



VACUUM DRYING OVENS

Model DP200/300/410/610

Instruction Manual

First Edition

- Thank you for choosing DP Series Vacuum Drying Ovens by Yamato Scientific Co., Ltd.
- 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 Co., Ltd.

Printed on recycled paper

TABLE OF CONTENTS


1. SAFETY PRECAUTIONS	1
Explanation of Symbols.....	1
Symbol Glossary	2
Warnings and Cautions.....	3
2. PRE-OPERATION PROCEDURES	4
Installation Precautions & Procedures	4
Vacuum System Information	9
3. COMPONENT NAMES AND FUNCTIONS	11
Unit Overview 1	11
Control Panel.....	13
4. OPERATION PROCEDURE	14
Prior Confirmation	14
Decompression/Purge Procedure	14
Setting Date & Time	15
Keypad Tone Function	16
Mode and Function Flow	17
Constant Temperature Mode	18
Auto Stop Mode.....	20
Auto Start Mode.....	22
Programmed Operation.....	24
Building Programs	27
Keypad Lock Function.....	31
Calibration Offset Function.....	32
Recovery Modes	33
CO2 Emissions & Power Consumption Settings	34
Data Backup & Reset.....	35
Data Monitoring	36
Independent Overheat Prevention Device.....	37
5. HANDLING PRECAUTIONS	38
6. MAINTENANCE PROCEDURE	43
Inspection and Maintenance	43
7. EXTENDED STORAGE & DISPOSAL	44
Extended Storage / Unit Disposal.....	44
Disposal Considerations.....	44
8. TROUBLESHOOTING	45
Error Code Guide	45
Troubleshooting Guide	46
9. SERVICE & REPAIR	48
10. SPECIFICATIONS	49
11. ACCESSORIES	51
Optional Accessory Guide.....	51
12. WIRING DIAGRAM	53
13. WEAR ITEMS	57
14. LIST OF HAZARDOUS SUBSTANCES	58
15. SETUP CHECKLIST	59


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. (Note 1) Serious injury is defined as bodily wounds,

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:
Electrical 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



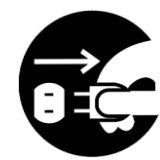
General Action
Required



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 DP 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.58).



Always ground equipment.

Always ground this unit 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 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 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.



DO NOT insert multiple power cables into a single outlet.

Inserting multiple cords into a single outlet, using branch outlets or extension cords, may cause power cable to overheat and/or catch fire. Other issues may include a drop in voltage, which may affect performance, resulting in failure to control or maintain proper temperatures.



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.

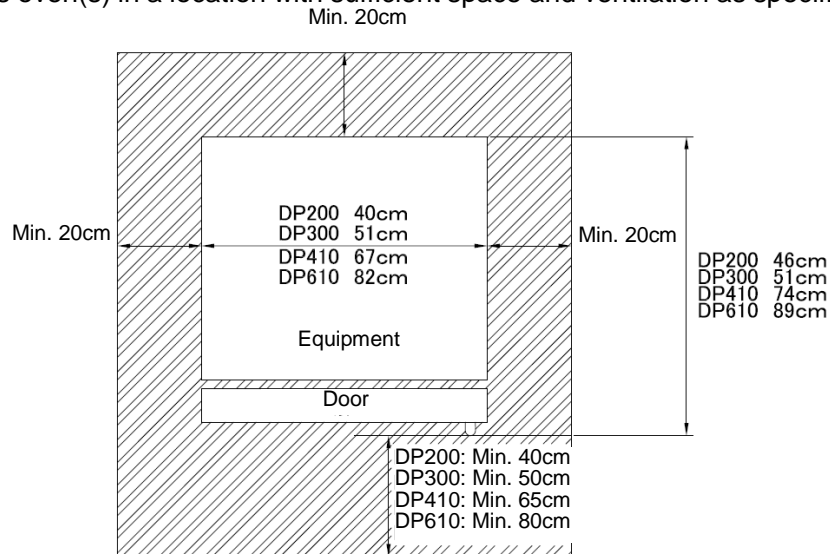


Do not install DP series unit:

- where flammable or corrosive gases/fumes will be generated.
- where exterior 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.



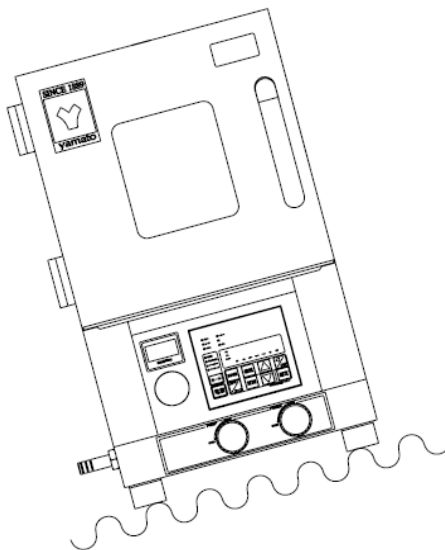
Install DP series oven(s) in a location with sufficient space and ventilation as specified as below.



2. Install on a level surface.



Install unit on a level and even surface. Failure to do so may result in abnormal vibrations or noise, possibly causing complications and/or malfunction.



Approximate unit weight:

DP200: approx. 45kg, DP300: approx. 72kg, DP410: approx. 210kg, DP610: approx. 310kg.

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

2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

3. Install in a safe location.

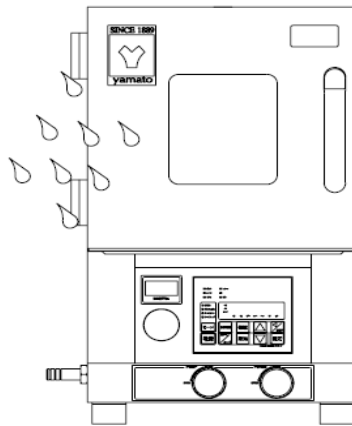
- ⚠ In the event of an earthquake or other unforeseen incident, equipment may unexpectedly shift or fall, causing injury. Taking preventative steps to install unit in a safe location, away from room access doors and out of other danger is strongly recommended.

