

(7)

While running

After operation is started, confirm that each display and indicator are properly functioning. If the door is opened (Door Open Input terminals are opened) while Timer is counting (counting down), the counting will be temporarily suspended. If the door is closed and the START/STOP Key is pressed, the counting will resume from the stopped value.

Status of Displays and indicators while running



(*) If High Limit Alarm output (AH option) is ordered, the Boiler indicator lights when the alarm output is ON.

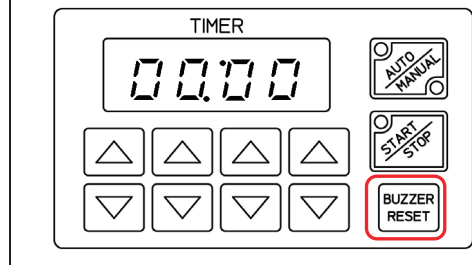
(8)

Running completed

- For Automatic operation, when the last step is completed, the baking end Buzzer output is turned ON.
- For Manual operation, when the Step Time is completed, the baking end Buzzer output is turned ON.

• 2 ways to turn the Buzzer output OFF

- ① Pressing the BUZZER RESET Key turns the Buzzer output OFF, baking time is reset (preset time start status), and only temperature control continues.
- ② If the door is opened (Door open input terminals are opened), the Buzzer output is turned OFF. To stop all operations, press the POWER Key to turn the power to the unit OFF.



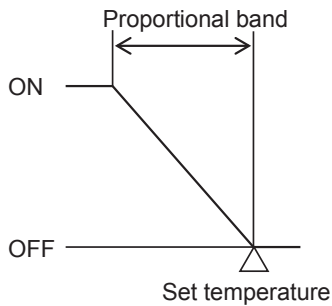
● If power is restored during operation, operation automatically resumes from the baking time of power failure.

Time error after power is restored: Max. 1 minute

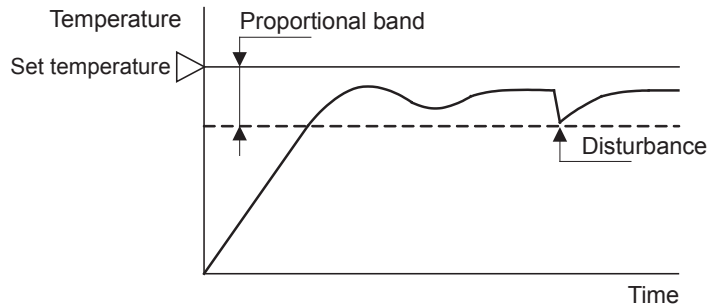
11. Control Action

11.1 PD Control Action

PD Control Action is a combination of P (proportional) Control Action and D (derivative) Control Action. In P (proportional) Control Action, control is performed by the proportional period within the proportional band in proportion to the deviation between the set temperature and measured temperature. In D (derivative) Control Action, stable control is performed by minimizing the overshoot and oscillation caused by rapid temperature change due to disturbance or when power is turned on.



(Fig. 11.1-1)



(Fig. 11.1-2)

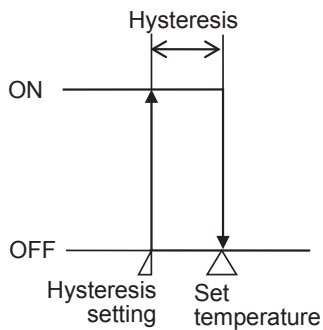
11.2 ON/OFF Control Action

In ON/OFF Control Action, control output is turned ON when measured temperature is lower than the [Set temperature – Hysteresis]. If the measured temperature exceeds the set temperature, control output is turned OFF.

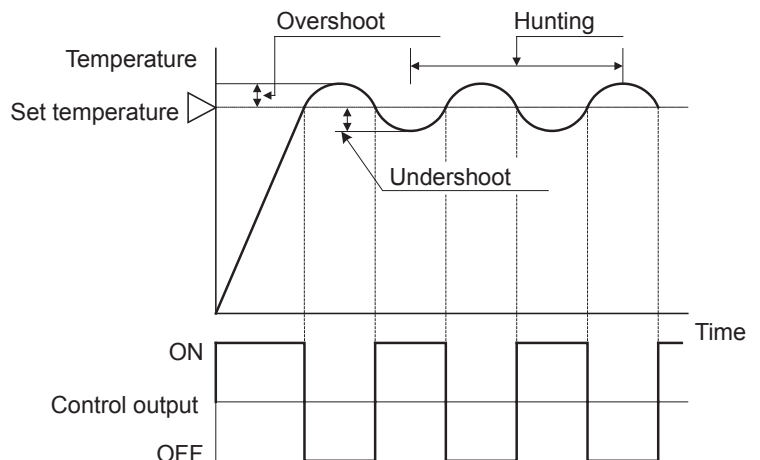
In ON/OFF Control Action, overshoot, undershoot and hunting phenomenon are generated.

