



Clean Oven

DE411/611

DT411/611

Instruction Manual

First Edition

- Thank you for choosing DE411/611 and DT411/611 series Clean Ovens from Yamato Scientific Co., Ltd.
- This product is not intended for medical applications. For laboratory drying and sterilization use only.
- For proper equipment operation, please read this instruction manual thoroughly before use. Always keep equipment documentation safe and close at hand for convenient future reference.

Warning: Read instruction manual warnings and cautions carefully and completely before proceeding.

**Yamato Scientific America Inc.
Santa Clara, CA**

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1. SAFETY PRECAUTIONS

Explanation of Symbols

A Word Regarding Symbols

Various symbols are provided throughout this text and on equipment to ensure safe operation. Failure to comprehend the operational hazards and risks associated with these symbols may lead to adverse results as explained below. Become thoroughly familiar with all symbols and their meanings by carefully reading the following text regarding symbols before proceeding

 **Warning** Signifies a situation which may result in serious injury or death (Note 1.)

 **Caution** Signifies a situation which may result in minor injury (Note 2) and/or property damage (Note 3.)

(Note 1) Serious injury is defined as bodily wounds, electrocution, bone breaks/fractures or poisoning, which may cause debilitation requiring extended hospitalization and/or outpatient treatment.

(Note 2) Minor injury is defined as bodily wounds or electrocution, which will not require extended hospitalization or outpatient treatment.

(Note 3) Property damage is defined as damage to facilities, equipment, buildings or other property.

Symbol Meanings



Signifies warning or caution.
Specific explanation will follow symbol.



Signifies restriction.
Specific restrictions will follow symbol.



Signifies an action or actions which operator must undertake.
Specific instructions will follow symbol.

1. SAFETY PRECAUTIONS

Symbol Glossary

Warning



General Warning



Danger!: High Voltage



Danger!: Extremely Hot



Danger!: Moving Parts



Danger!: Blast Hazard

Caution



General Caution



Caution: Shock Hazard!



Caution: Burn Hazard!



Caution: Do Not Heat Without Water!



Caution: May Leak Water!



Caution: Water Only



Caution: Toxic Chemicals

Restriction



General Restriction



No Open Flame



Do Not Disassemble



Do Not Touch

Action



General Action Required



Connect Ground Wire



Level Installation Required



Disconnect Power



Inspect Regularly

1. SAFETY PRECAUTIONS

Warnings and Cautions

Warning



NEVER operate equipment near combustible gases/fumes.

Do not install or operate DE/DT series unit near flammable or explosive gases/fumes. Unit is NOT fire or blast resistant. Negligent use could cause a fire/explosion. See "List of Hazardous Substances" (P.64).



ALWAYS ground equipment.

Always ground equipment properly to avoid electric shock.



DO NOT operate equipment when abnormalities are detected.

If smoke or unusual odors begin emitting from unit, or if any other abnormalities are detected, terminate operation immediately, turn off main power switch (Earth Leakage Breaker - "ELB") and disconnect power cable. Continued operation under such conditions may result in fire or electric shock.



DO NOT operate equipment with bundled or tangled power cable.

Operating unit with the power cable bundled or otherwise tangled may cause power cable to overheat and/or catch fire.



DO NOT damage power cable.

Damaging the power cable by forcibly bending, pulling or twisting may cause fire or electric shock to the operator.



NEVER process explosive or combustible substances.

Attempting to process/use explosive or combustible substances in/near unit may cause explosion or fire. See "List of Hazardous Substances" (P.64).



NEVER disassemble or modify equipment.

Attempting to dismantle or modify unit in any way, may cause malfunction, fire or electric shock.



DO NOT touch hot surfaces.

Some surfaces on this unit become extremely hot during operation. Exercise vigilance in order to avoid getting burned.



Caution



DO NOT operate equipment during thunderstorms.

In the event of a thunderstorm, terminate operation and turn off main power switch (ELB) immediately. A direct lightning strike may cause damage to equipment, or result in fire or electric shock.

2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

1. Choose an appropriate installation site.

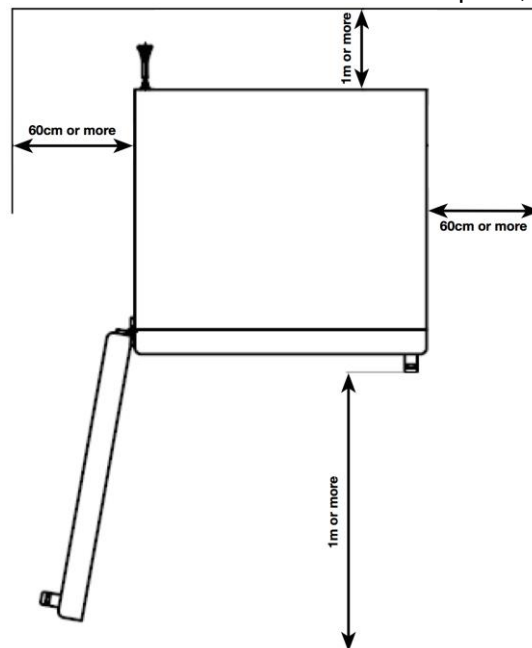


DO NOT install unit:

- where flammable or corrosive gases/fumes will be generated.
- where ambient temperature will exceed 35°C, will fall below 5°C or will fluctuate.
- in excessively humid or dusty locations.
- where there is constant vibration.
- where power supply is erratic.
- in direct sunlight or outdoors.



Install DE/DT series unit in a location with sufficient space, as specified as below.



2. Install on a level surface.



Install unit on level and even surface. Failure to do so may cause abnormal vibrations or noise, resulting in possible complications and/or malfunction.



Approximate weights:

DE/DT411: approx. 200kg DE/DT611: approx. 270kg

Handle unit with care. Transportation and installation should always be done by two or more people.

3. Install in a safe location.



In the event of an earthquake or other unforeseen incident, equipment may unexpectedly shift or fall, causing injury. Taking preventative steps to install unit in a safe location, away from room access doors and out of harm's way, is strongly recommended.

4. Remove protective caster covers with care.



Units are delivered with protective coverings (gray cover tubes) on casters. Gently remove them using a utility knife, exercising care not to damage the casters or inflict personal injury.

2. PRE-OPERATION PROCEDURES

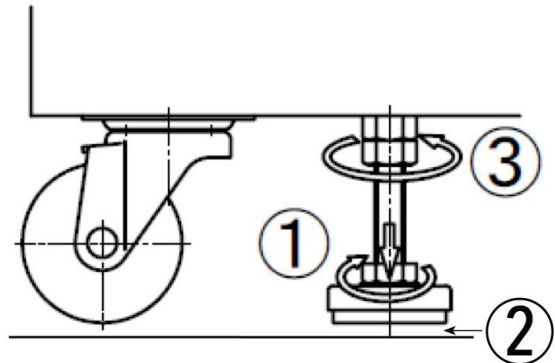
Installation Precautions & Procedures

5. Position adjustable leveling feet.

- ❗ Position the 2 (two) adjustable leveling feet, located on the undercarriage of DE/DT units.

After unit installation is complete, position the adjustable leveling feet using the following procedure:

- 1) Rotate leveling feet down until unit stands securely on the floor.
- 2) Check for gaps between floor and 4 (four) contact points (e.g. the 2 'two' front leveling feet and the 2 'two' rear casters).
- 3) Once unit is secure, tighten both leveling feet stop nuts firmly against the topmost nut to prevent leveling feet from turning under vibration.



6. Check stability.

- ❗ Unit may tip over or fall, causing injury or death during an earthquake or other unforeseen incident. Be sure to stabilize unit properly (adjustable leveling feet securely positioned, etc.) to assure safe operation and a safe work area.

7. Install in a well-ventilated area.

- ⊘ Install unit so that side panel heat vents (see P.8 for location) are unobstructed and allowed to sufficiently diffuse heat. Failure to do so may result in excessive temperatures inside the unit control panel, causing possible degraded CPU board performance, malfunction or fire. See installation specifications above.

8. Install in a dry location.

- ⊘ Install unit where it will be free from liquid spray and other moisture. Failure to do so may result in control mechanisms becoming wet, causing malfunction, electrical shock and/or fire.

9. Install in a location free of flammables and explosives.

- ⊘ Never install near flammables or explosives. Unit is NOT fire or blast resistant. Simply switching the main power switch (ELB) "ON" or "OFF" can produce a spark, which could relay during operation, causing a fire or explosion when near flammable or explosive fluids, chemicals or gases/fumes. See "List of Hazardous Substances" (P.64).

10. Connect to a proper power supply terminal.

- ❗ Connect power cable to a suitable facility outlet or terminal, according to the following electrical requirements.

Power requirements:	DE411	AC220V 3 phase	50/60Hz	7.0 A
	DE611	AC220V 3 phase	50/60Hz	10.0A
	DT411	AC220V 3 phase	50/60Hz	10.0A
	DT611	AC220V 3 phase	50/60Hz	14.0A

Standard test conditions with no load should be as follows. Operational voltage range: $\pm 10\%$, Voltage range at which specified performance is guaranteed: $\pm 5\%$, Frequency rating: $\pm 1\%$, Atmospheric pressure range: 86kPa ~ 06kPa, Ambient temperature: 23 ± 5 ; Humidity: $65 \pm 5\%$.

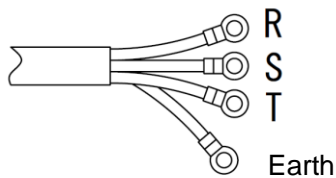
- ① Check the line voltage on outlet or terminal to be used and properly evaluate whether to utilize a line being shared by other equipment. If the unit is not activated by turning on the main power switch (ELB), take an appropriate course of action, such as connecting the unit to a dedicated power source.
- ① Multiple power cables connected to a single outlet may cause unit input voltage to drop, resulting in degraded heating and temperature control performance.

2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

11. Triple phase power cable MUST be connected properly.

- !** DE/DT models are designed to operate in triple phase at 220V AC. Determine phasing capability of facility power supply (single phase vs. triple phase) before attempting to connect power cable. Power connections for these units require specialized knowledge and skill. Contact Yamato dealer or a certified electrician about performing necessary electrical work and power cable connections. Electrical work and connections performed by anyone other than a qualified technician may result in malfunction, fire or electric shock.



Core color	Wiring on the distribution board
Red	Phase R
White	Phase S
Black	Phase T
Green	Earth

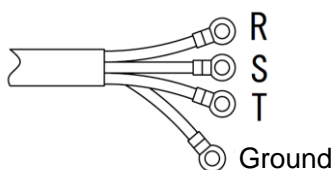
If three-phase (R, S, T) connection is configured incorrectly, "fan error" will be displayed when unit is powered on and fan motor will not rotate. In this event, change any two of the three wires. Error will clear and fan motor will operate normally. Confirm that differential pressure gauge indicator is beyond the halfway point and in the green zone.

12. Handle power cable with care.

- ⊘** Never operate unit with power cable bundled or tangled; and do not modify, bend, forcibly twist or pull on power cable. Doing so may cause fire and/or electrical shock.
- ⊘** Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects. Doing so may cause fire and/or electrical shock.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, be damaged and/or catch fire, which may result in electric shock.
- !** Turn off main power switch (ELB) immediately and disconnect from facility terminal or outlet, if power cable becomes partially severed or damaged in any way. Failure to do so may result in fire or electric shock. Contact a local dealer or Yamato sales office for assistance in replacing power cable if it is damaged.
- !** Always connect power cable to appropriate facility outlet or terminal.

13. Ground wire MUST be connected.

- ⚡** Grounding to Electrical Equipment Technical Standards, Section 19, class D (Grounding Resistance Max. 100Ω) is required in Japan when no grounding terminal is provided. Contact a local dealer, electrician, or Yamato Sales office for location-specific electrical requirements.
- !** Connect terminals securely to facility terminal or to an appropriate connector.
- Plugs and connectors are not included with this unit. Ground unit properly to facility outlet or terminal as required.



Core color	Facility
Red	Phase R
White	Phase S
Black	Phase T
Green	Earth

- ⊘** Never connect ground wire to gas lines, water pipes, telephone grounding lines or lightning rods. Doing so may result in fire or electrical shock.

2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

14. DO NOT disassemble or modify.



Attempting to disassemble or modify this unit in any way may result in malfunction, fire or electric shock.

15. Chamber rack installation and sample placement.



Install rack guides in desired position inside chamber before initial use.

Placing samples directly on bottom chamber surface may overheat samples, cause spills or lead to other mishaps. Temperature control may likewise become inaccurate, causing malfunction, fire or other equipment damage.

Always place samples on supplied chamber racks only; never on bottom chamber surface.

Use optional basket-type racks for processing smaller items (See P.60).

16. Exhaust precautions.



When leaving exhaust damper open for ventilation during operation, removing cover from the intake port is recommended

Remove the three screws from port cover at the right side of unit and remove.

Store the screws and intake port for safekeeping and later use.

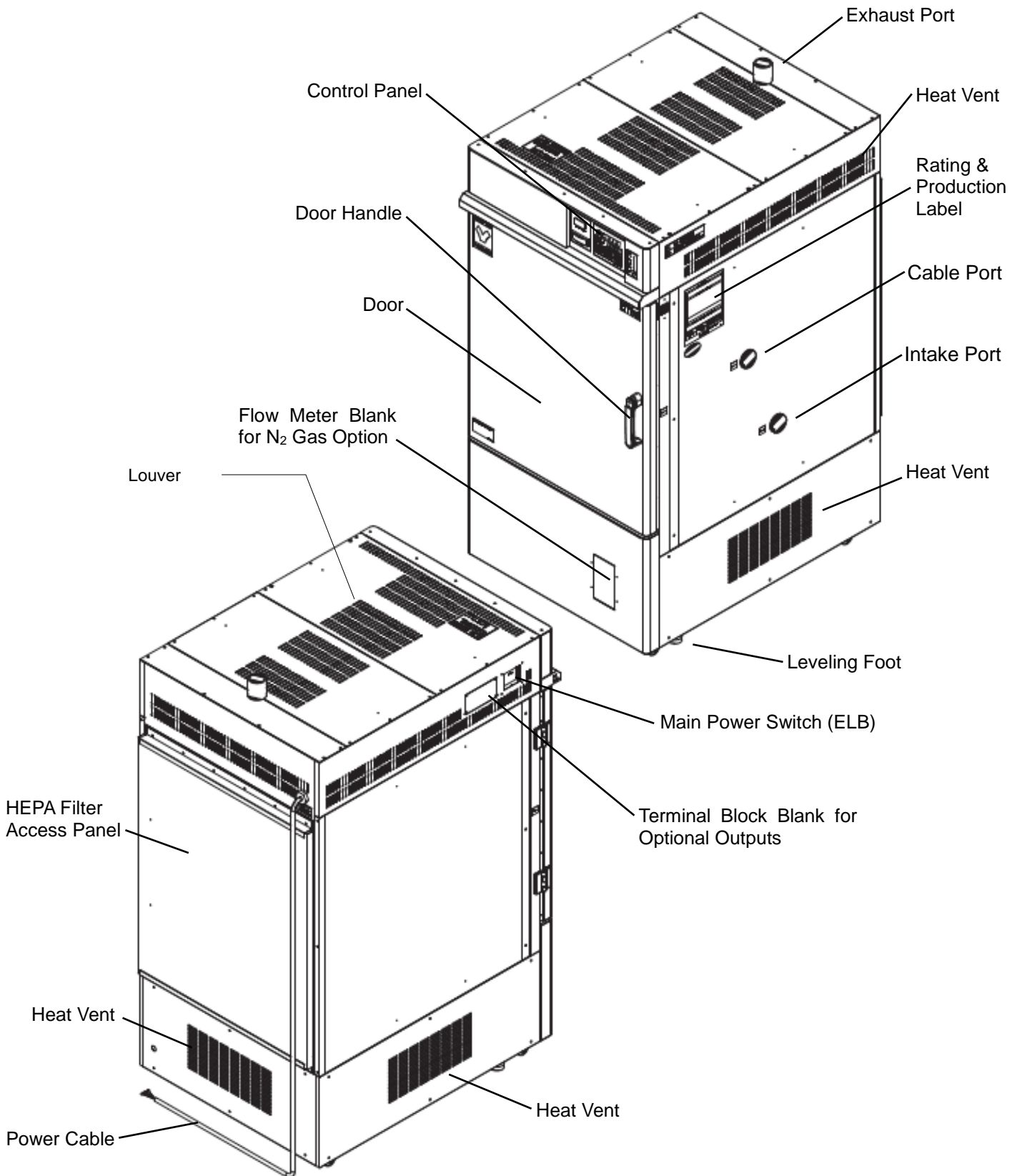
Before using exhaust damper for ventilated operation, take proper measures to assure adequate work area ventilation. Failure to do so may cause excessive work area temperatures due to heat from exhaust. Likewise, smoke and other harmful fumes may be emitted into work area from samples in process. Implement proper ventilation measures, such as by installing an exhaust hood or by running a proper duct from the exhaust port.

Exhaust port diameter is 61mm.