4. Install in a well-ventilated area (DP200/300 only).

- ⊘ Install unit so that side panel heat vents (see “Unit Overview 1” on P.11 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.

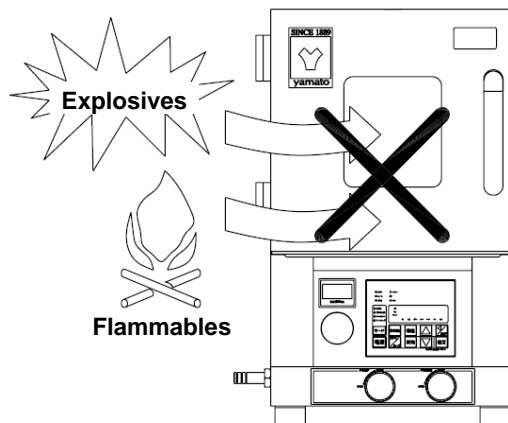
5. Install in a dry location.

- ⊘ 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.



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


- ⊘ Never install near flammables or explosives. This 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.58).








2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

7. Connect to power supply.

-  Connect power cable to a suitable facility outlet or terminal, according to the following electrical requirements.
- | | | | |
|--------------------------|-------|------------------------------|-------|
| Electrical requirements: | DP200 | Single phase 100V AC 50/60Hz | 7A |
| | DP300 | Single phase 100V AC 50/60Hz | 11A |
| | DP410 | Single phase 200V AC 50/60Hz | 11.5A |
| | DP610 | Single phase 200V AC 50/60Hz | 16A |
- ※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.
- ※Multiple power cables connected to a single outlet may cause unit input voltage to drop, resulting in degraded heating and temperature control performance.

8. 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 pinching it 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, melt 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 information about replacing power cable if it is damaged.
-  Always connect power cable to appropriate facility outlet or terminal.

2. PRE-OPERATION PROCEDURES

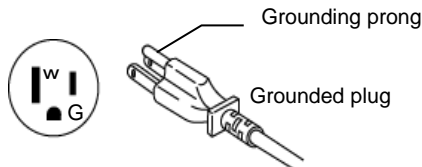
Installation Precautions & Procedures

9.(1) Ground wire **MUST** be connected properly (DP200/300 at 100V AC).



- Ground wire must be connected to a proper grounding line or terminal in order to avoid electrical shock.
- Never connect ground wire to gas lines or water pipes.
- Never connect ground wire to telephone grounding lines or lightning rods. Doing so may result in fire or electric shock.
- Never insert multiple plugs into a single outlet. Doing so may result in power cable overheating, fire or drop in voltage.

Connect to grounded outlet.

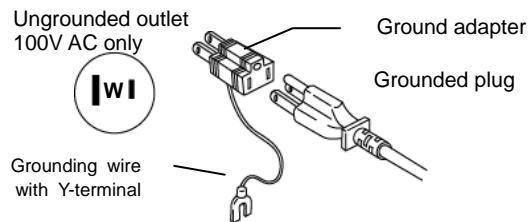


Outlet with ground receptacle

When no grounding terminal is found:

- Grounding to Electrical Equipment Technical Standards, Section 19, class D (Grounding Resistance Max. 100Ω) is required in Japan. Contact a local dealer, electrician, or Yamato Sales office for location-specific electrical requirements.

Use grounded adapter for ungrounded outlets.



Outlet with no ground receptacle

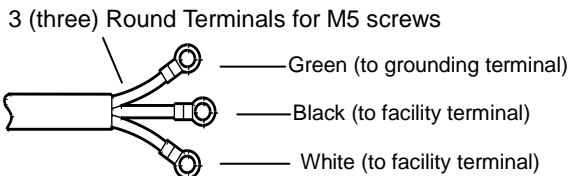
Ground adapter

- Insert grounded power plug into ground adapter. Connect grounding wire (green) from ground adapter to a ground terminal.

9.(2) Ground wire **MUST** be connected properly (DP410/610 220V AC).



- Grounding to Electrical Equipment Technical Standards, Section 19, class D (Grounding Resistance Max. 100Ω) is required in Japan where 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.



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

10. Observe wire color designation when connecting to facility terminal (DP410/610 200V AC) See table below.



Confirm that the facility main breaker is OFF before connecting the round terminals from the power cable. No power plugs or connectors of any kind are included with DP410/610. Where required, purchase an appropriate plug and properly connect using the round terminals.

Wire color	Terminal
Black	Live side
White	Neutral side
Green	Ground

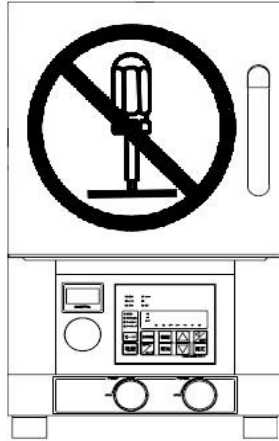
2. PRE-OPERATION PROCEDURES

Installation Precautions & Procedures

11. DO NOT disassemble or modify.



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



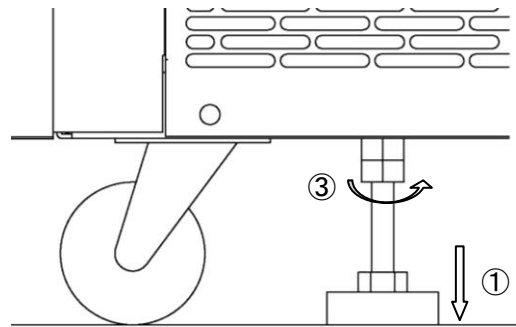
12. Position adjustable leveling feet (DP410/DP610 only).



Position the 2 (two) adjustable leveling feet, located on the undercarriage of DP410/610 units.

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

- ① Rotate leveling feet down until unit stands securely on the floor.
- ② Check for any gaps between the 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.