When the measured temperature largely exceeds the set temperature as shown below, this is called overshoot. When the measured temperature largely drops below the set temperature as follows, this is referred to as undershoot.

In hunting status, the result is an oscillating control status, as shown below.



(Fig. 11.2-1)



(Fig. 11.2-2)

12. External Input

12.1 Door Open Input

For Timer accuracy, if a Door Open/Closed switch is connected to the Door Open input terminals, Timer counting stops while door is opened (Door Open input terminals are opened).

If the START/STOP Key is pressed again after door is closed, Timer counting starts.

When the Buzzer output is ON, and if the door is opened (Door Open input terminals are opened), the Buzzer output is turned OFF.

12.2 Remote Input (RM option)

By connecting to a calendar Timer, this function makes Automatic Operation start without pressing the POWER Key. Using this function, it is possible to preheat an oven before starting operation.

If the Remote Input is turned ON.

- From Standby mode (no indication), the unit proceeds to PV/SV Display Mode, and operation starts (Top and Bottom Heaters operate and the Lighting output is ON).
- By pressing the POWER Key, the unit enters Standby mode (no indication), and operation stops. If the POWER Key is pressed again, the unit enters PV/SV Display Mode, however, the unit remains in stopped status.
- If the power supply to the unit is turned OFF, the unit moves to Standby mode (no indication), and operation stops.

If the power supply to the unit is turned ON again, the unit enters PV/SV Display Mode, and operation starts.

For the Program Function, Timer continues to work.

Time error after power is restored: Max. 1 minute

However, if power is turned OFF when Timer shows 0 min 0 sec, the Timer does not work (Timer is in a reset status) even if power is turned ON again.

If the Remote Input is turned OFF

- The unit enters Standby mode (no indication), and operation stops.
- If the POWER Key is pressed, the unit enters PV/SV Display Mode, however, operation remains in stopped status. If the POWER Key is pressed again, the unit enters Standby mode (no indication).

Note: If the Remote Input (RM option) is ordered, the Door Open Input cannot be used.

13. Other Functions

[Power failure countermeasure]

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

[Self-diagnosis]

The CPU is monitored by a watchdog timer, and if an abnormal status occurs, the controller is switched to warm-up status, turning all outputs OFF.

[Automatic cold junction temperature compensation]

This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains it at the same status as if the reference junction location temperature were at 0°C (32°F).

[Burnout]

If the thermocouple for the Top Heater temperature input is burnt out, [- -] flashes on the Top Heater Temperature Display.

If the thermocouple for the Bottom Heater temperature input is burnt out, [- -] flashes on the Bottom Heater Temperature Display.

The output of the burnt out control side will be turned OFF.

[Input error]

If temperature input exceeds [Top/Bottom Heater temperature high limit value + 50°C], the same action as that of burnout will be performed.

If the Top Heater temperature input is lower than -50°C, [- -] will flash on the Top Heater Temperature Display.

If the Bottom Heater temperature input is lower than -50°C, [- -] will flash on the Bottom Heater Temperature Display.

The output of the error-occurred control side will be turned OFF.

14. Specifications

14.1 Standard Specifications

Rating

Input Range	0 to 600°C
Input	Thermocouple K External resistance: 100 Ω or less
Power Supply Voltage	100 to 240 V AC 50/60 Hz
Allowable Voltage Fluctuation Range	85 to 264 V AC

General Structure

External Dimensions	140 × 310 × 88 mm (W × H × D)	
Mounting	Flush	
Front Panel	Membrane sheet	
Indicating Structure	Display	
	Menu Display	Red LED 1 digit, character size 14.3 x 8 mm (H x W)
	Step Display	Green LED 1 digit, character size 14.3 x 8 mm (H x W)
	Top Heater Temperature Display	Red LED 3 digits, character size 14.3 x 8 mm (H x W)
	Top Heater SV Display	Green LED 3 digits, character size 14.3 x 8 mm (H x W)
	Top Heater Output Limit Display	Red LED 1 digit, character size 14.3 x 8 mm (H x W)
	Bottom Heater Temperature Display	Red LED 3 digits, character size 14.3 x 8 mm (H x W)
	Bottom Heater SV Display	Green LED 3 digits, character size 14.3 x 8 mm (H x W)
	Bottom Heater Output Limit Display	Red LED 1 digit, character size 14.3 x 8 mm (H x W)
	Timer Display	Red LED 4 digits, character size 14.3 x 8 mm (H x W)
	Setting Structure	Setting method: Input by the membrane sheet key.