3. COMPONENT NAMES & FUNCTIONS

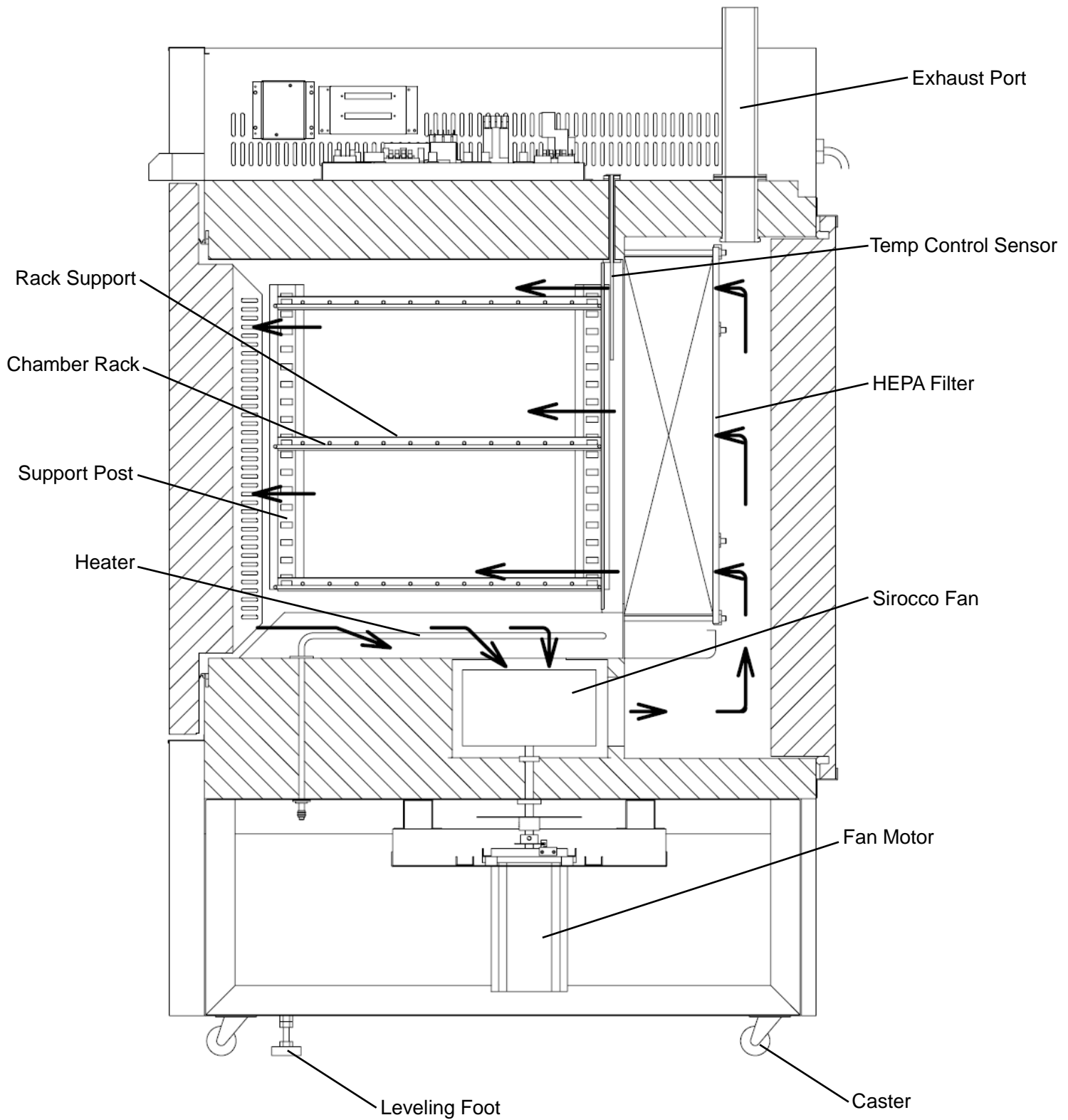
Main Unit

Exterior view



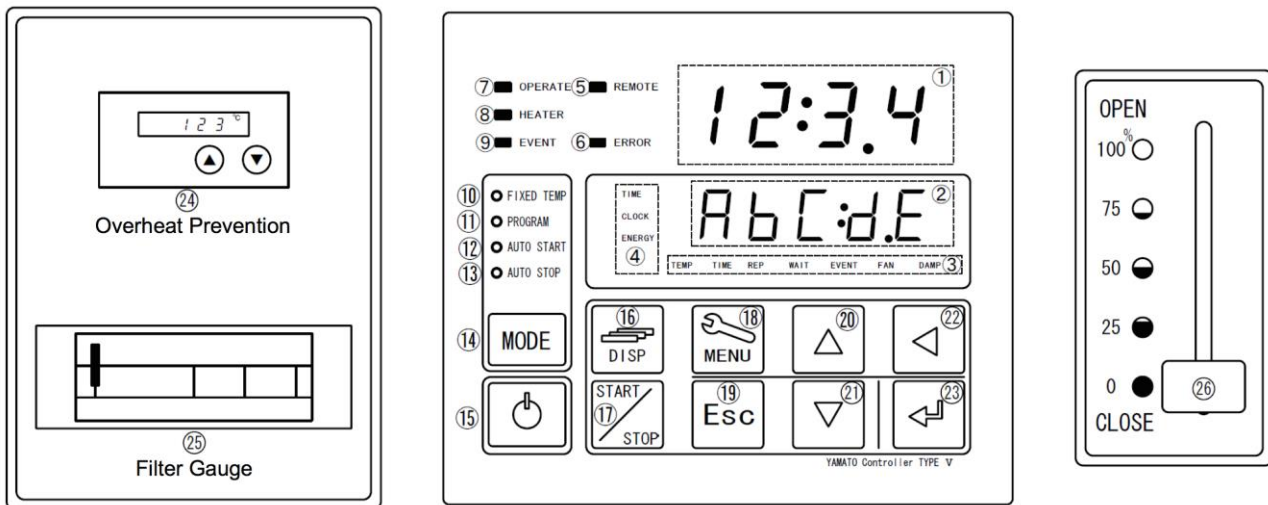
3. COMPONENT NAMES & FUNCTIONS

Interior Structure



3. COMPONENT NAMES & FUNCTIONS

Control Panel



No	Name	Description
1	Upper Display	Readout for chamber temperature, error code, etc.
2	Lower Display	Readout for temperature setting, clock, timer, etc
3	Function Indicator Lamps	Illuminates (one or more) to show which function is currently running or active
4	Mode Indicator Lamps	Illuminates (one at a time) to show which mode is currently running.
5	REMOTE Indicator Lamp	Illuminates while remote comm (optional item) transmission is in progress.
6	ERROR Indicator Lamp	Illuminates when an error has occurred.
7	OPERATE Indicator Lamp	Illuminates while in operation. Flashes in operation standby mode.
8	HEATER Indicator Lamp	Illuminates when heaters are on and drawing power.
9	EVENT Indicator Lamp	Illuminates when event output (optional item) is transmitted.
10	FIXED TEMP Indicator Lamp	Illuminates while constant temperature operation is in progress.
11	PROGRAM Indicator Lamp	Illuminates while programmed operation is in progress. Flashes while entering program settings.
12	AUTO START Indicator Lamp	Illuminates while auto start operation is in progress.
13	AUTO STOP Indicator Lamp	Illuminates while auto stop operation is in progress.
14	MODE key	Press to switch between operation modes, ⑩~⑬ on control panel.
15	POWER key	Press and hold to switch between unit idle and unit standby.
16	DISPLAY key	Press to switch between monitoring options in lower display.
17	START/STOP key	Press to start or stop an operation.
18	MENU key	Press to switch between setting options.
19	ESCAPE key	Press to return to previous menu without finalizing settings
20	▲ (Up) key	Press to increase setting value incrementally. Press and hold to increase perpetually.
21	▼ (Down) key	Press to decrease setting value incrementally. Press and hold to decrease perpetually
22	◀ key	Press to move cursor left.
23	ENTER key	Press to finalize setting items
24	Independent Overheat Prevention Device	Set device to keep unit from exceeding a predetermined temperature.
25	Filter Gauge	HEPA filter monitoring gauge
26	Damper Lever	Damper aperture adjustment mechanism

4. OPERATION PROCEDURE

Prior Confirmation

1. Check power supply and ground wire.



Confirm unit power cable is connected to a proper power source and grounded.

2. Check main power switch (ELB).



Confirm that ELB functions properly.
See "Maintenance Procedures" (P.52).
Check ELB performance once a month or before extended perpetual operation.
Current time shows in control panel lower display when ELB is ON (|).

3. Check Independent Overheat Prevention Device.



Confirm that IOPD temperature is set 20°C above unit temperature setting.
Check IOPD performance before extended operations. See "Independent Overheat Prevention Device" (P.45).

4. Check exhaust damper aperture.



Confirm that damper aperture is set properly. Close exhaust damper completely if ventilation is not required.

4. OPERATION PROCEDURE

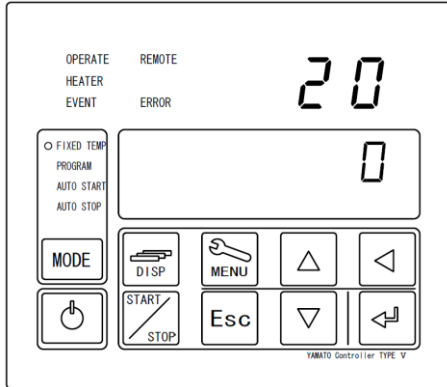
Setting Date & Time

The backup battery installed in DE/DT series units, is a wear item and has an estimated life of approximately 5 years. Replacing battery within the 5-year lifespan is recommended.

① Contact a local dealer or Yamato sales office to request a replacement battery. If unit has program data in memory, backup these settings before replacing backup battery. See P.42 of this manual for details.

To set the current date & time subsequent to backup battery replacement, follow the steps below.

1 Turn on power.



Turn ON the main power switch (ELB), located on the right panel of the DE/DT series units.

Lower display on the control panel will show the time. This indicates that the machine is in "idle".

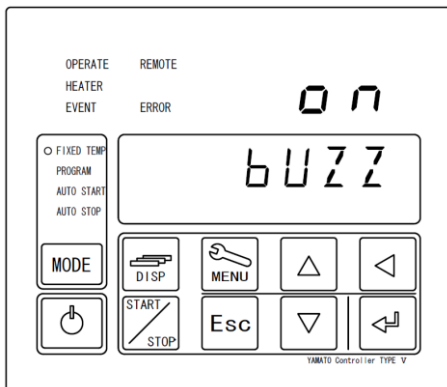
Press and hold to display the standby screen.

Upper display shows current temperature in the chamber, while lower display shows current temperature setting. This indicates that machine is in "standby".

This indicates that machine is in "standby".

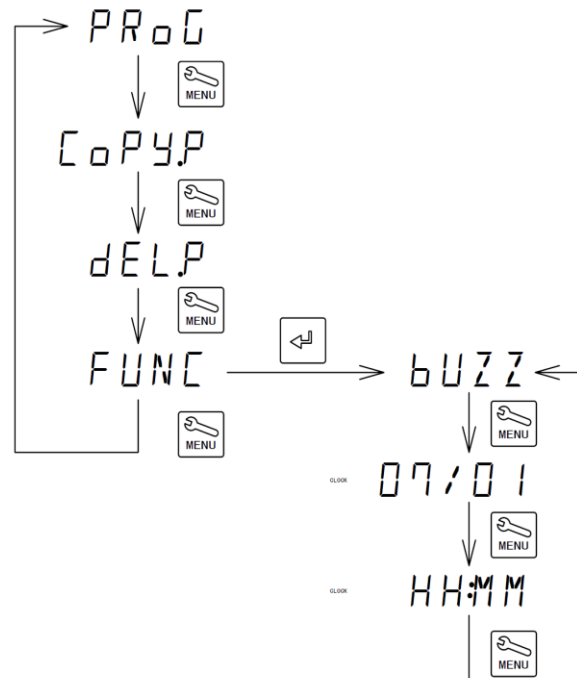
Fan begins running (runs when door is closed and stops whenever door is opened).

2 Go to date/time setting menu.



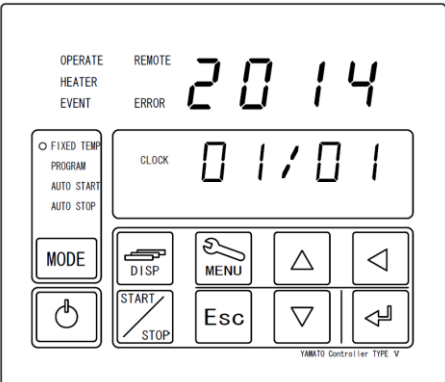








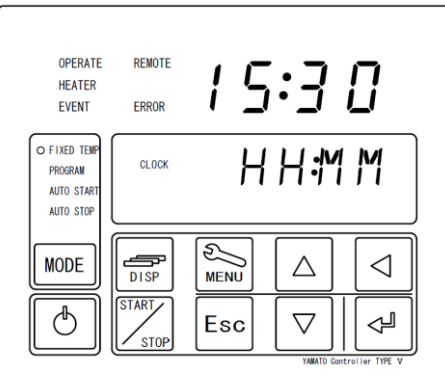







1) Press repeatedly until *FUNC* is shown in lower display. Press .

2) Press to bring up year in upper display and month/day/time in lower display. Clock indicator lamp flashes.

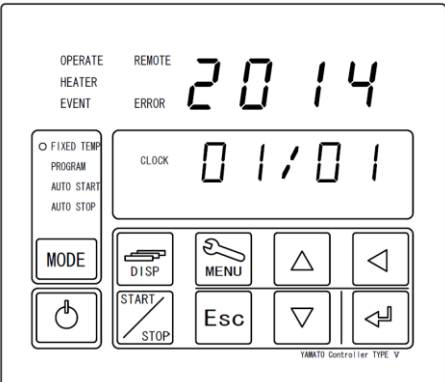








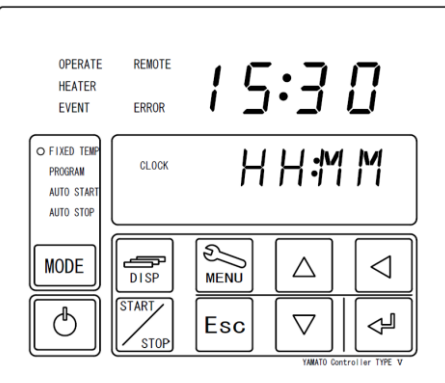









4. OPERATION PROCEDURE

Setting Date & Time

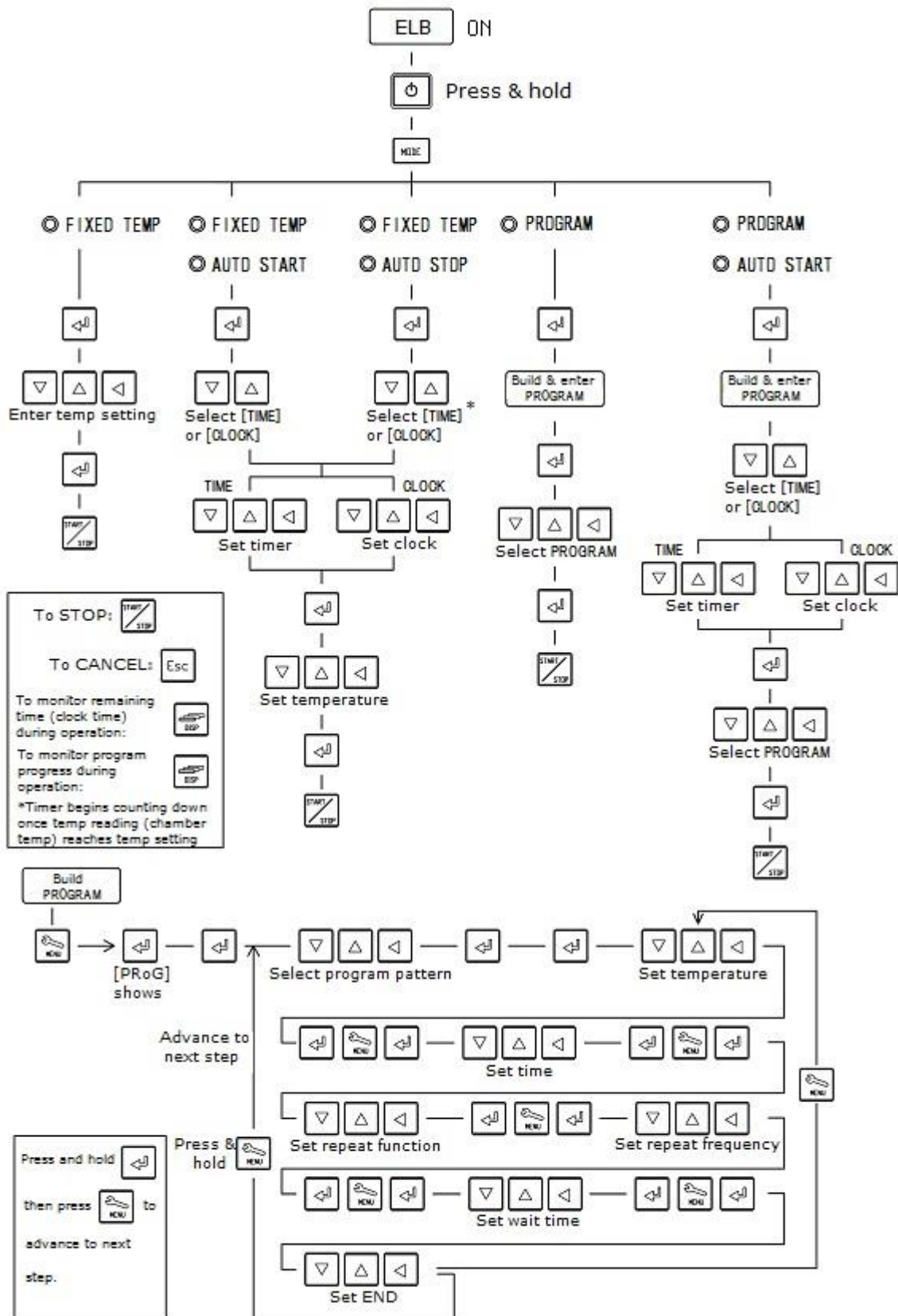
<p>3 Set the date.</p> 	<ol style="list-style-type: none"> 1) Press . 2) Set the current year using   and press . 3) Set month/date using   and press . <p>★ Press  to move cursor position.</p>
<p>4 Set clock.</p> 	<ol style="list-style-type: none"> 1) Press . 2) Press  and set clock using  . <p>Press .</p> <p>★ Enter time using 24-hour (military time) system. ★ Press  to move cursor position.</p> <ol style="list-style-type: none"> 3) Press  twice to restore initial screen once setting is completed.

Buzzer function selection

<p>3 Set the date.</p> 	<ol style="list-style-type: none"> 4) Press . 5) Set the current year using   and press . 6) Set month/date using   and press . <p>★ Press  to move cursor position.</p>
<p>4 Set clock.</p> 	<ol style="list-style-type: none"> 4) Press . 5) Press  and set clock using  . <p>Press .</p> <p>★ Enter time using 24-hour (military time) system. ★ Press  to move cursor position.</p> <ol style="list-style-type: none"> 6) Press  twice to restore initial screen once setting is completed.

4. OPERATION PROCEDURE

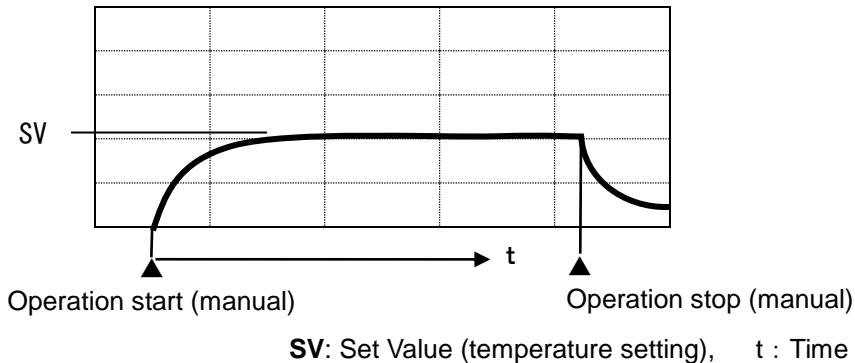
Mode & Function Flow



4. OPERATION PROCEDURE

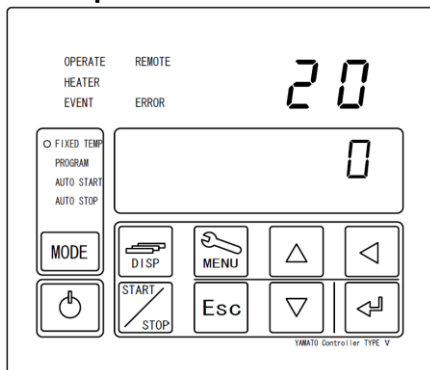
Constant Temperature Operation

FIXED TEMP (constant temperature) mode runs DE/DT unit at a constant selected temperature until START/STOP key is pressed, manually terminating operation.



Setting constant temperature mode.

1 Turn on power

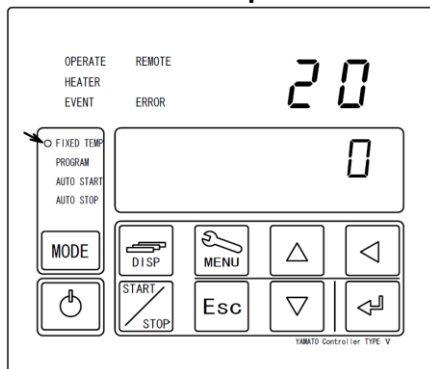


Turn ON (|) main power switch (ELB) (idle).

Press and hold to turn on control panel power. (Standby)

Current temperature reading is shown in upper display, Temperature setting is shown in lower display. Fan begins running (runs when door is closed and stops whenever door is opened).