2. PRE-OPERATION PROCEDURES

Vacuum System Information

Vacuum System Information

Vacuum pumps and vacuum line components (sold separately) for DP series ovens

- (1) Vacuum pump models and vacuum line components (sold separately), required for DP series ovens, are shown in Table 2.1. Select an appropriate vacuum pump and vacuum line components (sold separately) using the table below. Note that an appropriate check valve must also be selected for vacuum pumps (sold separately). Vacuum line components are also offered as options and available upon request.

Table 2.1 Vacuum pump models and required line components (sold separately) for DP series ovens

Item Model (Pump Connection Port Size)	Manufacturer or Supplier	Vacuum Pump Model (sold separately)	Effective Pump Displacement (at 50/60Hz) in liters/min.	Pump Inlet Size	Required vacuum line components
DP200/300 (Pump connection port : ϕ 18mm)	Yamato Science	PD53 ^{*1}	50/60	ϕ 18 mm	• ϕ 15 mm ID vacuum hose Qty 1
		PX52 ^{*1}			
		PD103	100/120	ϕ 27 mm	• ϕ 15 mm ID vacuum hose Qty 1
		PD138 ^{*1}	135/162		• ϕ 25 mm ID vacuum hose Qty 1
		PX137 ^{*1}	135/162	ϕ 30 mm	• Reducing pipe(ϕ 18/ ϕ 27) A(Brass)/C(Stainless St.) Qty 1
DP410/610 (Pump connection port : NW25 flange)	Yamato Science	PD138 ^{*1}	135/162	ϕ 27 mm	• ϕ 25 mm ID vacuum hose Qty 1
		PD203 ^{*1}	200/240		• Vacuum hose adapter Qty 1
		PX137	135/162	ϕ 30 mm	• Clamp (NE20/25) Qty 1
		PX202	200/240		• Center ring (NW25) Qty 1
	Adixen	M(T)2010	142/170	NW25 flange	• Flexible hose Qty 1
		M(T)2015	208/250		• Clamp (NW20/25) Qty 2
		M(T)2010C	142/170		• Center ring (NW25) Qty 2
		M(T)2015C	208/250		
	Kashiyama	NeoDry15E	250	NW25 flange	• Flexible hose Qty 1
					• Clamp (NW20/25) Qty 2
				• Center ring (NW25) Qty 2	

【Note】

- *1 These pump models can be fitted with components for the KF-style quick-coupling flange, as on all Adixen pump models.
 - If an existing vacuum pump is to be connected to a new DP series unit, and their inlet sizes do not match, use an appropriate reducing joint.
- (2) Be sure to use the proper vacuum line components between vacuum pump (sold separately) and DP series unit to prevent any vacuum leaks.
- (3) If an existing pump cabinet is to be used for a new vacuum pump (sold separately) installation on DP models 410/610, be sure to place the vacuum pump (sold separately) inside of the cabinet so that the oil gauge faces front and can be easily viewed and regularly inspected.

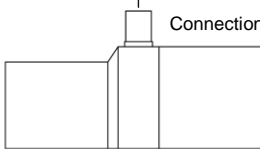
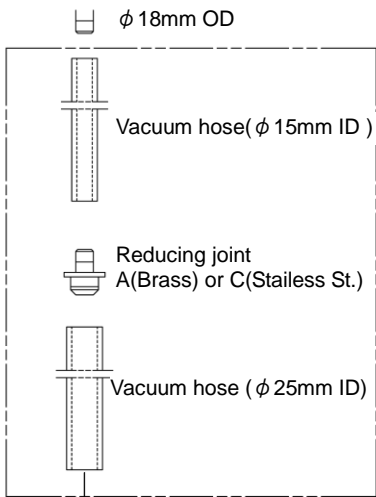
2. PRE-OPERATION PROCEDURES

Vacuum System Information

Vacuum System Information

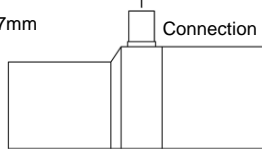
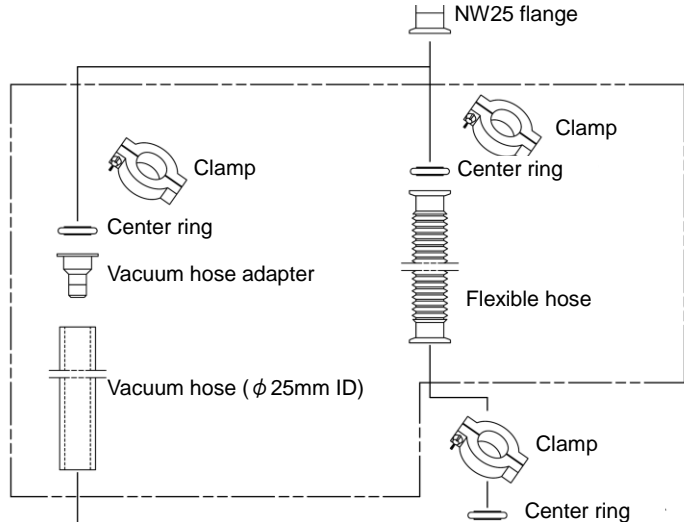
Vacuum pump and vacuum line components (sold separately) for DP series ovens

DP200/DP300 pump connection port

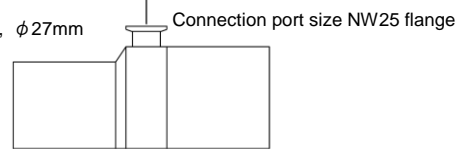


Rotary Vacuum Pump
PD138/203, PX137/202 etc.

DP410/610 pump connection port



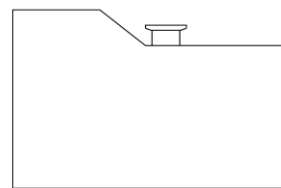
Rotary Vacuum Pump
KF25 quick-coupling specifications for M(T)2010/2015/2021,
PD/PX etc.