Indicating Performance

Indication Accuracy	±2°C (at 23°C of ambient temperature) (Equivalent to ±0.2% of input span ±1 digit)
Cold Junction Temperature Compensation Accuracy	Within ±1°C at 0 to 50°C
Temperature Coefficient	Within ±0.015 %/°C
Input Sampling Period	500 ms
Time Accuracy	±0.5% of setting time (at 23°C of ambient temperature)
Time Error after Power Restoration	Max. 1 minute

Control Performance

Setting Accuracy	Same as indication accuracy	
Control Action	PD control ON/OFF control action: When proportional band is set to 0.0°C. Individual settings for Top and Bottom Heaters	
	Proportional band	0.0 to 99.9°C (ON/OFF control when set to 0.0°C)
	Derivative time	0 to 300 seconds
	Manual reset	-19.9 to 99.9°C
	Common settings to Top and Bottom Heaters	
	Proportional cycle	1 to 120 seconds
	ON/OFF hysteresis	0.1 to 10.0°C

Control Performance

Control Output	Relay contact output 1a 1b	Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$) Electrical life: 100,000 cycles
	Non-contact voltage output (for SSR drive)	12 V DC $\pm 15\%$ Max. 40 mA (short circuit protected)
	Non-contact output 1a (SSR output)	Control capacity: 0.5 A 250 V AC
Buzzer output	Relay contact output 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$)	
Boiler Output	Relay contact output 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$)	
Steam Output	Relay contact output 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$)	
Fan Output	Relay contact output 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$)	
Lighting Output	Relay contact output 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load $\cos\phi=0.4$)	

Standard Function

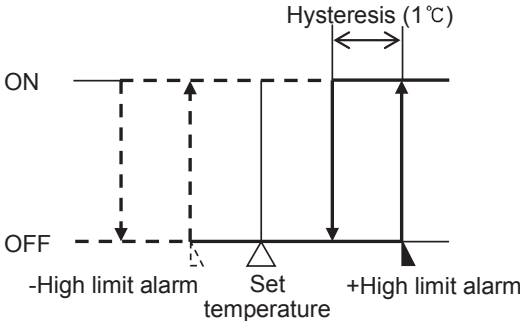
Memory Function	<p>If the Memory Function is selected in [Control Type], 15 memories can be set. If '30 memories' (M30 option) is ordered, 30 memories can be set. The Step Display indicates [$\bar{7}$].</p> <p>One memory can include Top and Bottom Heater temperatures, Timer set value, Output Limits (Top and Bottom Heater outputs), High limit alarm value (AH option) and Steam Time.</p>
Program Function	<p>If the Program Function is selected in [Control Type], 15 menus (8-steps/menu) can be set. If '30 memories' (M30 option) is ordered, 30 menus can be set. The Menu Display indicates the selected menu number. The Menu Numbers (10 to 15) are indicated as [$\bar{7}$ to \bar{F}]. For Menu Numbers larger than 15, the decimal point on the Menu Display lights with numbers (16 to 30), which are indicated as [\bar{t} to \bar{F}].</p> <p>In Automatic Operation, 8 steps are automatically performed. If either Top or Bottom Heater temperature is 0 (zero), and if Timer is set to a value other than 0 (zero), operation will commence. However, if Top and Bottom Heater temperatures of all remaining steps are 0 (zero), the unit will not proceed to the next step, but control is performed with the Top and Bottom Heater temperatures of the last step. If Timer value is set to 0 (zero), the step will be skipped, and will proceed to the next step.</p> <p>In Manual Operation, steps are performed one by one. Even if Timer time has elapsed, the unit will not proceed to the next step.</p> <p>One step can store Step Temperatures (Top and Bottom Heater temperatures), Timer set value, Output Limits (Top and Bottom Heater Output Limits), High Limit Alarm value (AH option) and Steam Time.</p>