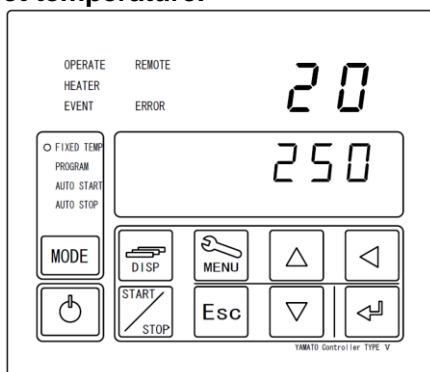
2 Select constant temperature mode.



Press (repeatedly if needed) until FIXED TEMP lamp lights.

- ★ Fixed Temperature mode is factory default. Once mode has been changed, the last mode run will be selected on subsequent startups.

3 Set temperature.

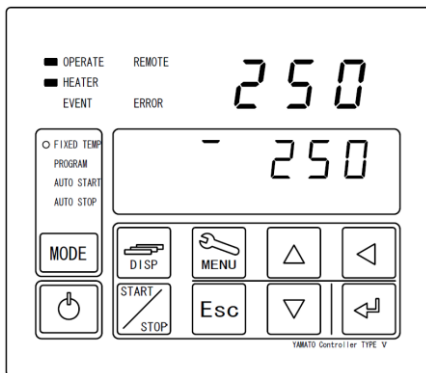
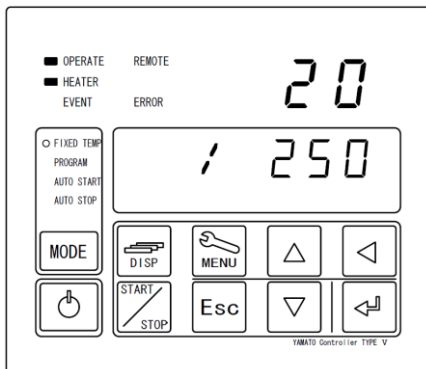



- 1) Press . Changeable digits flash in lower display.
 - 2) Change digit positions using and increase or decrease value using .
- Operating temperature ranges:
 DE411/611: 0~260°C
 DT411/611: 0~360°C
- 3) Press when temperature setting has been entered.

4. OPERATION PROCEDURE

Constant Temperature Operation

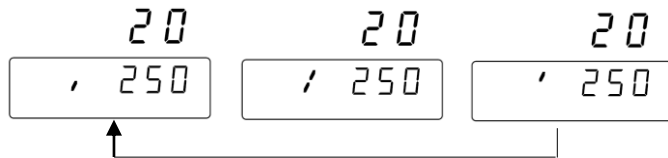
4 Start operation.



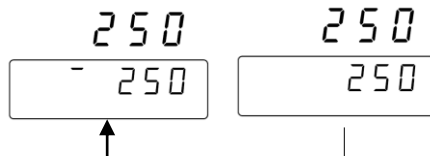
Press  to start operation.

OPERATE and HEATER lamps light and temperature begins building.

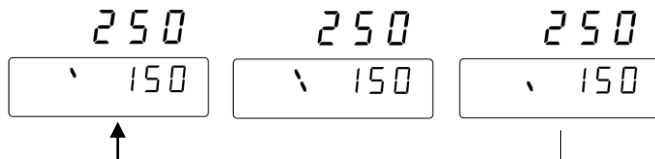
★ Lower display in heat build phase:



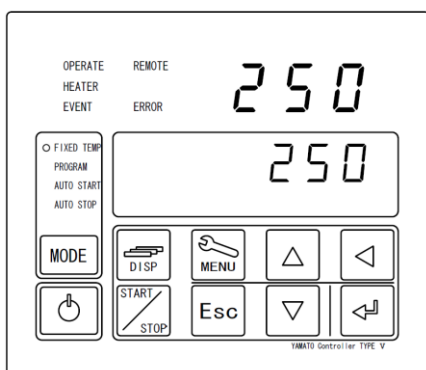
★ Lower display in temperature stabilization:





★ Lower display in cooling phase:




5 Pause/stop operation



Press  to manually terminate operation.

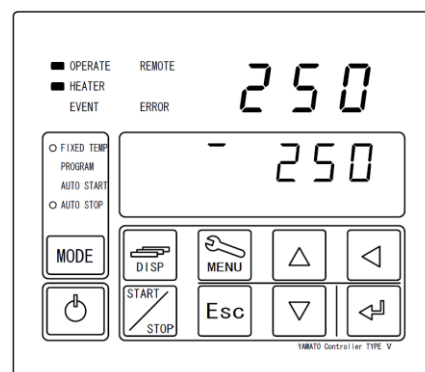
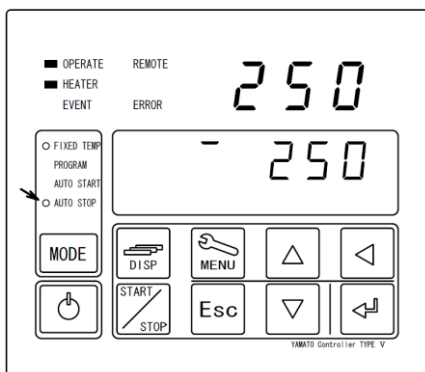
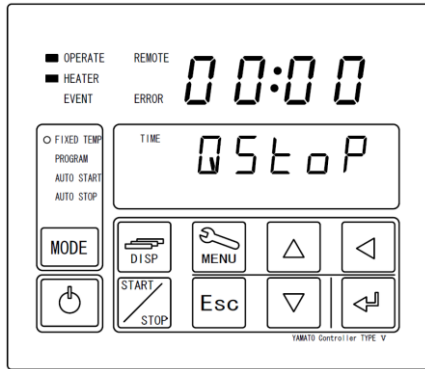
Start screen will be restored. Press  to begin operation once again, if desired.

★ Fan motor continues running regardless of whether operation is stopped. Press and hold  to turn off control panel and stop fan.

4. OPERATION PROCEDURE

Constant Temperature + Quick Auto Stop Operation

6 Set timer

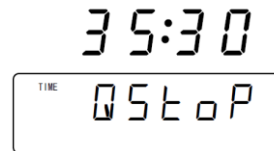


The quick auto stop function is used to automatically stop constant temperature operation at a certain time (by clock) or after a desired duration (by timer). **(decided during operation).**

- 1) Press **MODE** with constant temperature operation in progress.
- 2) **QStoP** is shown in lower display. "TIME" lamp (top-left in lower display) flashes.
- 3) Select **TIME** (timer) or **CLOCK** using **▲** **▼** and press **↵**.
- 4) Set **TIME** (setting range: 0~99hr : 59min) or **CLOCK** (24-hour time system) in upper display and press **↵**.

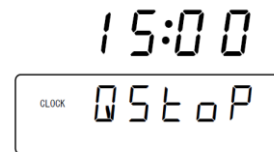
Example 1. Quick Auto Stop function set to timer:

Operation stops automatically 35 hours and 30 minutes **after temperature setting is reached.**



Example 2. Quick Auto Stop function set to clock:

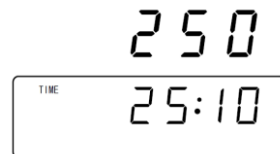
Operation stops automatically at 15:00 (3:00PM).



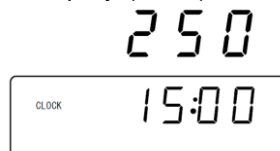
- 5) **AUTO STOP** lamp lights and Auto Stop function begins.

* Press **DISP** at any time during operation to monitor remaining time in the lower display.

- * Remaining time display (timer):



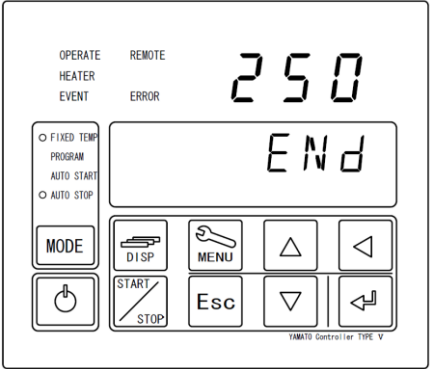

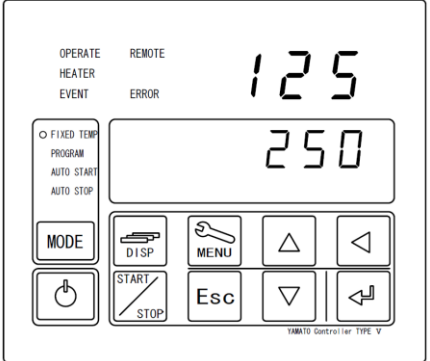

- * Stop time display (clock):



- * Press **DISP** again or wait about 10 seconds for screen to return to initial screen.

4. OPERATION PROCEDURE

Constant Temperature + Quick Auto Stop Operation

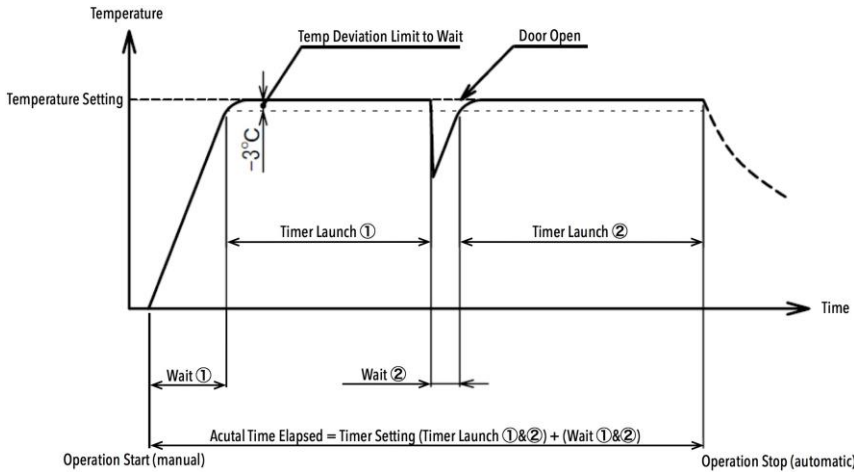
 <p>OPERATE REMOTE HEATER ERROR EVENT</p> <p>25.0</p> <p>END</p> <p>MODE DISP MENU Δ ◀</p> <p>START/STOP Esc ▽ ▶</p> <p>YAMATO Controller TYPE V</p>	<p>6) When timer runs out or when stop time is reached operation stops, lower display reads <i>END</i>.</p> <p>7) Press  to clear <i>END</i> from display.</p>
 <p>OPERATE REMOTE HEATER ERROR EVENT</p> <p>12.5</p> <p>25.0</p> <p>MODE DISP MENU Δ ◀</p> <p>START/STOP Esc ▽ ▶</p> <p>YAMATO Controller TYPE V</p>	<ul style="list-style-type: none">★ When operation stops and <i>END</i> is cleared, start screen is restored.★ Fan motor continues running regardless of whether operation is stopped. Press and hold  to turn off control panel and stop fan motor.

4. OPERATION PROCEDURE

Auto Stop Operation

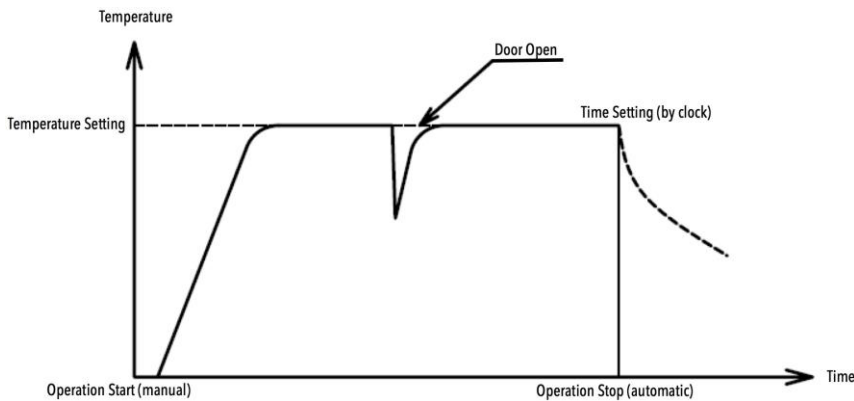
AUTO STOP (Automatic Stop) utilizes timer or clock to automatically stop an operation. Operation must be started manually. See below.

Auto stop mode set to timer:



When auto stop mode is set to the timer, unit enters a wait period, and remains “waiting” without counting down time until chamber temperature is within a set deviation range (-3°C ~ +6°C) of the temperature setting. Countdown begins once chamber temperature is within the deviation range. If temperature drops below or exceeds the deviation range after stabilizing, such as when door is opened, allowing heat to escape; countdown stops and unit once again enters wait period until heat builds to within deviation range once again.

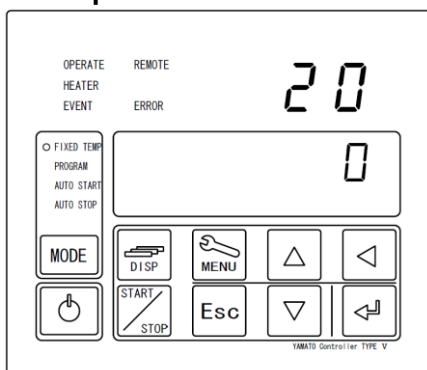
Auto stop mode set to clock:




Wait function does not operate when auto stop mode is set to the clock. Operation stops as soon as clock and set time agree, regardless of when temperature setting is reached. If a power failure occurs while auto stop mode is set to clock, unit will recover operation automatically when power is restored and run until stop time.

Set auto stop mode

1 Turn on power



Turn on (|) main power switch (ELB) (idle).

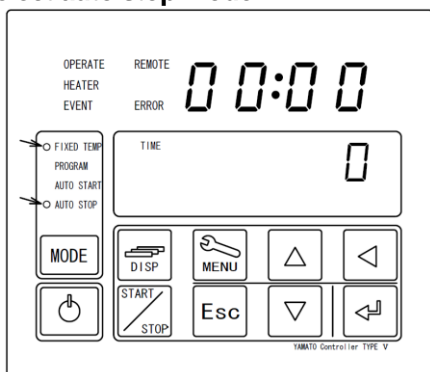
Press and hold  to turn on control power (standby).

Current temperature reading is shown in upper display, Temperature setting is shown in lower display. Fan begins running (runs when door is closed and stops whenever door is opened).

4. OPERATION PROCEDURE

Auto Stop Operation

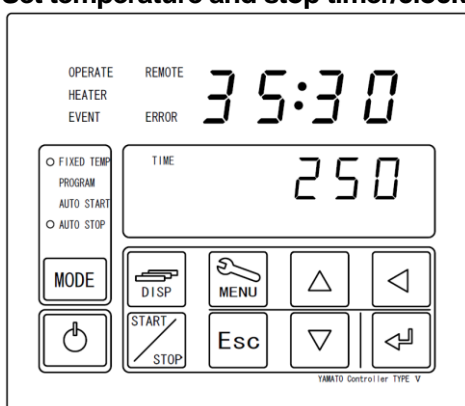
2 Select auto stop mode



Press **MODE** key repeatedly until both FIXED TEMP and AUTO STOP lamps light.

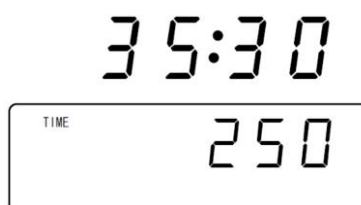
- ★ Fixed Temperature mode is factory default. Once mode has been changed, the last mode run will be selected on subsequent startups.

3 Set temperature and stop timer/clock

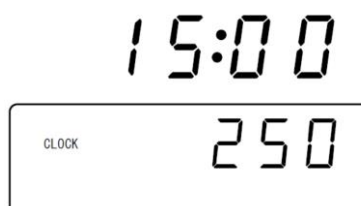


- 1) Press **←**.
- 2) Select stop TIME or CLOCK (lamp in upper-left of lower display) using **△** **▽** and press **←**.
- 3) Set TIME (setting range: 0~99hr : 59min) or CLOCK (24-hour time system) in upper display and press **←**.
- 4) Set temperature in lower display and press **←**.

Example 1. Auto Stop mode set to timer:
Operation stops automatically 35 hours and 30 minutes after 250°C temperature setting is reached.



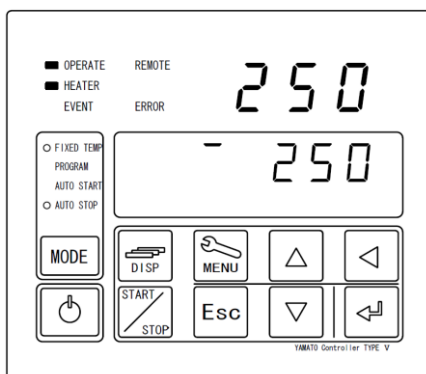
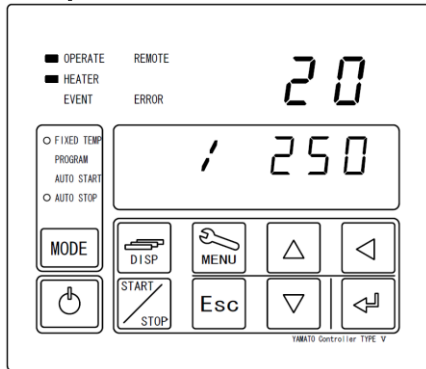
Example 2. Auto Stop mode set to clock:
Operation stops automatically at 15:00 (3:00PM).




4. OPERATION PROCEDURE


Auto Stop Operation

4 Start operation



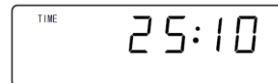
Press  to start operation.

OPERATE and HEATER lamps light and temperature begins building.

★ Press  at any time during operation to monitor remaining time in the lower display.

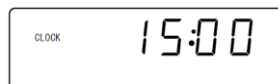
★ Remaining time display (timer):


250



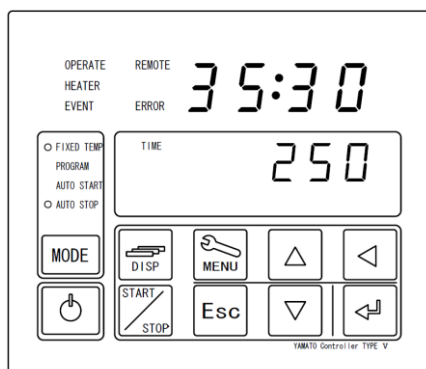
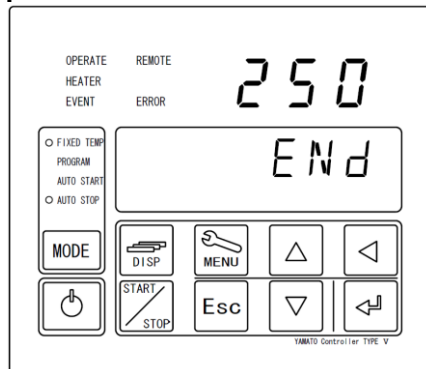
★ Stop time display (clock):

250




★ Press  again or wait about 10 seconds for screen to return to normal reading.


5 Operation end.



1) When timer runs out or when stop time is reached operation stops, lower display reads *END*.

2) Press  to clear *END* from display.