(Note)



components inside
broken line are
optional

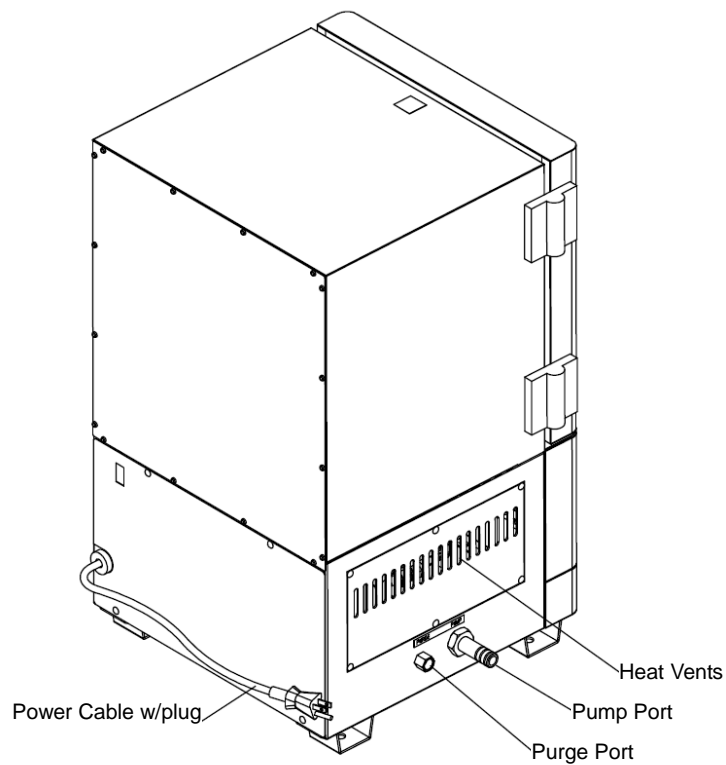
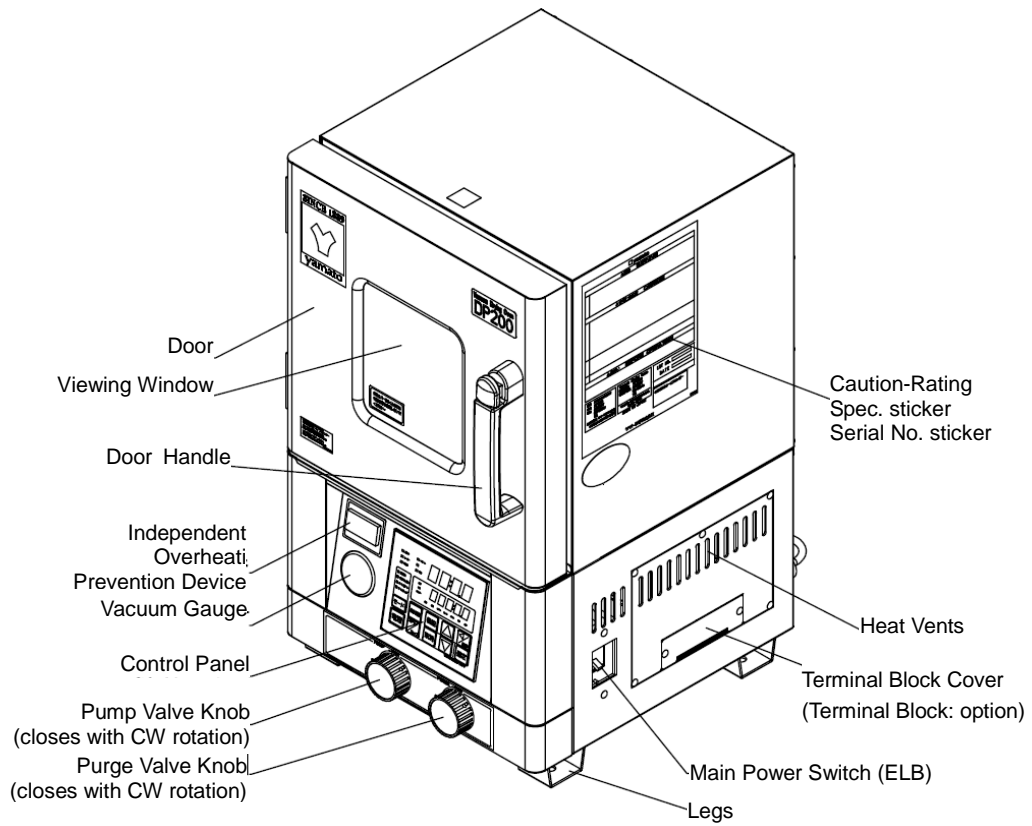