Output Limit Function	<p>Sets Output High Limit value. Output Limit can be changed without entering Top or Bottom Heater Setting mode. If 2 seconds elapse without any operation after the set value has been changed, the value at the given time will be registered.</p>																																		
<table border="1"> <tr> <td>Character</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>F</td> </tr> <tr> <td>Output Limit Value</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table>												Character	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%
Character	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%																								
Buzzer Output	<p>For the Memory Function, when the preset Timer counting is completed, the Buzzer output is turned ON. For the Program Function with automatic operation, when the last step is finished, the Buzzer output is turned ON. For the Program Function with manual operation, when the step time is finished, the Buzzer output is turned ON. To turn the Buzzer output OFF, press the BUZZER RESET Key or open the door.</p>																																		
Boiler Output	<p>Every time the BOILER Key is pressed, the Boiler output is turned ON or OFF. If High Limit Alarm output (AH option) is ordered, the Boiler output is disabled.</p>																																		
Steam Output	<p>If the STEAM Key is pressed, the Steam output is turned ON for the time set in [Steam Time]. If the STEAM Key is pressed again, the Steam output will be turned OFF.</p>																																		
Fan Output	<p>The Fan output is turned ON in PV/SV Display Mode.</p>																																		
Lighting Output	<p>Every time the LIGHT Key is pressed, the Lighting output is turned ON or OFF.</p>																																		
Door Open Input	<p>If the door is opened while Timer is working, the Timer can be suspended temporarily. Even though the door is closed, the Timer does not start again. By pressing the START/STOP Key, the Timer can be released, and Timer action will continue. If the door is opened while Buzzer output is ON, the Buzzer output will be turned OFF. If the Remote Input (RM option) is ordered, the Door Open Input will be disabled.</p>																																		

Other

Power Consumption	Approx. 14 VA
Ambient Temperature	0 to 50°C
Ambient Humidity	35 to 85 %RH (Non-condensing)
Weight	Approx. 1500 g

14.2 Optional Specifications

<p>30 Memories (Option code: M30)</p>	<p>If the Memory Function is selected in [Control Type], 30 memories can be set.</p> <p>One memory can include Top and Bottom Heater temperatures, Timer set value, Output Limits (Top and Bottom Heater Output Limits), High Limit Alarm value (AH option) and Steam Time.</p> <p>If Program Function is selected in [Control Type], 30 menus (8-steps per menu) can be set.</p> <p>One step can include step temperatures (Top and Bottom Heater Temperatures), Timer set value, Output Limits (Top and Bottom Heater Output Limits), High Limit Alarm value (AH option) and Steam Time.</p>
<p>Remote Input (Option code: RM)</p>	<p>If the Remote Input function is used, the oven can be preheated (Automatic Operation) without pressing the POWER Key before starting operation, by connecting to the calendar timer.</p> <p>If the Remote Input is turned ON.</p> <ul style="list-style-type: none"> • From Standby mode (no indication), the unit proceeds to PV/SV Display Mode, and operation starts (Top and Bottom Heaters operate, and the Lighting output is ON). • By pressing the POWER Key, the unit enters Standby mode (no indication), and operation stops. <p>If the POWER Key is pressed again, the unit enters PV/SV Display Mode, however, the unit remains in stopped status.</p> <ul style="list-style-type: none"> • If the power supply to the unit is turned OFF, the unit moves to Standby mode (no indication), and operation stops. <p>If the power supply to the unit is turned ON again, the unit enters PV/SV Display Mode, and operation starts.</p> <p>For the Program Function, Timer continues to work.</p> <p>Time error after power is restored: Max. 1 minute</p> <p>However, if power is turned OFF when Timer shows 0 min 0 sec, the Timer does not work (Timer is in a reset status) even if power is turned ON again.</p> <p>If the Remote Input is turned OFF.</p> <ul style="list-style-type: none"> • The unit enters Standby mode (no indication), and operation stops. • If the POWER Key is pressed, the unit enters PV/SV Display Mode, however, operation remains in stopped status. <p>If the POWER Key is pressed again, the unit enters Standby mode (no indication).</p>
<p>High Limit Alarm Output (Option code: AH)</p>	<p>Deviation setting from the set temperature, and if the temperature exceeds the range during operation, the alarm output will be turned ON.</p> <p>Common to Top and Bottom Heater setting items.</p> 

15. Character Table

The following shows characters, setting items, setting ranges and factory default values.