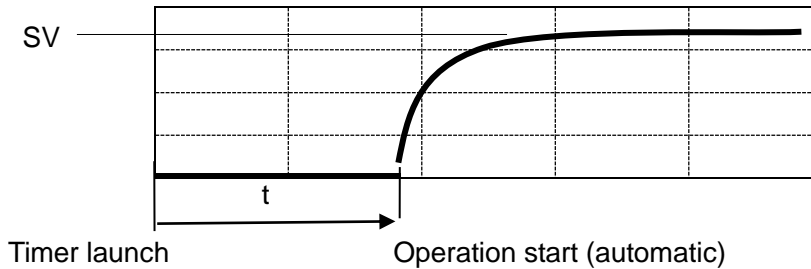
★ When operation stops, and *END* is cleared start screen is restored.

★ Fan continues running regardless of whether operation is stopped. Press and hold  to turn off control panel and stop fan.

4. OPERATION PROCEDURE

Auto Start Operation

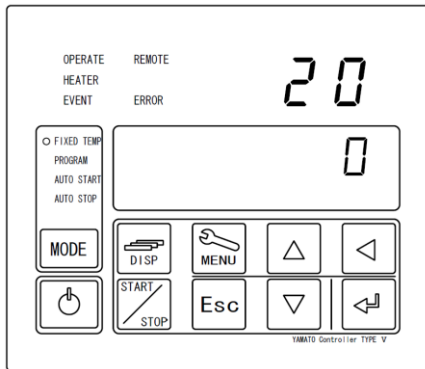
AUTO START (Automatic Start) mode utilizes timer or clock to automatically begin an operation. Operation must be stopped manually.



SV: Temperature setting, t: Auto start time (time)

Set Auto Start mode

1 Turn on power.

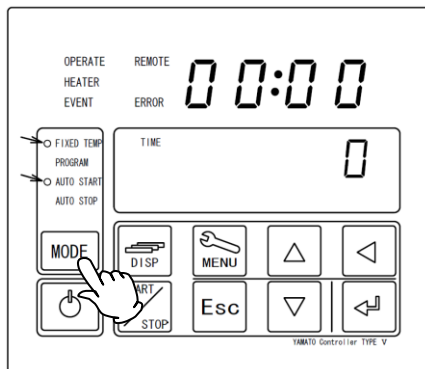


Turn ON (|) main power switch (ELB) located on lower-right side panel of unit. (idle)

Press and hold to turn on control power. (standby)

Current temperature reading is shown in upper display, Temperature setting is shown in lower display. Fan begins running (runs when door is closed and stops whenever door is opened).

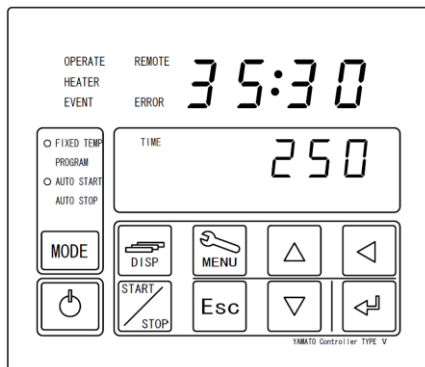
2 Select Automatic Start mode



Press repeatedly until both FIXED TEMP and AUTO START lamps light.

* Constant Temperature mode (FIXED TEMP) is factory default. Once mode has been changed, the last mode run will be selected on subsequent startups.

3 Set temperature and start timer/clock.




- 1) Press .
- 2) Select start TIME or CLOCK (lamp in upper-left of lower display) using and press .
- 3) Set TIME (range: 0~99hr : 59min) or CLOCK (24-hour time system) in upper display and press .
- 4) Set temperature in lower display and press .

4. OPERATION PROCEDURE

Auto Start Operation


Example 1. Auto Start mode set to timer:

Operation automatically begins 35 hours and 30 minutes after  is pressed.

35:30

TIME 250

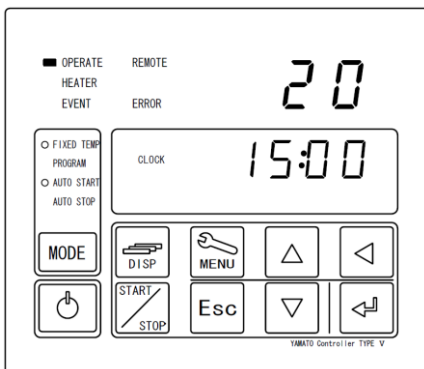
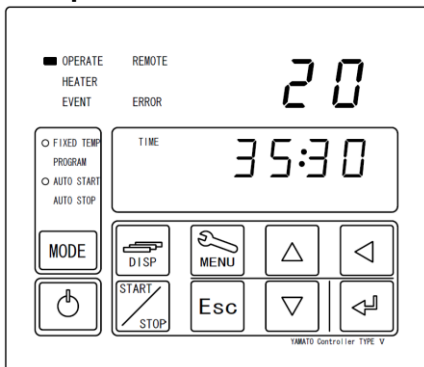
Example 2. Auto Start mode set to clock:


Press  and operation begins automatically at 15:00 (3:00PM).

15:00

CLOCK 250


4 Start operation



- 1) Press  to enter standby mode (wait) until operation begins at the selected time.
 - 2) The OPERATE lamp flashes and lower display will show remaining time until start or time at which operation will start.
- * Upper display shows current chamber temperature, while lower shows remaining wait duration or operation start time. When timer is selected, a countdown to operation begins:


20

TIME 25:37

- * Temperature setting may be confirmed by pressing :

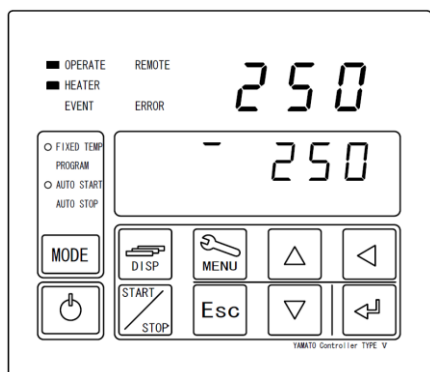
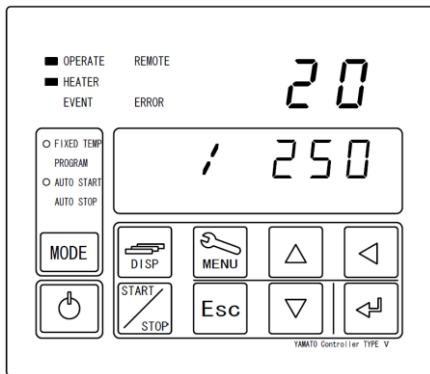
20

250

- * Press  once more to go back to viewing remaining wait duration.

4. OPERATION PROCEDURE

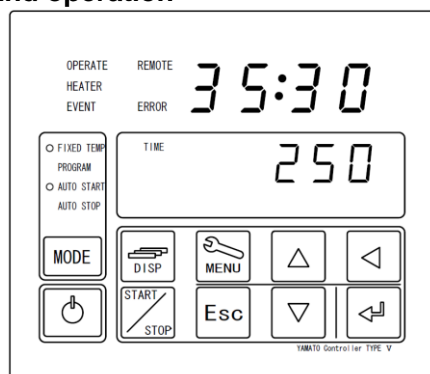
Auto Start Operation





3) When start timer runs out or when clock and start time agree, the OPERATE lamp changes from flashing to lighted; HEATER lamp lights and temperature begins building.

* The quick auto stop function is inoperable during auto start mode.

5 End operation



Press  to manually end operation. Initial screen is restored.

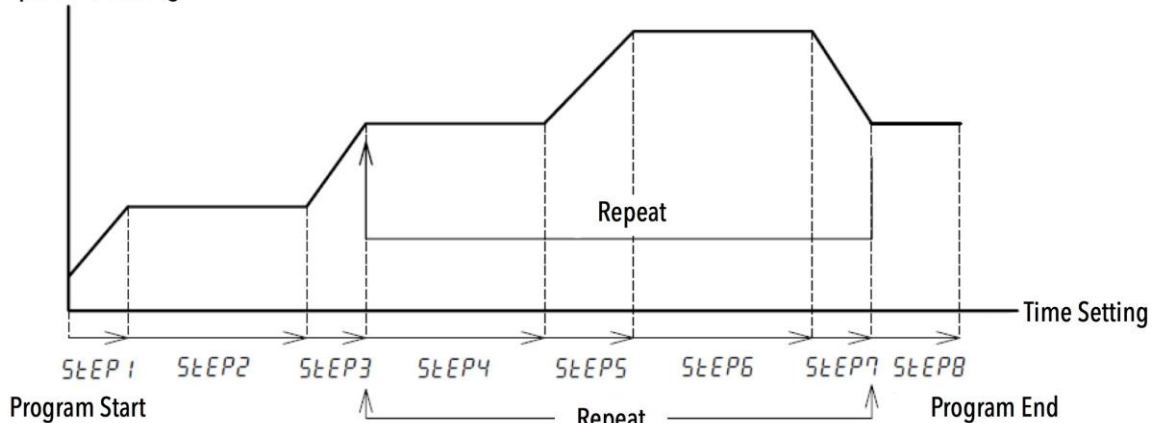
* Fan continues running regardless of whether operation is stopped. Press and hold  to turn off control panel and stop fan.

4. OPERATION PROCEDURE

Programmed Operation

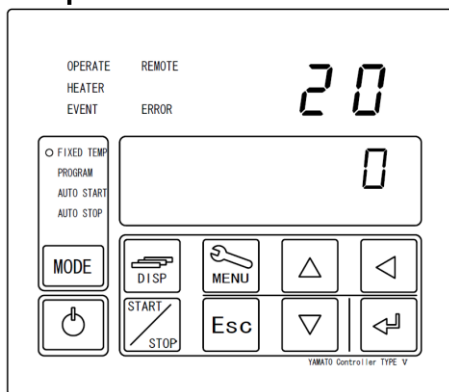
PROGRAM mode runs a combination of times and temperatures in a series of programmed steps as one operation. See below.

Temperature Setting




Running programs

1 Turn power ON



Turn main power switch ON (|) (idle).

Press and hold  to turn control panel power on (standby).

Current temperature reading is shown in upper display, Temperature setting is shown in lower display.

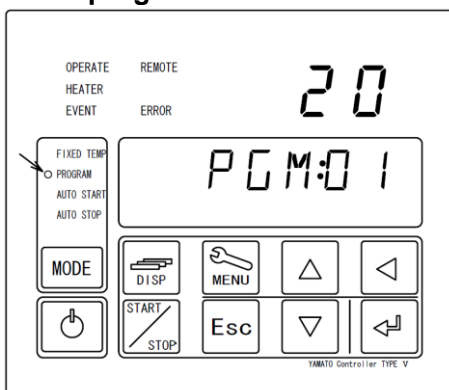
Fan begins running (Runs while door is closed and stops whenever door is opened).


! Programs must be entered prior to starting a programmed operation run.

For details on entering programs, see "Programming Procedure" on P.28

Create as many as 99 programs and steps in total (i.e. 11 programs with a maximum of 9 steps each). Step repeats are not counted in this total.

2 Select program mode



Press  repeatedly until PROGRAM lamp lights.

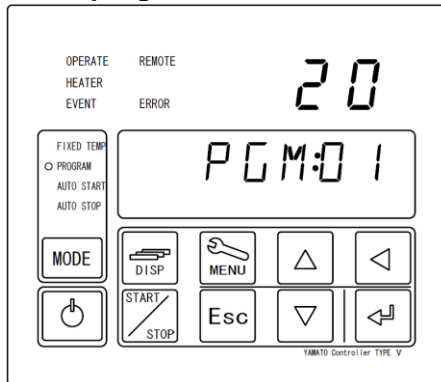
Lower display shows "PCM:XX" ("XX" signifies program number last used. Factory default is "01").

- * Constant Temperature (FIXED TEMP) is factory default mode. Once mode has been changed, the last mode run will be selected on subsequent startups.

4. OPERATION PROCEDURE

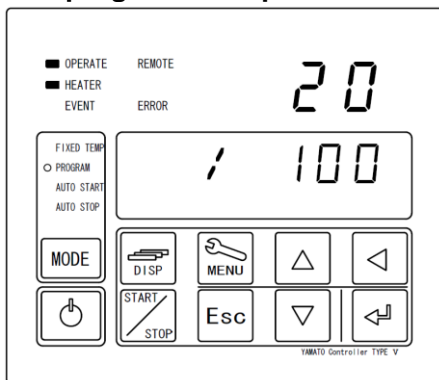
Programmed Operation

3 Select program number



Press . The program number in lower display will begin flashing. Select desired program number using and press .

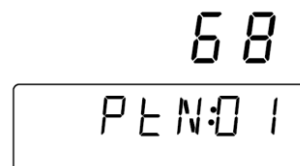
4 Start programmed operation



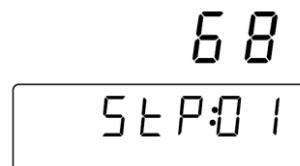
Press to start programmed operation.

- ★ Do not attempt to run a cycle if *END* has not been set at the end step in a program. Confirm whether *END* has been set, if program cycle does not start.
- ★ Operation cannot be started by pressing for program numbers which have not been entered.
- ★ The program pattern number, current step number or remaining operation time may be monitored in the lower display by pressing repeatedly at any time during operation.

- ★ Program pattern monitoring screen:



- ★ Current program step monitoring screen:



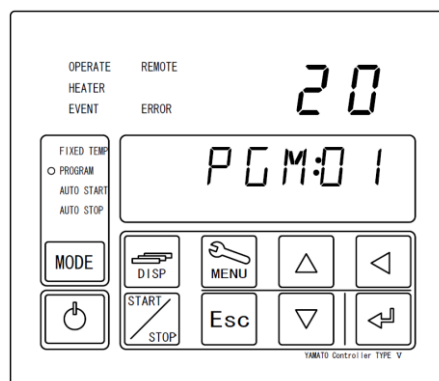
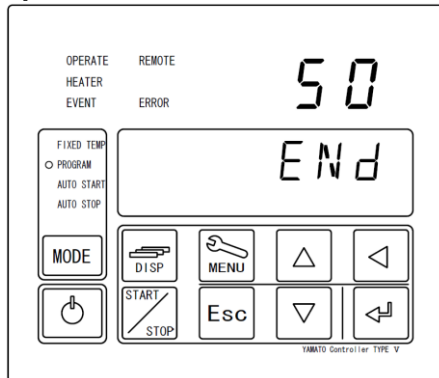
- ★ Remaining time monitoring screen:




4. OPERATION PROCEDURE

Programmed Operation


5 Operation end



1) When selected program cycle ends, lower display shows *END* and operation stops.

2) Clear *END* by pressing .

★ Initial screen is restored.

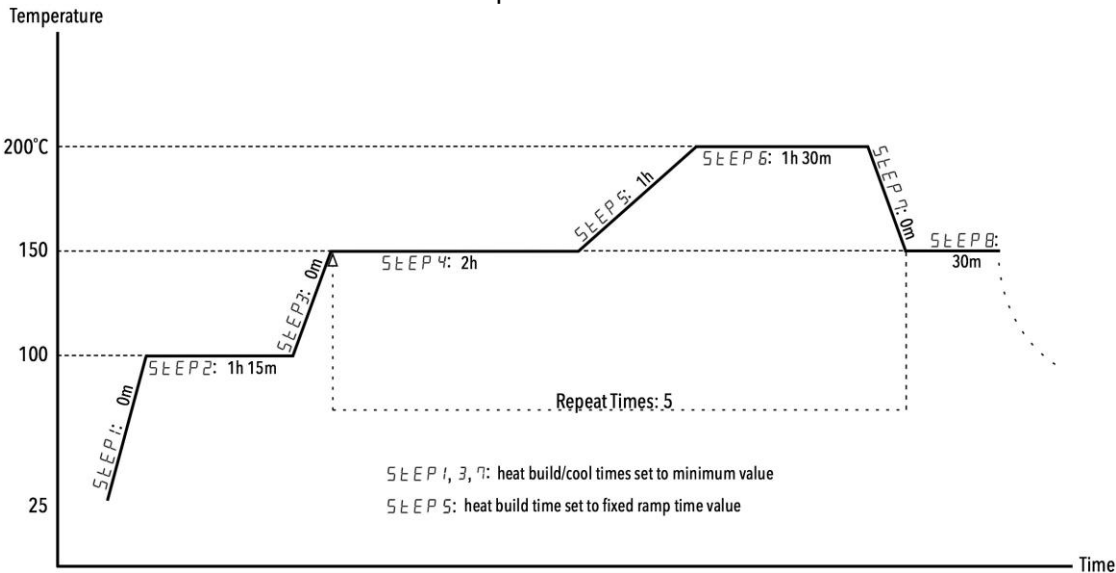
★ Fan continues running regardless of whether operation is stopped. Press and hold  to turn off control panel and stop fan.

4. OPERATION PROCEDURE

Programming Procedure

Sample program

In this example, there are 8 steps in program pattern 2. Steps from 4 to 7 are repeated 5 times and the program ends with step 8.
Note: Steps 4 to 7 are run a total of 6 times.



Pattern No	Step	Set temp.	Set time	Repeat dstn.	Repeat No.	Wait	End
P * * :01	P02: * *	TEMP	TIME	REP(STEP)	REP(COUNT)	WAIT	ENDST
02	01	100	00:00	0	0	ON	OFF
	02	100	01:15	0	0	OFF	OFF
	03	150	00:00	0	0	ON	OFF
	04	150	02:00	0	0	OFF	OFF
	05	200	01:00	0	0	ON	OFF
	06	200	01:30	0	0	OFF	OFF
	07	150	00:00	4	5	ON	OFF
	08	150	00:30	0	0	OFF	ON

- * When time settings on heat building or cooling steps are beyond the heating or cooling capacity (0 minutes in steps 1, 3 & 7 above) of the unit, it will operate at full power for a short time in wait (**ON**) mode until temperature setting has been reached. With wait set to **OFF**, unit will proceed to the next step regardless of whether temperature setting has been reached. Use caution when setting short heating/cooling times.
- * When the time setting on heat building or cooling steps is set longer than unit normally takes build heat or cool, unit will adjust itself to do so within the set timeframe.
- * When wait is set to **ON** for heating or cooling steps in program operation, the process moves on to the next step as soon as temperature is within the wait deviation range (-3~6°C of temp setting). If wait is set to **OFF**, however, the process will proceed to the next step after time setting has passed regardless of whether temperature setting is reached.
- * Once a step temperature has been set with wait **ON**, unit will enter wait mode whenever temperature in the chamber drops below (or exceeds) the temperature deviation range, due to instances such as opening the chamber door, until temperature builds back to within the deviation range (-3~6°C of temp setting). If wait is set to **OFF**, however, the process will proceed to the next step after the set time has passed, regardless of any extreme temperature changes occurring in the chamber.
- * When using the repeat function, programming the operation so that chamber temperature is identical to destination step temperature setting before the repeat executes, is recommended to facilitate smoother transition.
- * Unit heating and cooling capacities may vary depending on environmental and operating conditions. Taking these factors in to consideration before programming is therefore recommended.