Air-cooled Dry Vacuum Pump
NeoDry 15E

3. COMPONENT NAMES AND FUNCTIONS

Unit Overview 1

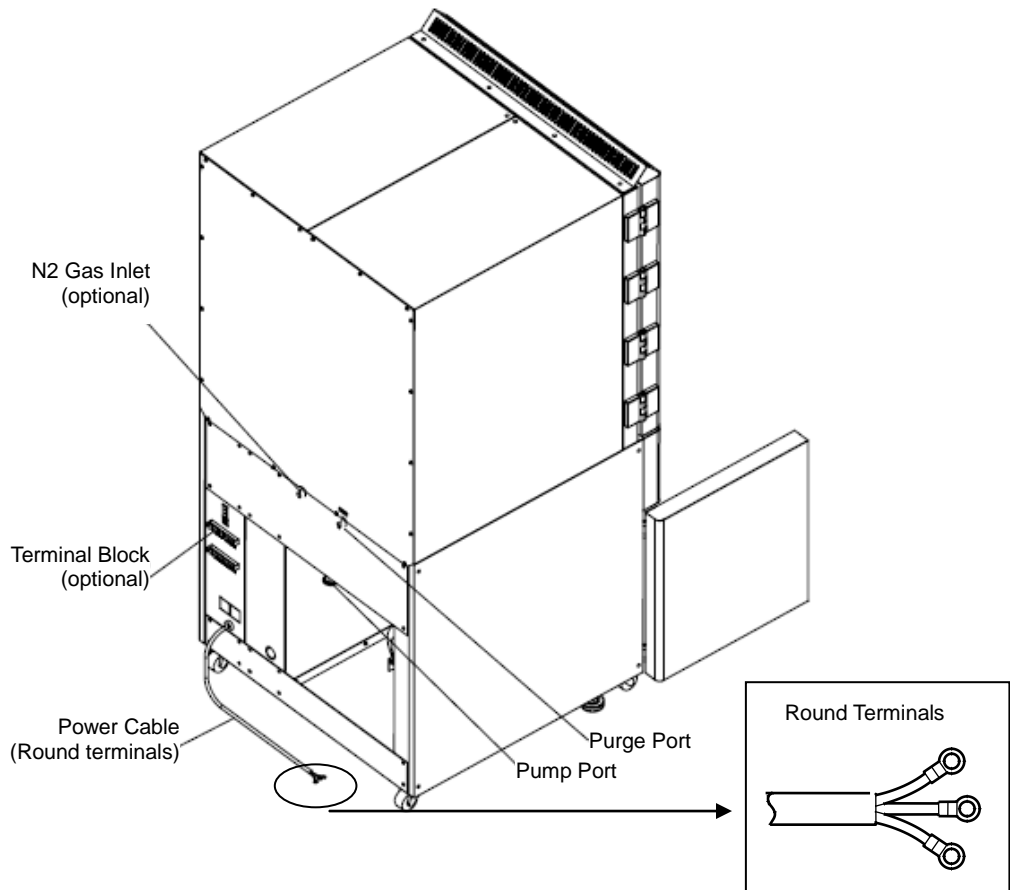
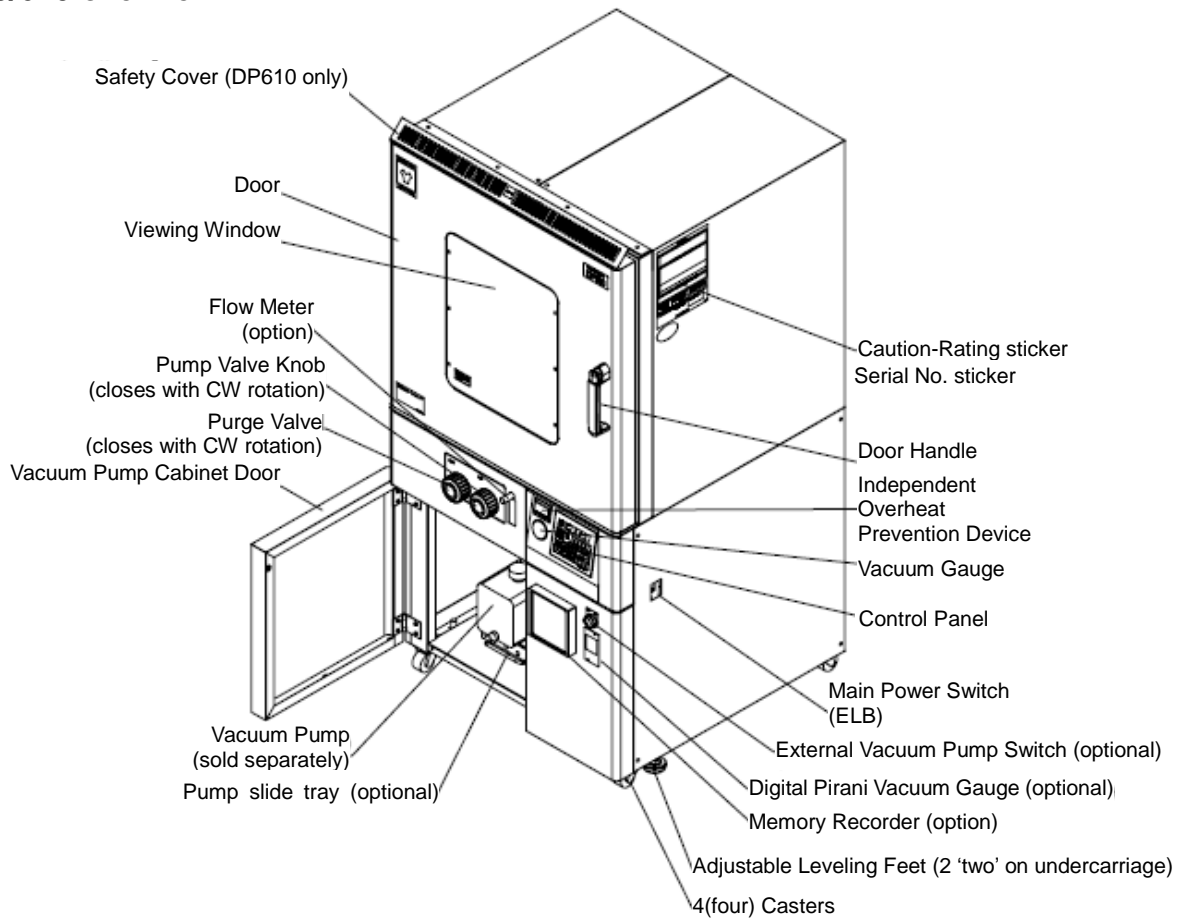
DP200/300 overview