Display	Setting Item	SV Display	Setting Range (Setting Resolution)	Factory Default
Top Heater Temperature	Top Heater Temperature	Set value	Top Heater temperature low limit to Top Heater temperature high limit	0°C
Bottom Heater Temperature	Bottom Heater Temperature	Set value	Bottom Heater temperature low limit to Bottom Heater temperature high limit	0°C
ST	Steam Time	Set value	0.0 to 99.9 sec (0.1 sec)	5.0 seconds
	Timer Time	Set value	00 min 00 sec to 99 min 50 sec (1 second)	00 min 00 sec
C	Proportional Cycle	Set value	1 to 120 sec (1 second)	Relay contact output: 30 sec Non-contact voltage output: 3 sec Non-contact output: 3 sec
HY	Hysteresis	Set value	0.1 to 10.0°C (0.1°C)	1.0°C
HL	High Limit Alarm	Set value	-100 to 100°C	0°C

Top Heater/Bottom Heater Basic Setting Mode

Display	Setting Item	SV Display	Setting Range (Setting Resolution)	Factory Default
P	Top Heater/Bottom Heater Proportional Band	Set value	0 to 99.9°C (0.1°C)	BOC-620-2□/E: 10.0°C BOC-610-2□/E: 0.0°C
D	Top Heater/Bottom Heater Derivative Time	Set value	0 to 300 seconds (1 sec)	32 seconds
RE	Top Heater/Bottom Heater Manual Reset	Set value	-19.9 to 99.9°C (0.1°C)	5.0°C
S/S	Top Heater/Bottom Heater Sensor Correction	Set value	-19.9 to 30.0°C (0.1°C)	0.0°C

Engineering Mode

Display	Setting Item	SV Display	Setting Range (Setting Resolution)	Factory Default
LOC	Set Value Lock	- - -	Unlock	Unlock
		LOC	Lock	
PRO	Control Type	NE	Memory Function	Memory Function
		PRO	Program Function	
SH1	Top Heater Temperature High Limit	Set value	Top Heater temperature low limit to 600°C (1°C)	400°C
SL1	Top Heater Temperature Low Limit	Set value	0°C to Top Heater temperature high limit (1°C)	0.0°C
SH2	Bottom Heater Temperature High Limit	Set value	Bottom Heater temperature low limit to 600°C (1°C)	400°C
SL2	Bottom Heater Temperature Low Limit	Set value	0°C to Bottom Heater temperature high limit (1°C)	0.0°C

16. Troubleshooting

If any malfunctions occur, refer to the following items after checking that power is being supplied to the controller.

Problem	Possible Cause	Solution
The oven is not functioning even if the power is supplied.	The POWER Key may not be pressed.	Press the POWER Key.
Set Value Memory Number or Menu Number cannot be changed.	The controller is in a setting mode.	Terminate the setting mode once.
	The Run indicator lights, and the Start indicator lights or flashes.	Press the RUN Key or BUZZER RESET Key to stop operation or Timer.
Step number cannot be changed.	The controller is in a setting mode.	Terminate the setting mode once.
	The Start indicator lights or flashes.	Press the BUZZER RESET Key to stop the Timer.
The START/STOP Key does not work. (Counting does not progress.)	Timer has not been set.	Set the Timer.
	The door may be opened.	Close the door.
Temperature does not rise or indication of Top Heater or Bottom Heater temperature is not stable.	The thermocouple or compensating lead wire may be burnt out.	Check if each problem is solved.
	Input terminals may not be securely connected.	
	Check whether the polarity of thermocouple or compensating lead wire is correct.	
	The heater may be burnt out or may not be connected securely.	
	The electromagnetic switch may break.	
	There may be equipment that interferes with or makes noise near the controller.	Keep BOC-600 clear of any potentially disruptive equipment.
[] is indicated on the Top or Bottom Heater Temperature Display.	The thermocouple or compensating lead wire may be burnt out.	Check each problem is solved.
	Input terminals may not be securely connected.	
[E r] is indicated on the Top Heater Temperature Display.	This is displayed when data reading/writing is not being carried out normally due to a defective internal memory or noise.	Please contact our agency or us.

***** Inquiry *****

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

(e.g.)

- Model ----- BOC-620-2R/E
- Serial number ----- No. 114F05000

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

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