4. OPERATION PROCEDURE

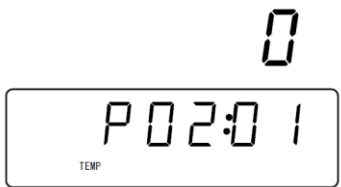






















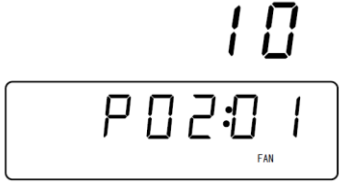


Programming Procedure

The following outlines the procedure for building the example program on P.28:
(This procedure assumes unit is set to factory defaults)

	Screen status	Procedure
I.	<p>OPERATE REMOTE HEATER ERROR EVENT ERROR</p> <p>20</p> <p>150</p> <p>MODE DISP MENU</p> <p>START STOP Esc</p> <p>YAMATO Controller TYPE V</p>	
II.	<p>OPERATE REMOTE HEATER ERROR EVENT ERROR</p> <p>PRoG</p> <p>MODE DISP MENU</p> <p>START STOP Esc</p> <p>YAMATO Controller TYPE V</p>	<p>PRoG flashes.</p>
III.	<p>OPERATE REMOTE HEATER ERROR EVENT ERROR</p> <p>USEd</p> <p>PO 1:0 1</p> <p>MODE DISP MENU</p> <p>START STOP Esc</p> <p>YAMATO Controller TYPE V</p>	<p>PROGRAM lamp flashes.</p> <p> - "USEd" appearing in upper display indicates that steps for selected program have already been entered and finalized.</p> <p> - Last "!" in PO 1:0 →! flashes.</p> <p> - First "!" in PO →! 1 flashes.</p> <p> - Changes "PO 1:0 1" to "PO 2:0 1".</p>
1-1	<p>Enter program pattern 02, STEP 01.</p> <p>---</p> <p>PO 2:0 1</p>	<p>"2" in PO 2:0 1 flashes and upper display shows " - - - -", signifying that program steps have not yet been entered.</p>










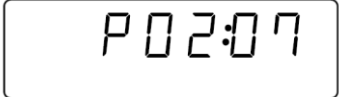


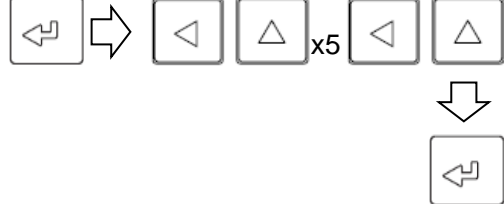



4. OPERATION PROCEDURE

Programming Procedure

1-2		<p>Enter program pattern 02, SLEEP 01.</p>  - TEMP flashes in bottom left of lower display.
1-3		<p>Enter 100 (°C).</p>  - Last "0" in "000" flashes.      
1-4		<p>Enter "00:00" (0 hours and 0 minutes - default).</p>  - TIME flashes in bottom left of lower display.  
1-5		<p>Enter "0" (no repeat destination - default).</p> <p>REP flashes in bottom left of lower display.</p>  
1-6		<p>Enter "0" (no repeats - default).</p> <p>REP lamp flashes.  </p>
1-7		<p>Turn wait function "0n". ("waits" until chamber temp is within -3°C ~ +6°C of temp setting before beginning time countdown - default).</p> <p>WAIT lamp flashes.  </p>
1-8		<p>Set variable fan speed to "10" (Max - default)</p> <p>FAN lamp flashes.  </p>


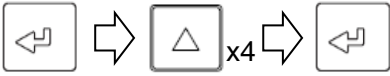

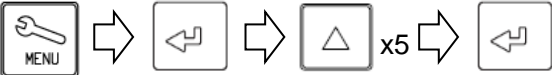





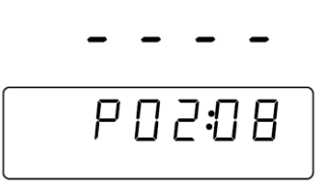

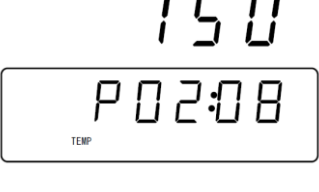
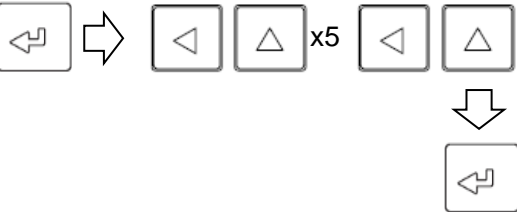
4. OPERATION PROCEDURE

Programming Procedure

<p>1-9</p>		<p>Set "END" setting to OFF (default). (to program next step, set to OFF; to enter current step as final, set to ON)</p> <p>All program lamps flash.</p> 
<p>1-10</p>	<p>STEP 01 setting complete.</p>	<p>Press and hold </p>
<p>2-1</p>		<p>Input program pattern 02, STEP 02.</p> 
<p>STEP02 } STEP03 } STEP04 } STEP05 } STEP06</p>	<p>Enter parameters for STEPS 2 ~ 6 in the same manner as STEP 1 above.</p> <p>Use  to change cursor position</p> <p>and  or  to change parameter values.</p>	<p>* Press  any time while entering program to view remaining available steps. (RESET.P will show in lower display. Remaining steps will show in upper display.)</p>
<p>7-1</p>		<p>Enter program pattern 02, STEP 07.</p>  - TEMP lamp flashes.
<p>7-2</p>		<p>Enter 150 (°C).</p> 
<p>7-3</p>		<p>Enter "00:00" (00 hour 00 minute).</p> <p>Time lamp flashes.  </p>








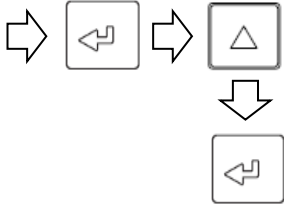
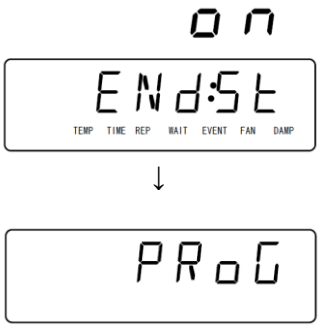


4. OPERATION PROCEDURE

Programming Procedure

<p>7-4</p>		<p>Enter "4" (repeat begins at SLEEP 4)</p> 
<p>7-5</p>		<p>Enter "5" (repeats steps 4 ~ 7 five times) * Repeat count may be set between 1 and 99 or to indefinite setting, "INF" (infinity).</p> 
<p>7-6</p>		<p>Turn wait function "ON". WAIT lamp flashes.  </p>
<p>7-7</p>		<p>Set "END" setting to OFF. All setting lamps flash. Press and hold .</p>
<p>8-1</p>		<p>Enter program pattern 02, SLEEP 08.  - TEMP flashes.</p>
<p>8-2</p>		<p>Enter "150" (°C).</p> 

4. OPERATION PROCEDURE

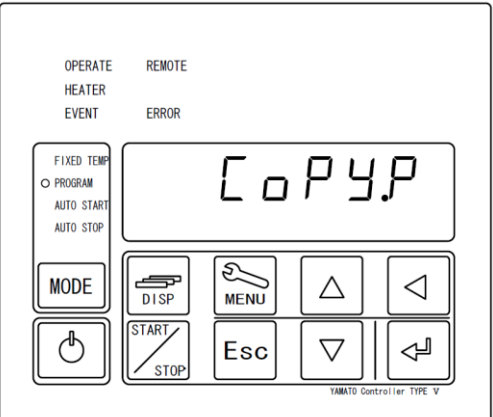


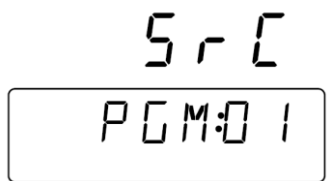



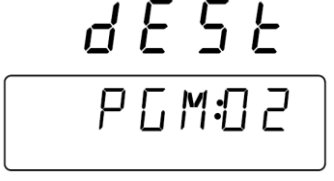



Programming Procedure

8-3		<p>Enter "00:30" (0 hours, 30 minutes) * Entering "INF" on final step makes time setting indefinite (must be stopped manually).</p> 
8-4		<p>Enter "0" (No repeat destination)</p> 
8-5		<p>Enter "0" (No repeats)</p> 
8-6		<p>Set wait function to OFF. Wait lamp flashes.</p> 
8-7		<p>Set "END" setting to ON.  - All program setting lamps flash.</p>  <p>* Always set END to ON in the final step of programs. Programs without END set to ON will not be recognized as a complete program and will not run.</p>

* Duplicating and using the program planning worksheet on P.66. of this manual is recommended.

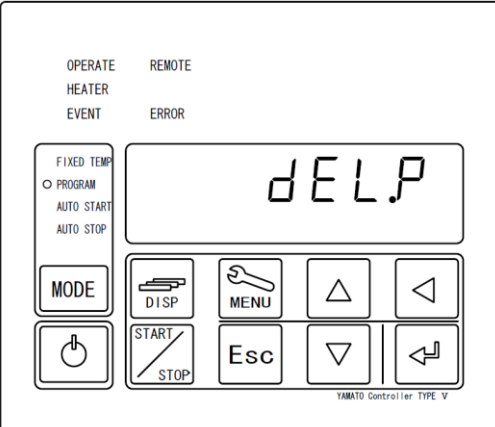









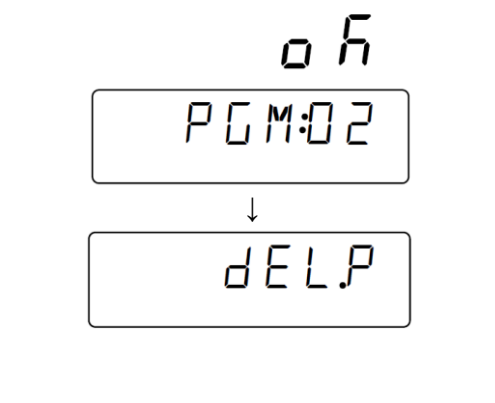
4. OPERATION PROCEDURE

Copying & Deleting Programs

<p>1-1</p>	 <p>OPERATE REMOTE HEATER EVENT ERROR</p> <p>FIXED TEMP PROGRAM AUTO START AUTO STOP</p> <p>MODE</p> <p>DISP MENU</p> <p>START STOP Esc</p> <p>YAMATO Controller TYPE V</p>	<p>★ Copying programs</p> <p>Press  repeatedly until <code>COPY</code> appears, flashing in lower display. Press .</p>
<p>1-2</p>		<p><code>PGM:01</code> shows with the "01" flashing in lower display. Enter the program number to be copied using   and press .</p>
<p>1-3</p>		<p>"dESt" flashes in upper display, while the lowest available program number (i.e. <code>PGM:01</code>) shows with the number flashing in lower display. Enter desired copy destination using   and press . Copied program has been replicated to the selected destination.</p>
<p>1-4</p>	<p style="text-align: center;">↓</p>	<p>Upper display shows "OK" with lower display showing [source program number - copy destination number] (i.e. <code>01-02</code>), and initial copy screen is automatically restored; indicating program has been copied and pasted successfully.</p>

4. OPERATION PROCEDURE

Copying & Deleting Programs

<p>2-1</p>	 <p>OPERATE REMOTE HEATER EVENT ERROR</p> <p>FIXED TEMP PROGRAM AUTO START AUTO STOP</p> <p>MODE</p> <p>DISP MENU</p> <p>START/STOP Esc</p> <p>YAMATO Controller TYPE V</p>	<p>★ Deleting programs</p> <p>Press  repeatedly until <i>dELP</i> shows, flashing in lower display. Press .</p>
<p>2-2</p>		<p><i>PGM:01</i> shows with the "0" flashing in lower display. Select a pattern number to delete using  , or select <i>AL</i> (ALL) using , then press and hold .</p>
<p>2-3</p>		<p>When "<i>dEL</i>" begins flashing in upper display, confirm and finalize by pressing .</p>
<p>2-4</p>		<p>Upper display shows "OK" with lower display flashing the deleted program number (i.e. <i>PGM:02</i>), and initial delete screen is automatically restored; indicating program has been deleted successfully.</p>

4. OPERATION PROCEDURE

Wait Function

When the wait function is set to ON, the system “waits”, without counting down time, until chamber temperature (reading) is within the deviation zone of between -3°C and $+6^{\circ}\text{C}$ of the temperature setting. When time is set to 0 minutes, the system will build heat at full power to reach setting as quickly as possible. When time is set longer than system normally takes to heat or cool to selected temperature, unit will automatically control heating and cooling so that temperature setting is reached (staying within the deviation range) at the time setting.

If chamber temperature drops during temperature stabilization, such as when opening chamber door, system will “wait” and pause countdown time if deviation zone’s upper or lower limit is exceeded.

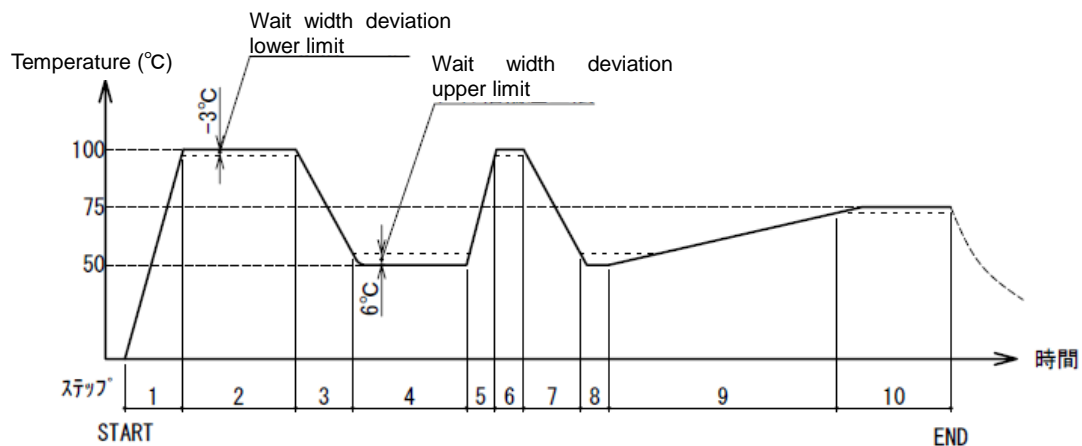
When wait function is set to OFF, the system proceeds to next step when time setting is reached regardless of whether temperature setting is reached or whether chamber temperature falls below or exceeds the deviation zone.

When time is set beyond unit capacity to heat or cool (e.g. too short), unit proceeds to next step before temperature setting is reached. Wait function should be set to ON for short ramp (build) times.

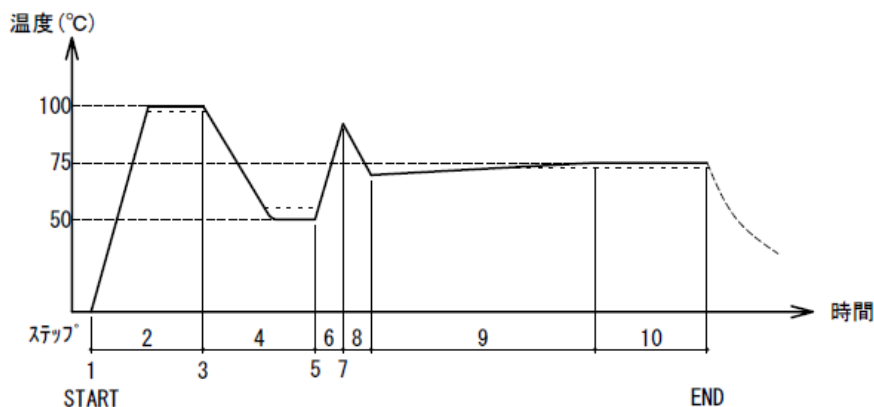
※ Example of estimated heating/cooling at indicated setting of wait [All ON] and [ALL OFF] in the program in the table below.

Step	1	2	3	4	5	6	7	8	9	10
Set temp($^{\circ}\text{C}$)	100	100	50	50	100	100	50	50	75	75
Set time	0 min	30 ,on	0 min	30 min	0 min	5 min	0min	5 min	2 hr	30 min
	Heating and cooling time of steps (1), (3), (5) and (7) are at the full power setting.									
	Heating time of the step (9) has been set longer than the specification.									

【Example of estimated process at “Full ON” setting for the wait function】



【Example of estimated process at “Full OFF” setting for the wait function】

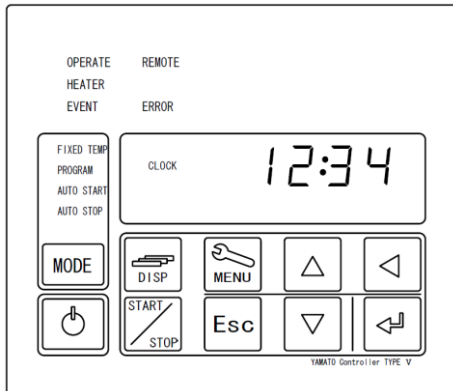


4. OPERATION PROCEDURE

Keypad Lock Function

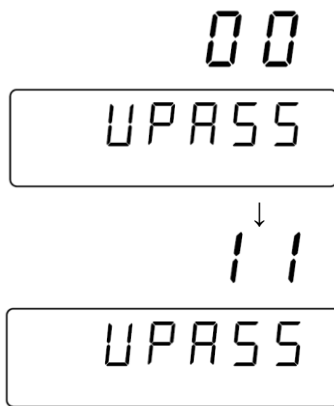
★ Set keypad lock.

1 Turn control power off (idle)



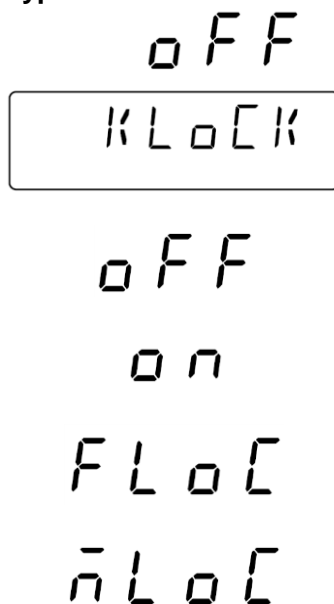
Turn main power switch ON (|). Lower display shows current time.
If unit is in standby, press and hold to turn control panel power off (idle).

2 Enter password



- 1) Press and hold . *UPASS* shows in lower display while *00* flashes in upper display.
- 2) Using , and , enter password "11" into upper display and press (password is set at "11" and cannot be modified).

3 Set keypad lock mode



- 1) Lower display shows *KLoCK* while upper display shows *oFF*. This is the factory default setting.
- 2) Use , to select lock mode and finalize by pressing .

Keypad lock modes are as follows:

o n : Key lock function disabled (factory default)

o n : All keys except , and are disabled.

FLoC : only is disabled.

nLoC : only is disabled.

Press and hold to return unit to idle.

4. OPERATION PROCEDURE

Calibration Offset Function

The calibration offset feature makes it possible to compensate for any difference between temperature reading on the control panel and actual chamber temperature (taken manually). This enables parallel compensation in either direction (+ or -) over the entire temperature setting range on all DE/DT series units.

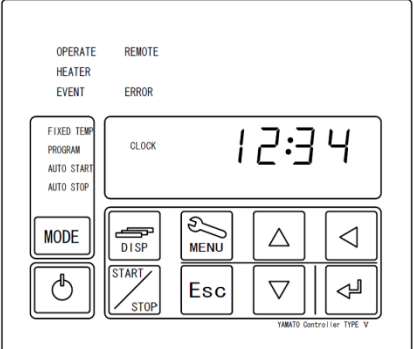

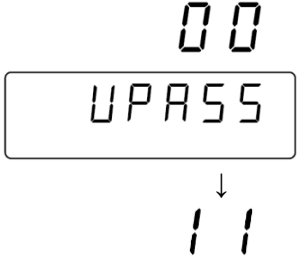





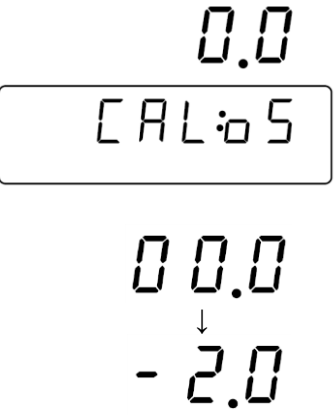







Example

Actual chamber temperature is lower than control panel temperature reading by 2°C:

Temperature reading can be calibrated by entering a calibration offset value of -2.0 to compensate against the actual temperature deficiency of 2°C.