3. COMPONENT NAMES AND FUNCTIONS

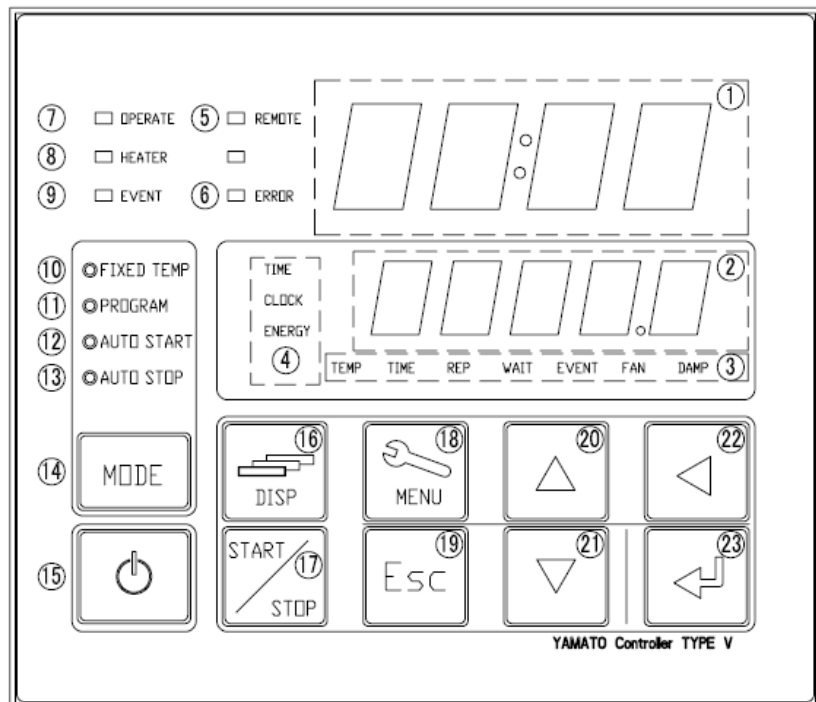
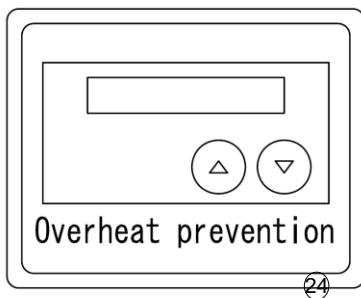
Unit Overview 2

DP410/610 overview



3. COMPONENT NAMES AND FUNCTIONS

Control Panel



No	Name	Description
1	Upper Display	Readout for temperature reading (current chamber temp), error codes, 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 (only one) 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 occurs.
7	OPERATE Indicator Lamp	Illuminates during operation. Flashes in operation standby mode.
8	HEATER Indicator Lamp	Illuminates when heaters are receiving power.
9	EVENT Indicator Lamp	Illuminates when event output (optional item) is transmitted.
10	FIXED TEMP Indicator Lamp	Illuminates during constant temperature operation.
11	PROGRAM Indicator Lamp	Illuminates during programmed operation. Flashes while entering program settings.
12	AUTO START Indicator Lamp	Illuminate during auto start operation.
13	AUTO STOP Indicator Lamp	Illuminates during auto stop operation.
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	DISP 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	Esc key	Press to return to previous menu without finalizing settings.
20	▲(Up) key	Press to increase setting value.
21	▼(Down) key	Press to decrease setting value.
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 certain temperature.

4. OPERATION PROCEDURE

Prior Confirmation

- (1) Power source and ground wire
Be sure to connect power cable to an appropriate power source and confirm that ground wire is connected.
- (2) Main power switch (ELB)
Turn ELB ON.
Test ELB function once a month or before extended operation. See “Maintenance Procedures” (P.43) for details.
Check the lower display on the control panel when ELB is turned on and confirm it is showing current time.
- (3) Independent Overheat Prevention Device (IOPD)
Be sure to set IOPD temperature 20°C over the chamber temperature setting.
Test IOPD function before each instance of extended operation. See “Maintenance Procedures” (P.43) for details.
- (4) Vacuum line connection
Be sure to connect unit securely to vacuum pump (sold separately).
- (5) Vacuum pump (sold separately)
Check vacuum pump oil level and be sure it is free of contamination.

Decompression/Purge Procedure

- (1) Decompressing unit chamber
 1. Close purge valve.
 2. Close the pump valve.
 3. Turn vacuum pump ON.
 4. Open the pump valve.Note: open pump valve gradually when processing powdery or frothy test samples.
- (2) Repressurizing unit chamber
 1. Close pump valve.
 2. Open purge valve to allow ambient pressure back into chamber.
 3. Open Pump Valve.
 4. Shut vacuum pump OFF.Note: open purge valve gradually when processing powdery test samples.

4. OPERATION PROCEDURE

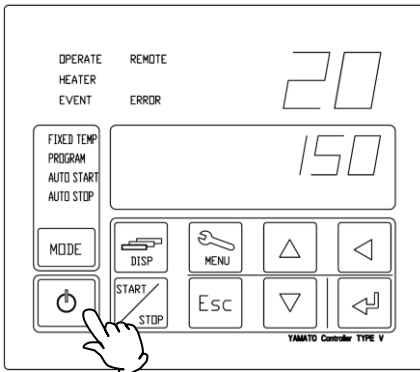
Setting Date & Time

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

※ Contact a local dealer or Yamato sales office to request a replacement battery. If unit has program data in memory, make a data backup file before replacing backup battery. See “Data Backup” (P.35) in this section for details.

To set the current date & time, after replacing backup battery, follow the steps below.

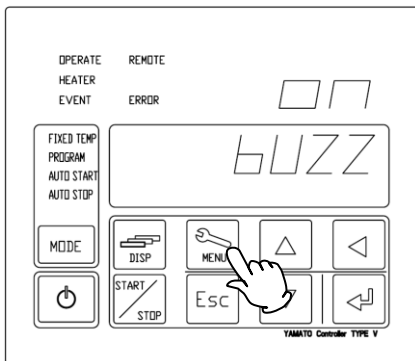
1 Turn on power.



Turn ON the main power switch (ELB), located on the right panel of the DP series units. Lower display on the control panel will show the time. This indicates that the machine is in “idle”.

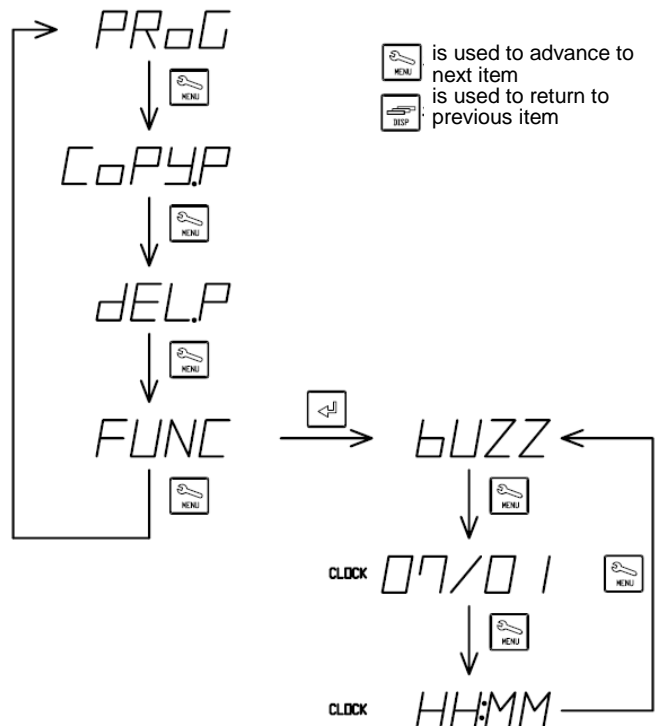
Press and hold to display the standby screen. Upper display shows current temperature in the chamber while lower display shows current temperature setting. This indicates that the machine is in “standby”.

2 Use the MENU key to view date and time in displays



① Press repeatedly until FUNC appears in lower display, then press .

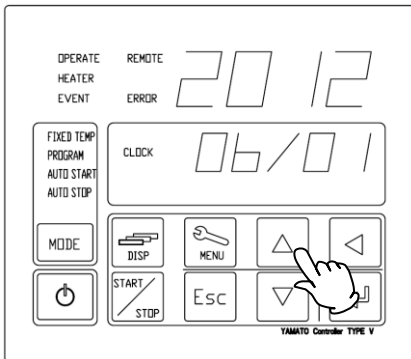
② When [bUZZ] is shown in the lower display, press to view the year in upper display, and month/date in lower display.



4. OPERATION PROCEDURE

Setting Date & Time

3 Set the date.

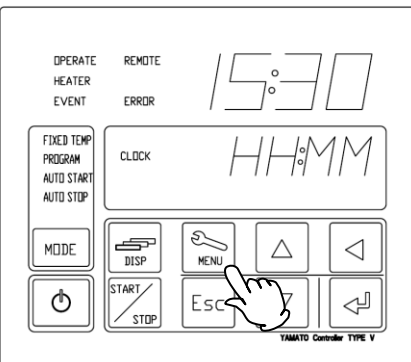


Setting the year/month/date and clock.

- ① Year and month/date are shown on upper and lower displays respectively.
- ② Press . Settable value begins flashing.
- ③ Set calendar year with and . Press .
- ④ Set month/date with and . Press .

※Press to change digit (flashing) positions.

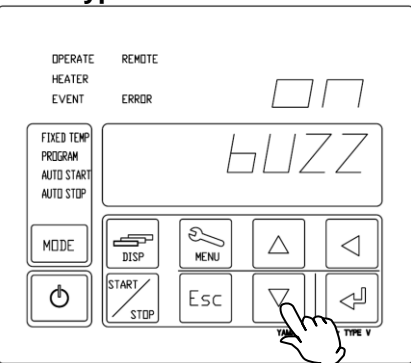
4 Set the time.



- ① Press .
- ② Press and set current time with and press .
Set time in conformance to the 24-hour time system (e.g. military time, continental time or railway time).
※Press to change digit (flashing) positions.
- ③ Press twice to return to initial screen when time/date settings are completed.

Keypad Tone Function

1 Set keypad tone.



- ① Press repeatedly until FUNC is shown, then press to bring up BUZZ in lower display. Press . oFF begins flashing in upper display.
- ② Select one of three keypad tone modes using and press .

on: Activates tone for all keys. (factory default).

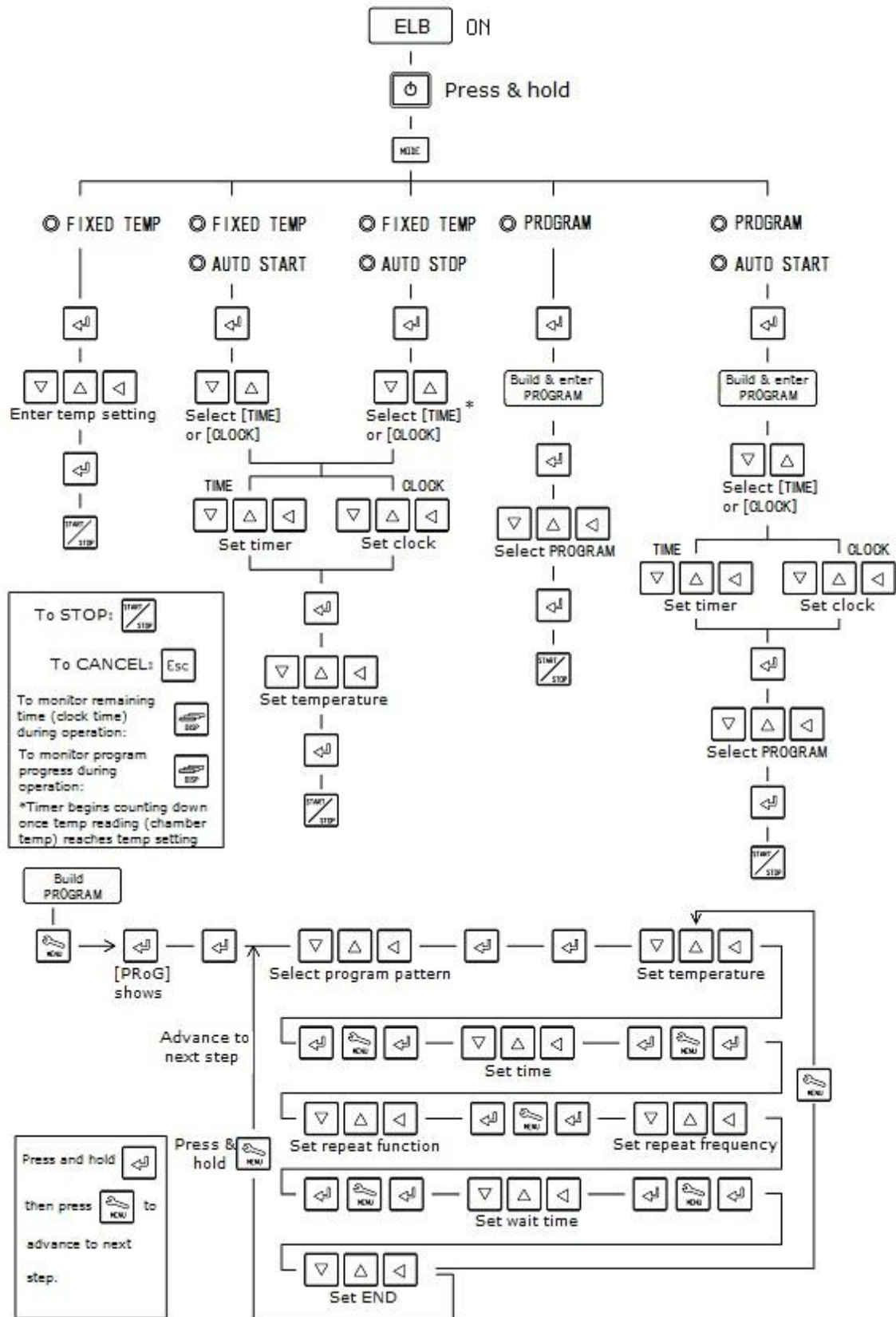
CLK: Activates tone for POWER and ENTER keys only.