If the initial temperature reading was 200°C, it will read 198°C after offset calibration, and be brought into agreement with actual chamber temperature.

- ★ **The -2°C calibration in the example above is applied over the entire temperature setting range (DE411/611: 0~260°C, DT411/611: 0~360°C). Note that offset values may change slightly depending on sample/specimen arrangement in the chamber and/or temperature setting.**

<p>1 Turn control panel off (idle)</p>		<p>Turn main power switch ON (). Lower display shows current time. If unit is in standby, press and hold  to turn control panel power off (idle).</p>
<p>2 Enter password.</p>		<ol style="list-style-type: none"> 1) Press and hold . <i>UPASS</i> shows in lower display while <i>00</i> flashes in upper display. 2) Using , , and , enter password "1 1" into upper display and press  (password is set at "11" and cannot be modified).
<p>3 Set Calibration Offset value.</p>		<ol style="list-style-type: none"> 1) Press . <i>CAL:05</i> is shown in lower display and <i>0.0</i> in upper display. Press . Right-most digit flashes. 2) Enter offset value using , ,  and press . <p>Example Temperature reading: 200°C, actual chamber temperature (manually taken): 198°C → Offset input value: -2.0°C</p> <p>Press and hold  to return to initial idle screen.</p>

4. OPERATION PROCEDURE

Recovery Function

★ Select recovery mode for the event of a power failure.

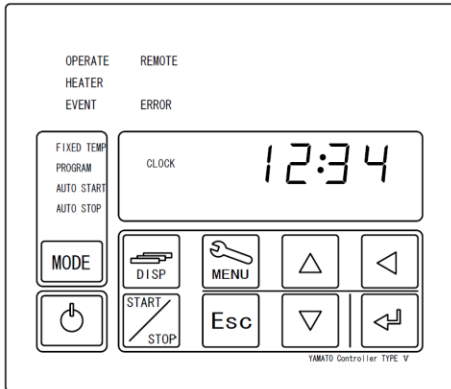
<p>1 Turn control panel off (idle)</p>		<p>Turn main power switch ON (). Lower display shows the current time.</p> <p>If unit is in standby, press and hold to turn control panel power off (idle).</p>
<p>2 Enter password</p>		<ol style="list-style-type: none"> 1) Press and hold . <i>UPASS</i> shows in lower display while <i>00</i> flashes in upper display. 2) Using , and , enter password "11" into upper display and press (password is set at "11" and cannot be modified).
<p>3 Select recovery setting</p>		<ol style="list-style-type: none"> 1) Press repeatedly until <i>RECOV</i> shows in lower display and press . 2) Use , to select recovery mode and press . <p>Recovery modes are as follows:</p> <p><i>C n t</i>: Operation resumes where it left off when power failure occurred.</p> <p><i>S t o p</i>: Operation is terminated and unit goes into idle when power is restored.</p> <p>Press and hold to return to initial idle screen.</p>

4. OPERATION PROCEDURE


CO₂ Emissions & Power Consumption Settings

★ Setting CO₂ conversion factor & resetting total CO₂ emissions/power consumption.

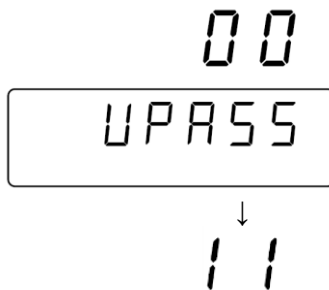
1 Turn control panel power off




Turn main power switch ON (|). Lower screen shows current time.





If unit is in standby, press and hold  to turn control panel power off (idle).

2 Enter password.

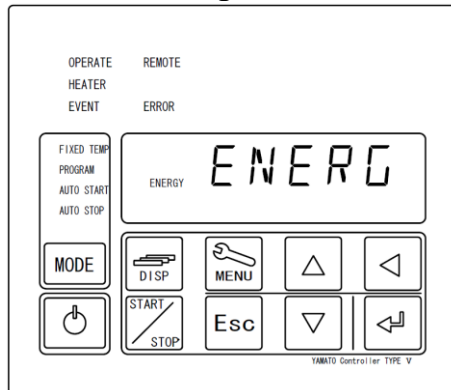



1) Press and hold .


UPASS shows in lower display while 00 flashes in upper display.



2) Using ,  and , enter password "1 1" into upper display and press  (password is set at "11" and cannot be modified).

3 Reset monitoring data




① Press  repeatedly until *ENERG* shows flashing in lower display, along with ENERGY indicator lamp.

② Press  to enter set/reset menu.

③ Press  scroll through the items in lower display and press  to select one.

POWER: Accumulated power consumption

Press  to change *OFF* (constant) to *run* (flashing).

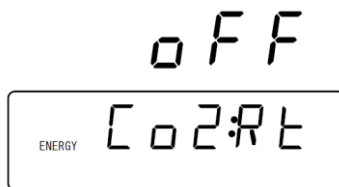
Press  to reset accumulated power consumption.

Press  to return.

4. OPERATION PROCEDURE

CO₂ Emissions & Power Consumption Settings


4






K G J: CO₂ emission factor.

The factory default setting of **550** (0.000550t CO₂/kWh) reflects the Environmental Ministry Press Release on 6 November 6, 2013.

Applicable value varies by utility company. Contact the servicing utility authority to confirm what value should be used.


Press  to change 550 (constant) to 0550 with last "0" flashing.


Change the emission factor using   .

Press  to finalize.


Press  to go return.

CO2:Rt: Integrated CO₂ Emission

Press  to change upper display from OFF (constant) to rUn (flashing).

Press  to reset CO₂ emission data.

Press  to return.

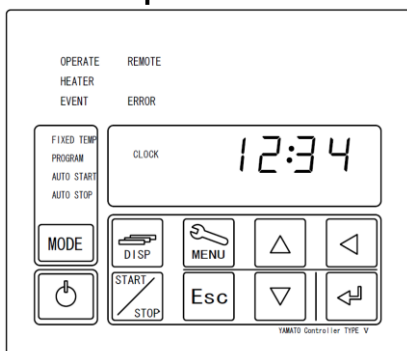
Press and hold  to go back to initial idle screen.

4. OPERATION PROCEDURE

Data Backup, Data Recovery & Reset

★ Back up data, recover data from backup or reset data to factory default.

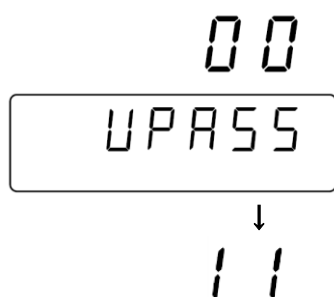
1 Turn control panel off



Turn main power switch ON (|). Lower screen shows the current time.

If unit is in standby, press and hold to turn control panel power off (idle).

2 Enter password.

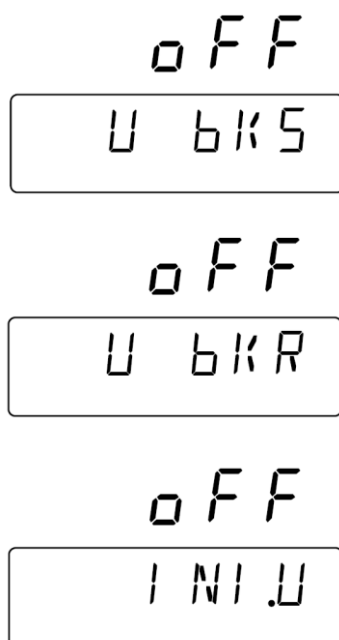


1) Press and hold .

UPASS shows in lower display while *00* flashes in upper display.

2) Using , and , enter password "11" into upper display and press (password is set at "11" and cannot be modified).

3 Back up, restore or reset data.



Press repeatedly to scroll through the following items in lower display, respectively:

U bK5 backs up settings for the event of backup battery failure or accidental reset.

Press to change *oFF* (constant) to

rUn (flashing), then press again to back up.

Press to return to *U bK5* menu.

U bKR: restores cleared or reset data from backup.

As above → → *oFF* to *rUn* → → restore

I NI.U: Resets all settings to factory default.

As above → → *oFF* to *rUn* → → reset

Backup items include programs entered, temperature offset values and other data, such as keypad lock modes, power recovery modes, etc. These may be recovered if *I NI.U* function is executed in error or if backup battery fails.

Press and hold to return to idle screen.

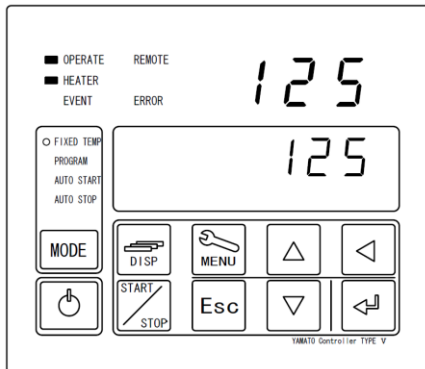
4. OPERATION PROCEDURE

Monitoring Data

Current power consumption, accumulated hours of operation, etc. may be viewed by using the data monitoring feature.

Setting information shown in upper display cannot be modified.

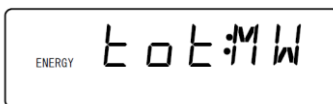
1 Applicable value shows in upper display



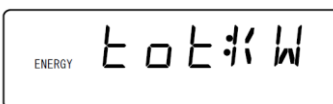
0.0



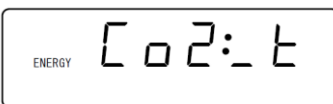
123



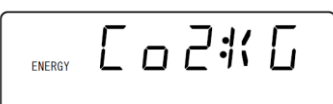
456




456




789



Monitoring items may be viewed in standby or while operation is in progress.

Press and Hold .

Monitor items display screen activates and current item is shown in upper display.

Press  to scroll thru items and back to standby screen:

k W: Current power consumption (in kW) is power consumed from moment of activation, and calculated in hourly increments.
Shown as 0.0 in standby. May be shown as 0.0 or 3.6 during temperature stabilization.

t o t : M W Accumulated power consumption (in MWh).
Shown in three-digits up to 999.

t o t : k W Accumulated power consumption (in kWh).
Shown in three-digits up to 999.

Example

If total kilowatt hours is 123,456, "123" (being in thousands of kW) will be shown in the t o t : M W screen, while "456" is shown in the next t o t : k W screen.

C o 2 : _ t CO₂ emissions volume (in t - "tons").
Shown in three digits up to 999.

CO₂ emissions is calculated by multiplying the power consumption by an emissions coefficient. Obtain an applicable coefficient from the servicing utility authority. Initial value is calculated on the factory default setting of 0.550 (k-CO₂/kWh). See "Setting and resetting the monitor indication, P.43.

C o 2 : k G CO₂ emissions volume (in kg). Shown in three digits up to 999.

Example

If total CO₂ emissions volume is 456,789kg, "456" (being in thousands of kg) will be shown in the C o 2 : _ t screen, while "789" is shown in the next C o 2 : k G screen.

OPERATION PROCEDURE

Monitoring Data

<p>45.6</p> <p>ENERGY P I d:M V</p>	<p><i>P I d:M V</i> Heater Output Heater output shows heater power output ratio in a percentage of rated capacity. Output is controlled by a PID operation value between 100 and 0% until temperature setting is reached.</p>
<p>5</p> <p>ENERGY P o W:t M</p>	<p>Example If upper display shows 45.6, output is at 45.6% of rated heater capacity.</p> <p><i>P o W:t M</i> Accumulated power-on time (in hours). First digit of 5 shown (0xxxx)</p>
<p>67</p> <p>ENERGY P o W:t M</p>	<p>Power-on time is elapsed time between turning main power switch (ELB) ON (I) and OFF (O).</p> <p><i>P o W:t M</i> Accumulated power-on time (in hours). Last four digits of 5 shown (x0000)</p>
<p>1</p> <p>ENERGY R U N:t M</p>	<p>Example If accumulated power-on time is 50,067 hours the first <i>P o W:t M</i> screen will show 5 and next <i>P o W:t M</i> screen will show 67. Maximum total for this indicator is 65,535.</p> <p><i>R U N:t M</i> Accumulated operation run time (in hours). First digit of 5 shown (0xxxx)</p>
<p>23</p> <p>ENERGY R U N:t M</p>	<p>Accumulated operation run time is the sum total of hours aggregated between the start and end of operation runs.</p> <p><i>R U N:t M</i>: Accumulated operation run time (in hours). Last four digits of 5 shown (x0000)</p> <p>Example If accumulated operation run time is 10,023 hours, the first <i>R U N:t M</i> screen will show 1 and next <i>R U N:t M</i> screen will show 23. Maximum total for this indicator is 65,535.</p>

4. OPERATION PROCEDURE

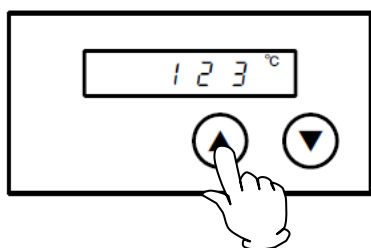
Independent Overheat Prevention Device

DE/DT series units feature redundant safety devices: 1) The internal automatic overheat prevention (automatic reset) feature, and 2) the Independent Overheat Prevention Device (IOPD) with discrete power supply, circuit and sensor; completely independent of the CPU board.

The IOPD main relay functions to activate and cut power to the heater when chamber temperature goes too far beyond objective temperature.

These functions are enabled while the main power switch (ELB) is ON.

Setting Independent Overheat Prevention Device (IOPD) activation temperature



※Set temperature with ▼▲ keys on IOPD panel.



Operation may be terminated by Independent Overheat Prevention Device (IOPD) activation, when IOPD temperature setting and target temperature are less than 20°C apart. IOPD temperature should be set at least 20°C higher than target temperature.

Note: main function of IOPD is to keep DE/DT unit from overheating, NOT to protect test samples from damage. Likewise, it is NOT intended for protection against accident or injury resulting from the negligent use of explosives and flammables.

Factory defaults and setting ranges are shown below:

Model	Factory default setting	Setting range
DE411	280°C	0°C~300°C
DE611	280°C	0°C~300°C
DT411	380°C	0°C~400°C
DT611	380°C	0°C~400°C

To confirm whether IOPD functions as intended, set chamber temperature to any value within unit specification range and allow temperature to stabilize. Gradually lower IOPD temperature setting. If IOPD activates within 10°C of temperature setting, it is functioning normally.

Note: it normally takes 5 (five) seconds for IOPD to activate. Waiting 5 seconds each time temperature is lowered in the confirmation test above, is therefore recommended. When IOPD activates, error code Er07 shows in main unit display and operation is terminated.

When changing the IOPD temperature setting, a few seconds are needed for changes to finalize. For this reason, wait 5 seconds after entering change before turning main unit off.

5. HANDLING PRECAUTIONS



Warning

1. DO NOT process hazardous or harmful substances.



Never process explosive or flammable items. Fire or explosion causing serious injury or death may result. See "List of Hazardous Substances" (P.64) for more information on these items.

2. Use extreme caution when heating in resin containers.



Confirm temperature tolerance before using resin containers or vessels. Heating resin beyond capacity to withstand temperature will cause resin to melt and may result in a fire or explosion.

3. DO NOT operate equipment when abnormalities are detected.



If unit begins emitting smoke or abnormal odors for reasons unknown, turn off main power (ELB) immediately, disconnect power cable from power supply, and contact a local dealer or Yamato sales office for assistance. Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death. Never attempt to disassemble or repair unit. Repairs should be always be performed by a certified technician.

4. DO NOT insert foreign objects into unit openings.



Never insert metal or combustible objects into unit openings, ventilation ports or exhaust ports. Fire or electric shock, causing serious burns, injury or death may result.



In the event that a foreign object accidentally falls inside, turn off main power (ELB) immediately, disconnect power cable and contact a local dealer, or Yamato sales office for assistance. Continuing to operate unit without removing object may cause fire or electric shock resulting in serious injury or death.

5. Use extreme caution in handling samples following high temperature operation.



Sample/process items are HOT! Do not touch upon removal from chamber, following high temperature operation. Use heat-resistant gloves and exercise extreme care in order to avoid getting burned.

6. Use extreme caution when opening unit door during high temperature operation.



When necessity dictates opening door during high temperature operations, maintain a safe distance until hot air, expelled from chamber, has dissipated. DO NOT touch internal door or other heated interior surfaces. Severe burns may result.

Likewise, DO NOT touch exterior door surface, cable ports, exhaust port or any other surface areas which are likely to become hot during operation. Burns may result.



Be advised that if a fire/smoke alarm is installed in close proximity to unit, it may be set off when chamber door is opened and hot air or smoke is expelled.

7. DO NOT touch hot surfaces.



Never touch the door, cable or areas surrounding exhaust port during or immediately following an operation. Severe burns may result.

8. Clean level.



Clean level, class 100 (FED-STD-209D) is maintained when chamber temperature inside is stable, but not guaranteed while temperature is increasing or decreasing. Optional high-performance products are available to maintain clean level class 100 during temperature changes in the chamber. See the List of options on P.61.

5. HANDLING PRECAUTIONS



Caution

1. DO NOT climb on equipment.



Do not attempt to climb onto unit or substitute it for a proper step ladder. Units are not designed to support bodily weight and damage may result. In addition, unit may become unstable and tip over or fall resulting in equipment damage, serious injury or death.

2. DO NOT place items on on top of equipment.



Do not place any objects on unit. Doing so may cause unit to become unstable and tip over, resulting in possible equipment damage, injury or death.

3. DO NOT operate equipment during thunderstorms.



In the event of a thunderstorm, turn off main power switch (ELB), and disconnect power cable immediately. A direct lightning strike may cause equipment damage fire or electric shock, resulting in serious injury or death.

4. DO NOT leave chamber door open.



Do not leave DE/DT unit door open (i.e. to cool test samples while in chamber, etc.) following an operation run. Heat from chamber may damage and/or deform control panel, causing control board malfunction or failure. Always remove processed test samples and close chamber door.

5. DO NOT process corrosive items.



Do not process items containing corrosive chemicals of any kind. Despite stainless steel chamber structure, damage may nonetheless occur from exposure to strong chemicals.

6. ALWAYS run equipment within specified temperature range.

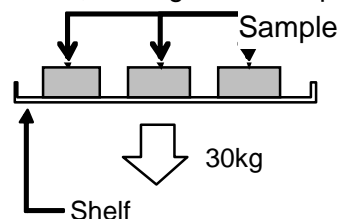


Working temperature range is room temperature +15°C~260°C (DE411/611) and +15°C~360°C (DT411/611).
Never attempt to operate unit outside of specification range. Equipment malfunction or damage may result.

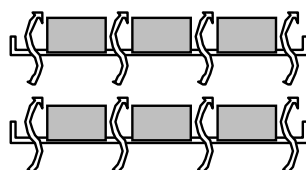
7. Arrange test samples appropriately.



Weight capacity for one chamber rack is approximately 30kg. Test sample load total for each rack should not exceed this specification.
Arrange test samples evenly on racks, leaving as much space between them as possible.



Do not place too many test samples on rack at once. Doing so may hinder proper temperature control in chamber. Test samples should be managed in the following way; 1. Install the supplied chamber racks, 2. Leave as much space between test samples as possible, 3. As a general rule, leave 30% or more of the total space on each rack unoccupied.



Leave 30% of total rack space empty

5. HANDLING PRECAUTIONS



Caution

8. DO NOT place items on bottom surface of chamber.



Operating unit with test samples placed directly on bottom surface of chamber may cause unit to perform poorly. Likewise, chamber temperature may become excessive, causing malfunction or damage. Always use the supplied chamber racks, supported on the standard supports, and avoid placing any items on bottom surface. Do not allow test samples to contact chamber walls.

9. Power outages.



In the event of a power loss during operation, one of the following will occur when power is restored, depending on what settings have been selected:

- Continued operation: if power recovery settings have been set to continue (factory default), pressing START/STOP, after power is restored, will allow operation will pick up where it left off with the power failure.
- Stop operation: if recovery settings have been set to stop, operation will be terminated and unit will go into idle when power is restored.

See "Recovery Function" (P.39) for details.

10. Chamber door seal.



Chamber door seals are manufactured from silicon rubber. Benzoic acid, oil, and other components used during the silicone rubber manufacturing process may be emitted during operation, spoiling incompatible test samples. If test samples, sensitive to silicone rubber by-products, are to be processed; specially formulated fluoro-rubber seals are available upon request.

Note that acids, alkaline, and halogenated solvents are corrosive to rubber.



Caution:

Substances which cause corrosion or damage to the silicon or fluoro rubber used in chamber door seals are shown in the Table 5.1.

Do not process test samples which contain any of the substances shown in this table.

For further assistance, contact a Yamato sales office or dealer.

Table 5.1 - Substances that are harmful to chamber door seal

Material Classification	Silicon Rubber	Fluoro-rubber
Hydrocarbons	Butane, Isooctane, Benzene, Toluene, Xylene, Styrene, Diphenyl, Pinene, Kerosene	Propane
Halogen, Haloid Hydrocarbon	Methyl Chloride, Methylene Chloride, Chloroform, Carbon Tetrachloride, Trichloroethylene, Phlorobenzene, Monochloronaphthalene, R-11, R-12, R-21, R-22, R-113, R-114, Bromine	R-21, R-22
Ketone, Aldehyde	Methyl Ethyl Ketone, Diisopropyl Ketone, Diclhexanon, Acetophenone	Acetone, Methyl Ethyl Ketone, Methyl Isobutyl Ketone, Diisopropyl Ketone, Diclhexanon, Acetophenone
Ester	Methyl Acetate, Ethyl Acetate, Propyl Acetate, Butyl Acetate, Amyl Acetate, Methyl Acetoacetate, Butyl Acrylate, Ethyl Methacrylate	Methyl Acetate, Ethyl Acetate, Propyl Acetate, Isopropyl Acetate, Butyl Acetate, Amyl Acetate, Ethyl Acetoacetate, Ethyl Acrylate, Butyl Acrylate, Ethyl Methacrylate

5. HANDLING PRECAUTIONS



Material Classification	Silicon Rubber	Fluoro-rubber
Ether	Diethyl Ether, Dibutyl Ether, Ethylene Oxide, Dioxane, Epichlorohydrin, Tetrahydrofuran	Diethyl Ether, Isopropyl Ether, Dibutyl Ether, Dibenzyl Ether, Ethylene Oxide, Dioxane, Epichlorohydrin, Furfural, Tetrahydrofuran
Alcohol	Amyl alcohol	
Multiple Alcohol Derivative		Cellosolve Acetate, Butyl Cellosolve, Triacetin
Fatty Acid, Phenol	Acetic Anhydride, Oleic Acid, Phenol Palmitate	Formic Acid, Acetic Anhydride, Hydroquinone
Nitrogen Chemical Compounds	Nitromethane, Nitroethane, Nitropropane	Nitromethane, Nitroethane, Nitropropane, Ethylenediamine, Dimethylaniline, Ethanol amine, Hydrazine, Triethanol Amine, Dimethyl Formamide, Pyridine, Piperidine
Sulfur and phosphorus compounds	Hydrosulfuric	Hydrosulfuric, Tributyl Phosphate
Other Chemical Compounds	Nickel Acetate, Lead Acetate, Zinc Acetate, Tetraethyl Lead, Vegetable Oil, Silicon Oil	Calcium Acetate, Nickel Acetate, Lead Acetate, Zinc Acetate
Inorganic Solvent	Hydrochloric Acid, Nitric Acid, Sulfuric Acid, Hydrobromic Acid, Phosphoric Acid, Hypochlorous Acid, Chromic Acid, Perchloric Acid, Sodium Hydrate	Sodium Hydrate, Aqueous Ammonia

5. HANDLING PRECAUTIONS



Caution

11. Temperature control.



The temperature sensor for this unit is installed on the inside wall of the chamber and used to control chamber temperature. Chamber temperature reading, as detected by the sensor, may not always agree with the temperature of test specimens. More often than not, chamber and test sample temperatures will differ largely immediately after opening or closing chamber door.

12. Inspect equipment regularly.



The main power switch (ELB) and the Independent Overheat Prevention Device (IOPD), in particular, are key devices in maintaining DE/DT series unit safety, and must be inspected/maintained regularly.

See "Inspection & Maintenance" (P.52) for details.

13. Always set Independent Overheat Prevention Device temperature.



Activation temperature for the Independent Overheat Prevention Device (IOPD) must be set in order to protect unit from damage, if overheating occurs.

See P.45 for details.

14. Open exhaust damper when processing moistened samples.



When processing moistened samples, open the exhaust damper to increase heat and disperse moisture. If moisture is allowed to collect and become trapped inside unit, malfunction or electric shock may result. Excessive moisture inside unit may likewise accelerate HEPA filter deterioration.



Do not attempt to process dripping wet or liquid samples.

15. Samples/specimens needing special attention.



Use caution when processing samples/specimens, which contain powder or small particles, so they are not disbursed by sudden movements or abrupt air pressure changes. Allowing flammable or metallic items to contact the heater assembly may cause a fire or shock hazard.



Be advised that more time may be required for chamber temperature to rise when processing a larger amount of samples/specimens or those with a higher heat load capacity. Do not process more samples than necessary. Further note that temperature reading may not be consistent when processing heat-generating specimens.

16. Check damper aperture before operation.




Confirm that damper is at the required aperture before operation. If damper is left fully open, during high temperature operation, unit may be unable to reach maximum temperature and maximum clean level may not be reached. Leaving intake fully open may also prevent unit from reaching maximum temperature.


5. HANDLING PRECAUTIONS




17. Cable port precaution.

 Whenever a manual temperature gauging sensor or probe is inserted through the cable port, close the port cover as fully as possible and completely seal any gaps with heat-resistant insulation or sealant. If the seal is inadequate, temperature characteristics or other performance properties will be degraded and inaccurate.



18. Initial operation.

 When operating unit for the first time, organic substances in the heat insulator may burn and produce smoke, which is normal and not a malfunction. An accompanying odor may also be emitted, but will subside with continued operation.


19. DO NOT apply paint thinner, alcohol or other solvents to equipment.

 Never attempt to clean DE/DT series units with paint thinner, alcohol or solvents of any kind. Doing so may cause coating to peel, discoloration, superficial damage and deformity to some components.
Note: always turn off main power switch (ELB) prior to cleaning or maintenance.

20. Fan motor.

 Fan continues operating while the ELB is ON(|) and unit is in standby with chamber door closed.
Press  to turn controls off (idle) and stop fan.

21. Read instruction manual thoroughly before operation.

 Always read instruction manual(s) for all equipment, thoroughly, before beginning setup, installation and operation.

6. MAINTENANCE PROCEDURES

Daily Inspection & Maintenance



Warning

- Be sure that main power switch (ELB) is OFF before daily inspection and maintenance.
- Perform inspections and maintenance when chamber interior is at room temperature.
- Never attempt to disassemble unit.



Caution

- Clean unit using soft damp cloth.
- Never use benzene, paint thinner, scouring powder, scrubbing brush or other abrasives and solvents to clean unit. Superficial damage and/or discoloration, as well as deformity to some components may result.

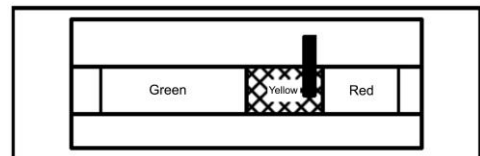
Inspect monthly.

- Inspect main power switch (ELB) ON and OFF function.
 - Prepare unit for inspection by connecting power cable to a facility outlet or terminal.
 - Confirm that main switch (ELB) is "OFF" then, turn main switch (ELB) back "ON".
 - With the main switch "ON", depress the test button on the main switch (ELB) using a ball-point pen or other fine-tipped object. If main switch (ELB) shuts off, it is functioning normally.
 - Test Independent Overheat Prevention Device (IOPD).
 - Run unit in constant temperature mode and allow temperature to stabilize.
 - Set the activation temperature for the IOPD to approximately 5°C below chamber temperature.
 - If overheating prevention device is functioning normally, heater will shut off within few seconds and error code "Er07" will appear in the upper display. An alarm will also sound and ERROR lamp will illuminate.
- ① Main power switch (ELB) and overheat prevention device must be inspected, as prescribed above, prior to every instance of extended or overnight operation.**

Replacing the HEPA filter

Check differential pressure gauge (filter gauge).



- If the gauge indicator is in the yellow zone nearing red, while unit is operating at room temperature, replace the HEPA filter.
Even with the indicator still in the yellow zone, the HEPA filter capacity is diminished. Chamber airflow and/or temperature characteristics are also affected. Replacing the HEPA filter sooner, rather than later, is therefore recommended.
- Utmost care must be taken when replacing HEPA filter and should be done by Yamato or other certified technician.



◆ Contact local Yamato dealer or Yamato Customer Service Center for service or questions.

7. STORAGE AND DISPOSAL

Extended Storage & Unit Disposal

 Warning	 Caution
<ul style="list-style-type: none"> • If unit will be out of service for an extended period, turn off main power switch (ELB) and disconnect power cable from facility outlet or terminal. 	<ul style="list-style-type: none"> • Unit disposal. <ul style="list-style-type: none"> ● Remove door handle and hinges to prevent it from locking. ● Do not leave unit unattended, or in reach of children. ● Dispose of this unit in accordance with local laws and regulations.

Disposal Considerations

Dispose of or recycle this unit in a responsible and environmentally friendly manner. Yamato Scientific Co., Ltd. strongly recommends disassembling unit, as far as is possible, in order to separate parts and recycle them in contribution to preserving the global environment.

Major components and materials, comprising DE/DT series units are listed in the table below:

Component	Material
Structural	
Exterior	Chrome-free electrogalvanized carbon steel sheet metal, finished in chemical-proof, baked-on coating
Chamber	Stainless steel sheet metal
Heat Insulation	Ceramic fiber + glass wool
Door seal	Silicon rubber
HEPA Filter	Stainless steel + glass wool
Electrical	
Switches and Relays	Resin composites, copper and other materials
Control Panel	Polycarbonate resin
Printed Circuit Boards	Fiber glass composites and other materials
Heater	Stainless steel tubing
Power Cable	Composites of synthesized rubber coating, copper, nickel and other compound materials
Wires	Fiber glass composites, flame-retardant vinyl, copper, nickel and other materials
Labels	Resin materials
Sensors (Pt&K TC Sensor)	Stainless steel and other material

8. TROUBLESHOOTING

Error Codes

All possible error codes are shown in Table 8.1 below.

On DE/DT series units, operation stops and a sounding alarm accompanies occurring errors.

Pressing any key (except ) will pause the alarm. After three minutes alarm will sound again.


Upper display shows error code and error source source appears in lower display. Confirm error code and turn power off immediately.

Table 8.1 Error Codes

Screen	Source	Causes & Solutions
Er01 SENS	Sensor Failure	<ul style="list-style-type: none"> ● Failure in temperature input circuit. ● Open circuit in temperature sensor line. ● Temperature out of specification range. <p>Contact original dealer of purchase</p>
Er02 TRIAC	TRIAC Short Circuit	<ul style="list-style-type: none"> ● Electrical short in TRIAC circuit. ● Faulty current transformer (CT) sensor. <p>Contact original dealer of purchase</p>
Er03 HEAT	Faulty or Disconnected Heater Line	<p>May occur when the power supply is changed during installation or when unit is transported</p> <ul style="list-style-type: none"> ● Open phase in power supply: confirm whether 3-phase power supply is connected properly. <p>While in operation (all models)</p> <ul style="list-style-type: none"> ● Heater line faulty or severed. ● Faulty current transformer (CT) sensor. ● Drop in supply voltage. <p>Contact original dealer of purchase</p>
Er04 FAN	Fan Motor Failure	<ul style="list-style-type: none"> ● Fan motor malfunction <p>Contact original dealer of purchase</p>
Er07 OHEAT	Independent Overheat Prevention Device (IOPD) activated	<ul style="list-style-type: none"> ● Independent Overheat Prevention Device (IOPD) has activated. <p>Turn ELB OFF, then back on ON (reset). Check both chamber temperature and IOPD temperature setting. If unit does not function normally after ELB reset, contact original dealer of purchase</p>
Er10 RELAY	Main Relay Contact Damaged	<p>Turn ELB OFF, then back ON (reset) and confirm:</p> <ul style="list-style-type: none"> ● whether contact point on main relay is damaged. ● whether current transformer (CT) sensor(s) has failed. <p>contact original dealer of purchase.</p>

8. TROUBLESHOOTING

Error Codes

Error Display	Error Code Name	Causes and their solutions
Er 14 RAM	RAM Failure, backup battery capacity reduced or dead	<p>Turn ELB OFF, then back ON (reset) and confirm whether backup battery capacity is decreased or is dead.</p> <ul style="list-style-type: none"> ● Replace backup battery <p>If error cannot be cleared by ELB reset or battery replacement, Contact original dealer of purchase</p>
Er 15 EEPROM	EEPROM Failure	<p>Turn ELB OFF, then back ON (reset) and confirm whether there is a change in data code on EEPROM.</p> <ul style="list-style-type: none"> ● Change data code on EEPROM. ● Replace backup battery <p>Contact original dealer of purchase if this error cannot be cleared after completing above items.</p>
door	Door Open	<p>Door is open.</p> <ul style="list-style-type: none"> ● NOT a malfunction. <p>“door” flashes in lower display, and heater/fan motor are shut off to maintain operator safety while door is open. Closing the door clears the flashing “door” indicator and normal operation resumes.</p> <p>Keeping door open for more than 2 minutes will activate an alarm. Pressing any key (except ) pauses alarm.</p> <p>Alarm will sound again for every additional 2 minutes the door is left open.</p>

8. TROUBLESHOOTING

Troubleshooting Guide

Table 8.2 - Troubleshooting Guide

Symptom	Possible Causes	Possible Solutions
Unit does not turn on/operate when main power switch (ELB) is turned "ON". (no current time in lower display)	<ul style="list-style-type: none"> ▪ No power from power supply ▪ ELB failure ▪ Control board failure 	<ul style="list-style-type: none"> ▪ Check connection to power supply and confirm power supply voltage. ▪ Replace ELB. (*) ▪ Replace control board. (*)
Displays are blank when control panel is powered on (unit in standby)	<ul style="list-style-type: none"> ▪ Power supply failure (must be within $\pm 10\%$ voltage rating) ▪ Control board failure 	<ul style="list-style-type: none"> ▪ Connect to adequate power supply ▪ Replace control board (*)
Fan does not operate when control panel is powered on (unit in standby)	<ul style="list-style-type: none"> ▪ Fan motor malfunction ▪ Door open. 	<ul style="list-style-type: none"> • Replace fan motor (*) • Close door.
Temperature in chamber does build	<ul style="list-style-type: none"> ▪ IOPD and/or built-in self-diagnosis function has shut heater circuit down (error code displayed). 	<ul style="list-style-type: none"> ▪ Refer to Table 8.1, this chapter (*)
Temperature reading is erratic	<ul style="list-style-type: none"> ▪ Heavily fluctuating ambient temperature ▪ Power supply failure (must be $\pm 10\%$ of voltage rating) ▪ Temperature affected by test samples ▪ Control board failure ▪ Temperature sensor failure 	<ul style="list-style-type: none"> ▪ Re-evaluate installation site ▪ Connect to adequate power supply ▪ Reduce test sample load ▪ Replace CPU board (*) ▪ Replace temperature sensor (*) ▪ See P.50, "Samples/specimens needing special attention".

* Contact original dealer of purchase

9. SERVICE AND REPAIR

Requests for Repair

When a problem occurs, terminate operation immediately, turn off main power switch (ELB) and disconnect power cable.

Contact original dealer of purchase.

The following information is required for all repairs.

- Model name
- Serial Number
- Date (year/month/day) of purchase
- Description of problem in as much detail as possible

Guaranteed Supply Period for Repair Parts

Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for DE/DT series ovens. "Repair parts" is defined as components which, when installed, allow for continued unit operation.

10. SPECIFICATIONS

Product		Clean oven			
Model		DE411	DE611	DT411	DT611
System		Forced air circulation and ventilation			
External temperature range		5°C~35°C			
Power supply		Triple phase 220V AC 7A	Triple phase 220V AC10A	Triple phase 220V AC 10A	Triple phase 220V AC 14A
		Common to 50/60Hz, operating voltage range : ±10%			
Performance *1	Temperature Range	Room temp. + 30°C~260°C		Room temp. + 30°C~360°C	
	Temperature control accuracy	±0.3°C (at 260°C) JTM K05		±0.3°C (at 360°C) JTM K05	
	Temperature fluctuation *2	±0.5°C (at 260°C) JIS C60068		±0.5°C (at 360°C) JIS C60068	
	Temperature distribution accuracy	±2.5°C (at 260°C) JTM K05		±4.0°C (at 360°C) JTM K05	
	Temperature slope	10°C (at 260°C) JIS C60068		20°C (at 360°C) JIS C60068	
	Time to max temp.	Approx. 70 min.		Approx. 80 min.	
	Clean level	Class100 when temperature stable *3			
Configuration	Exterior	Chrome-free electro-galvanized steel Chemical-proof powder coating			
	Chamber	Stainless steel			
	Insulation Material	Glass wool			
	Door	Single side (left) swing			
	Heater	Stainless steel tube heater with fins			
	Heater capacity	2.5kW	3.6kW	3.6kW	5.2kW
	Fan (motor)	Stainless steel sirocco fan (condenser motor 400W)			
	Differential gauge	Analog type colored scale (0~300Pa)			
	Cable port	I.D. :φ33mm (right side)			
	Exhaust port	Manual exhaust damper O.D.φ61mm (top panel)			
	Casters	Universal swivel caster (no stoppers)			
	Adjustable leveling feet	Two (front undercarriage)			
	HEPA filter	Heat-resitant HEPA filter (dust-collection efficiency : 99.97% or better, up to 0.3µm particle filtering)			
	Intake filter	Stainless steel felt			
Control Configuration	Type	V-shape controller			
	Temp. control system	PID Z control			
	Temp. setting system	Digital setting with ▲/▼ keys.			
	Temp. display system	Upper display (Chamber): Green 4-digit LED Digital Display (Incrementation: 1°C) Lower display: Orange 5-digit LED Digital Display (Incrementation 1°C)			
	Other displays	LED: temperature indicator for heating/stabilization/cooling			
	Timer	Configurable from 1 minute, 99 hours, 59 minutes, timer operation: 24 hour time system, clock operation			

10. SPECIFICATIONS

Model		DE411	DE611	DT411	DT611
Control Configuration	Operation modes	Constant temperature operation Programmed operation (Maximum 99 steps, up to 99 patterns, repeat operation function) Duration/time select operation function (auto start/auto stop/quick auto stop, program operation)			
	Additional functions	Variable fan speed Accumulated on time, operation time function (up to 65,535 hours); calibration offset; accumulated power consumption monitoring, total CO ₂ emission monitoring, heater output monitoring; power recovery; setting data save and restore			
	Heater Control	Triac with Zero-cross Control			
	Sensor	K type Thermocouple dual sensor (temperature control and independent overheat prevention device sensors)			
Safety Device	Controller	Self-diagnostic functions (temp. sensor failure detection, TRIAC short circuit, heater disconnect, fan motor failure detection, main relay contact failure, automatic overheat prevention), key lock function			
	Earth leakage breaker (ELB)	15A	15A	15A	20A
		Current leak /short circuit/surge protection, rated sensitivity 30mA			
	Independent Overheat Prevention Device (IOPD)	Temperature setting range: 0~300°C			
	Phase reversal relay	Fan motor reverse rotation detection			
Door switch	Door open: fan motor and heater circuit OFF Door closed: fan motor and heater circuit ON				
Standard	Internal dimensions: Width *4 Depth Height	450mm	600mm	450mm	600mm
		450mm	600mm	450mm	600mm
		450mm	600mm	450mm	600mm
	External dimensions: Width *4 Depth Height	700mm	850mm	700mm	850mm
		1025mm	1175mm	1025mm	1175mm
		1570mm	1720mm	1570mm	1720mm
Internal capacity	91ℓ	216ℓ	91ℓ	216ℓ	
Weight	Approx. 200kg	Approx. 270kg	Approx. 200kg	Approx. 270kg	
Tiers/shelf support pitch	12 tiers /30mm	17 tiers /30mm	12 tiers /30mm	17 tiers /30mm	
Chamber rack capacity (ea.)	Approx. 30kg	Approx. 30kg	Approx. 30kg	Approx. 30kg	
Included items	Racks/supports	Stainless steel wire: 2 Rack supports: 4	Stainless steel wire: 3 Rack supports: 6	Stainless steel wire: 2 Rack supports: 4	Stainless steel wire: 3 Rack supports: 6
	Instruction Manual	1 copy			
	Warranty card	1 copy			
Article	*1 Performance based on rated source voltage, single phase/3 phase 220V±5%, room temperature 23°C ±5°C, 65%RH±20% humidity, 86kPa to 106kPa atmospheric pressure, exhaust damper closed, intake closed, unloaded. *2 Value calculated by dividing JIS measurement by 2. *3 Federal Class standards (FED-STD-209D) ISO14644 class 5, JIS B9920 class 5, and FED-STD-209E class M3.5 equivalent *4 Protrusions excluded.				

11. ACCESSORY OPTIONS

Accessory Item List

Clean Ovens DE411/61, DT411/611 are compatible with a wide variety of available options as shown in Tables 11.1. and 11.2.

Options listed in Table 11.2 are required to be installed at the Yamato manufacturing facility.

Table 11.1 List of Options (factory installation not required)

Option	Product Code No.	Model Name	Compatible models	Description
Chamber Rack (stainless steel wire) with supports	212686	-	DE/DT411	Same as standard racks; available for additional purchase.
	212687	-	DE/DT611	
Chamber Rack (perforated stainless steel) with supports Load capacity: approx. 30kg/rack	252688	-	DE/DT411	Perforated stainless steel chamber racks.
	252689	-	DE/DT611	
Basket Style Rack Container (stainless steel mesh) Load capacity: approx. 15kg/container	212924	ODT12	DE/DT411	30mm deep rack container constructed from stainless steel mesh (3 mesh panels); for processing smaller samples/specimens. Designed to be stacked on standard stainless steel wire racks.
	212925	ODT14	DE/DT611	
Sheath Sensor (K thermocouple)	212946	ODT48	All	Additional temperature sensor for confirming temperature in chamber or temperature of samples. May be connected to optional memory recorder.
Silicon Plug (for 1 opening)	212947	ODT52	DE models only	Silicon rubber plug for sealing gaps caused by sensors inserted through cable port. φ2mm opening in center.

Table 11.2 List of Options (factory installation required)

Option	Product Code No.	Model Name	Compatible models	Description
Remote Communications Terminal (RS485)	212948	ODT54	All	Terminal installed on main unit for controlling and monitoring operation status from remote PC workstation.
Remote Communications Adaptor Kit	211880	OIN90	All	Adapter kit for connecting unit to remote PC workstation. Option ODH44 required. Software supplied with kit.
Temperature Output Terminal (4-20mA)	212949	ODT56	All	Terminal outputting a 4 – 20 milli ampere analog signal for external temperature sensor.
External Alarm Output Terminal	212950	ODT58	All	Terminal allowing alarm signals accompanying unit errors to be output externally.

11. ACCESSORY OPTIONS

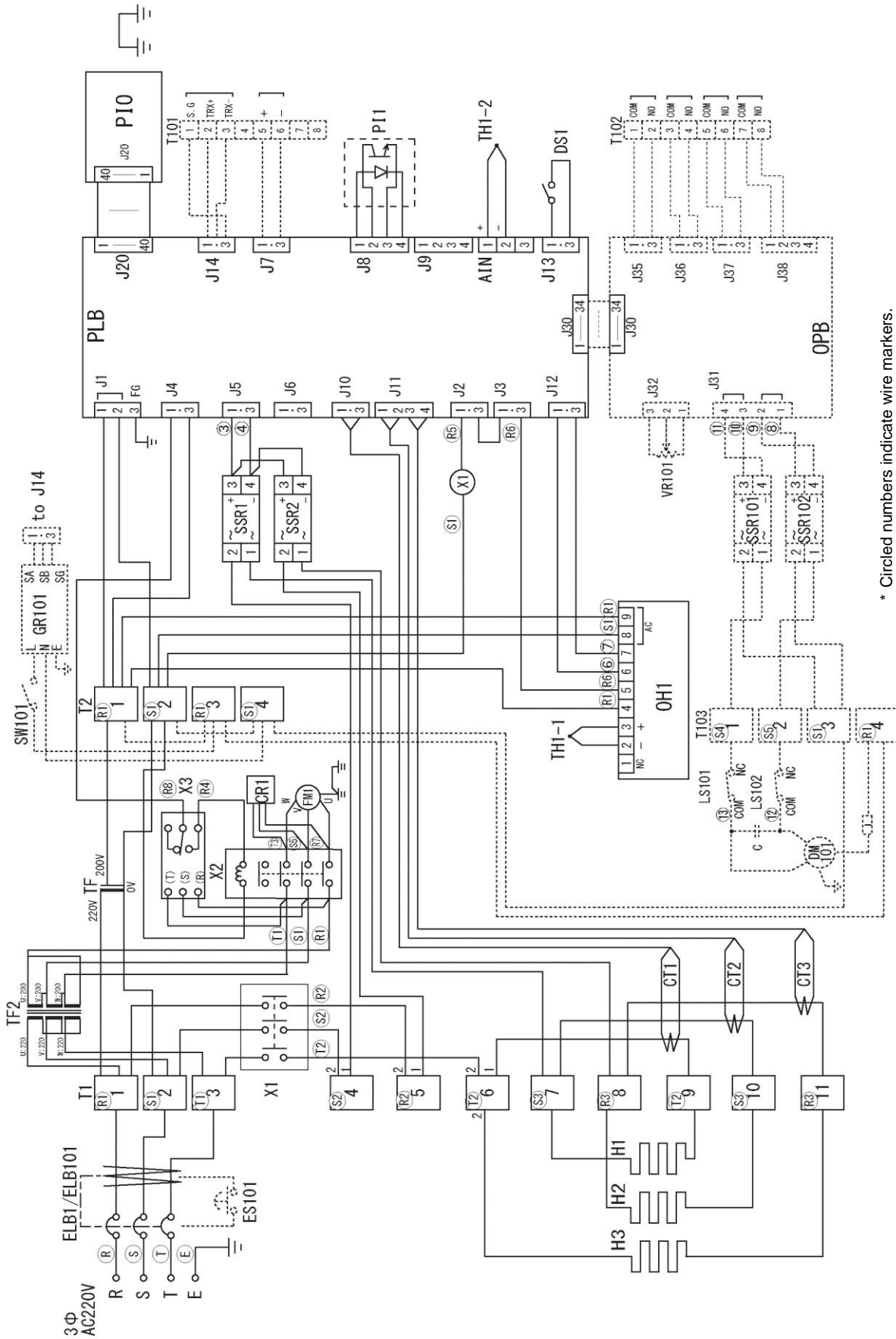
Accessory Item List

Table 11.2 List of options (factory installation required)

Option	Product Code No.	Model Name	Compatible models	Discription
Time-up Output Terminal	212951	ODT62	All	Termmal allowing a signal, indicating "END" of Auto Stop Operation or Programmed Operation, to be ouput externally.
Operation Signal Output Terminal	212952	ODT64	All	Terminal allowing signal, indicating operation in progress, to be output externally.
Event Output Terminal	212953	ODT66	All	Terminal allowing ON-OFF signals, indicating unit status, such as standby, operating, operation end, and program steps, to be output externally.
Emergency stop button	212935	ODT32	DE/DT411	Button to shut main power off in the event of an emergency.
	212936	ODT34	DE611	
	212937	ODT36	DT611	
Data Logger	212938	ODT38	DE/DT411	Integrated into main unit. Paperless (inputs: 6), sensor optional (may be used with ODT48). The following three parameters may be monitored: temperature as measured by unit main controller (PV), objective temperature while in operation (SV), heater output ratio (MV).
	212939	ODT42	DE/DT611	
Power cord (10m)	212940	ODT44	All	10m substitution power cable for main unit. No plug included.
Auto damper	212928	ODT22	DE/DT411	Electronic damper allowing exhaust port aperture and air flow to be controlled automatically by motor and control circuit in five stages.
	212929	ODT24	DE/DT611	
N2 gas injection unit (with flow meter)	212930	ODT26	DE/DT411	Unit allows N ₂ gas to be routed into chamber, preventing sample oxidization during processing. N ₂ gas flow may be monitored using flow meter.
	212931	ODT28	DE/DT611	
Duct connection port for clean room application	212926	ODT16	DE/DT411	Exhaust port (O.D. 80mm) for exterior duct installed on rear panel prevents dust and other contaminants from being expelled into clean rooms. Duct and external fan unit not included.
	212927	ODT18	DE/DT611	
Hi-performance HEPA filter	212954	ODT68	DE411	Hi-performance filter maintains clean level class 100 in all heating conditions (stabilization, increase, decrease). Max resistance temp: 200°C.
	212955	ODT70	DE611	

12. WIRING DIAGRAM

DE411/611 DT411/611



* Circled numbers indicate wire markers.
 * Dotted lines (-----) indicate optional items.

12. WIRING DIAGRAM

Wiring Diagram Glossary

Symbol	Component	Symbol	Component
ELB1	Earth Leakage Breaker (ELB)	PI1	Photo coupler
T1	Wiring terminal 1	DS1	Door switch
T2	Wiring terminal 2	CR1	Spark eliminator
X1	Main relay	FM1	Fan motor
X2	Thermal relay	PLB	Type V planar board
X3	Phase reversal relay	PIO	Type V display board
SSR1, 2	Solid state relay	OH1	Independent Overheat Prevention Device
H1, 2, 3	Heaters	TH1-1	Independent Overheat Prevention Device sensor
CT1, 2, 3	Current sensing element	TH1-2	Temperature control sensor
TF	Transformer	TF2	Transformer

Optional portion

Symbol	Component	Symbol	Component
ELB101	Earth Leakage Breaker (w/wire lead)	OPB	Type V option board
ES101	Emergency stop button	T103	Auto damper terminal block
T101	External output terminal block	DM101	Auto damper motor
T102	External output terminal block	LS101, 102	Auto damper limit switch
GR101	Data logger	SSR101, 102	Auto damper solid state relay
SW101	Data logger switch	VR101	Auto damper volume resistor

13. HAZARDOUS SUBSTANCES LIST



Never attempt to process explosives, flammables or any items which contain explosives or flammables.

Explosive Substances	①Nitroglycol, Glycerine trinitrate, Cellulose Nitrate and other explosive nitrate esters
	②Trinitrobenzen, Trinitrotoluene, Picric Acid and other explosive nitro compounds
	③Acetyl Hydroperoxide, Methyl Ethyl Ketone Peroxide, Benzoyl Peroxide and other organic peroxides
	④Metallic Azide, including Sodium Azide, etc.
Combustible Substances	①Metal "Lithium" ②Metal "Potassium" ③Metal "Natrium" ④Yellow Phosphorus
	⑤Phosphorus Sulfide ⑥Red Phosphorus⑦Phosphorus Sulfide
	⑧Celluloids, Calcium Carbide (a.k.a, Carbide)⑨Lime Phosphide⑩Magnesium Powder
	⑪Aluminum Powder ⑫Metal Powder other than Magnesium and Aluminum Powder
	⑬Sodium Dithionous Acid (a.k.a., Hydrosulphite)
Oxidizing Substances	①Potassium Chlorate, Sodium Chlorate, Ammonium Chlorate, and other chlorates
	②Potassium Perchlorate, Sodium Perchlorate, Ammonium Perchlorate, and other perchlorates
	③Potassium Peroxide, Sodium Peroxide, Barium Peroxide, and other inorganic peroxides
	④Potassium Nitrate, Sodium Nitrate, Ammonium Nitrate, and other nitrates
	⑤Sodium Chlorite and other chlorites
	⑥Calcium Hypochlorite and other hypochlorites
Flammable Substances	①Ethyl Ether, Gasoline, Acetaldehyde, Propylene Chloride, Carbon Disulfide, and other substances with ignition point at a degree 30 or more degrees below zero.
	②n-hexane, Ethylene Oxide, Acetone, Benzene, Methyl Ethyl Ketone and other substances with ignition point between 30 degrees below zero and less than zero.
	③Methanol, Ethanol, Xylene, Pentyl n-acetate, (a.k.a.amyl n-acetate) and other substances with ignition point between zero and less than 30 degrees.
	④Kerosene, Light Oil, Terebinth Oil, Isopenthyl Alcohol(a.k.a. Isoamyl Alcohol), Acetic Acid and other substances with ignition point between 30 degrees and less than 65 degrees.
Combustible Gases	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C at one air pressure.

Excerpt from Table 1, Hazardous Substances, in Cabinet Order from Occupational Health and Safety Law (substances related to Articles 1, 6, and 9)

14. SETUP CHECKLIST

* Setup DE/DT series units using the following procedure:

Model	Serial number	Installation Date	Installed by (company or personnel)	Installation approved by	Assessed by

No.	Item	Procedure	Section & Reference Page	Assessed by
Specifications				
1	Accessories	Verify included accessories against accessories column.	10. Specifications 59	
2	Installation	<ul style="list-style-type: none"> ▪ Check site visually. Caution: check for hazards 	2. Pre-operation Procedures 1. Choose Appropriate Site for Installation. 4~7	
		<ul style="list-style-type: none"> ▪ Prepare installation space. 		
		<ul style="list-style-type: none"> ▪ Install chamber racks 	5. Handling Precautions 7. Arranging test samples 47	
Equipment Operation				
1	Power Source Voltage	<ul style="list-style-type: none"> ▪ Measure line voltage (facility power outlet or terminal) with voltmeter. ▪ Measure line voltage during operation. (Must meet required voltage rating) Caution: confirm facility power source rating meets unit requirements 	2. Pre-operation Procedures 5 7. Connect power cable to proper power supply 6 9. Ground wire must be connected 7 10. Specifications Power Supply (Required) 58	
2	Operation	<ul style="list-style-type: none"> ▪ Start operation. 	2. Pre-operation procedures Installation Precautions 4~7 4. Operation procedure Setting Time & Date ~ Service & Repair 12~ 57	
Description				
1	Operation	Explain function of each component as written in instruction manual.	4. Operation Procedure Setting Time & Date 12 1. Safety Precautions ~ 3~ 14. List of Hazardous Substances 64	
2	Error codes	Explain error codes and reset procedures as written in instruction manual.	8. Error Codes ~ 54~ 15. Setup Checklist 65	
3	Maintenance and inspection	Explain function of each component as written in instruction manual.	6. Maintenance Procedures Inspection & Maintenance 52	
4	Setup checklist completion	<ul style="list-style-type: none"> ▪ Fill in installation date and name of installing personnel or company on unit "OK and Service Sticker". 	9. Service & Repair 57	

APPENDIX 1

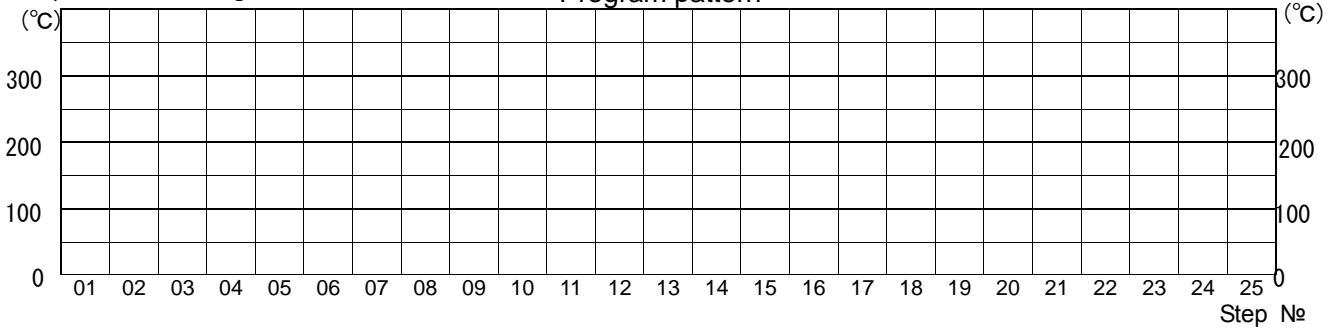
Program Planning Worksheet

Control № _____

Model name		Preparation date	(Y) (M) (D)
Program number		Prepared by	

Temperature setting

Program pattern



Program No.	Step	Temperature Setting	Time	Repeat Dstn	Repetition Count	Wait	*Event			Fan Speed	*Damper Aperture	End
		TEMP (°C)	TIME Hr : Min	REP STEP	REP COUNT	WAIT ON/OFF	1	2	3	FAN 1~10	DAMP %	END:ST
P** : 00	P02 : **											
	01		:									
	02		:									
	03		:									
	04		:									
	05		:									
	06		:									
	07		:									
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	21		:									
	22		:									
	23		:									
	24		:									
25		:										
Remarks												

*Optional items.

Feel free to duplicate and utilize this worksheet.

Limited liability

Always operate equipment in strict compliance to the handling and operation procedures set forth by this instruction manual.

Yamato Scientific Co., Ltd. assumes no responsibility for malfunction, damage, injury or death resulting from negligent equipment use.

Never attempt to disassemble, repair or perform any procedure on DE/DT series units which are not expressly mandated by this manual. Doing so may result in equipment malfunction, serious personal injury or death.

Notice

- Instruction manual descriptions and specifications are subject to change without notice. Yamato Scientific Co., Ltd. will replace flawed instruction manuals (pages missing, pages out of order, etc.) upon request.

Operation Manual

Clean Oven

DE411/611

DT411/611

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