oFF: Deactivates tone for all keys.

Press the key twice to go back to initial screen when keypad tone settings are completed.

4. OPERATION PROCEDURE

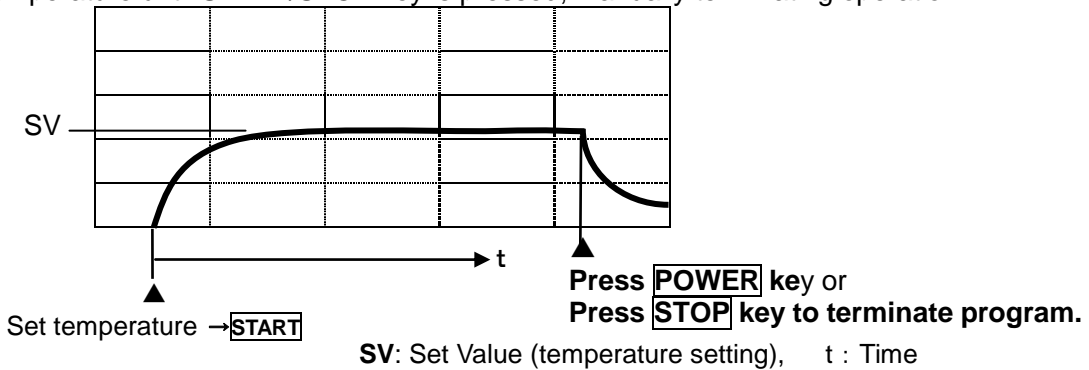
Mode and Function Flow



4. OPERATION PROCEDURE

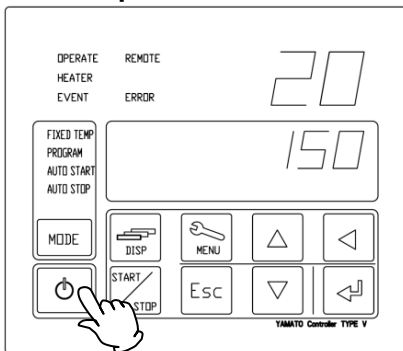
Constant Temperature Mode

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



Setting constant temperature mode.

1 Turn on power.

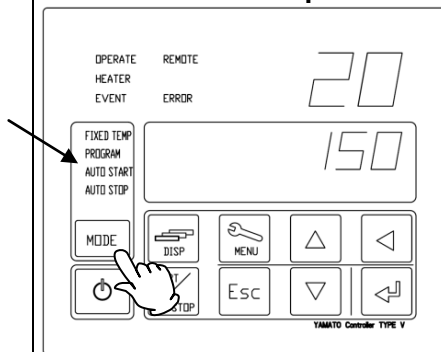


Turn ON main power switch (ELB), located on right panel of unit. (idle)

Press and hold to turn on power. (standby)

Chamber temperature is shown in upper display, Temperature setting is shown in lower display.

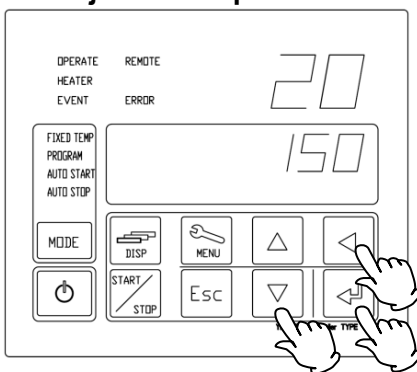
2 Select constant temperature mode.



Press repeatedly until FIXED TEMP indicator lamp comes on.

※ Factory default temperatures are shown in upper and lower displays on first-time start-up. All subsequent start-ups will default to last temperature values entered.

3 Set objective temperature.



① Press . Changeable digits flash in lower display.

② Toggle between digits using and enter desired value using .

Operating Temperature Range :
 DP200/300:40~240°C (Setting range: 0~250°C)
 DP410/610: 40~20°C (Setting range: 0~210°C)

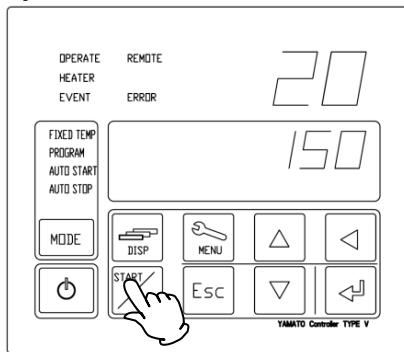
③ Press once temperature setting has been entered.


Press once or twice to cancel setting.

4. OPERATION PROCEDURE

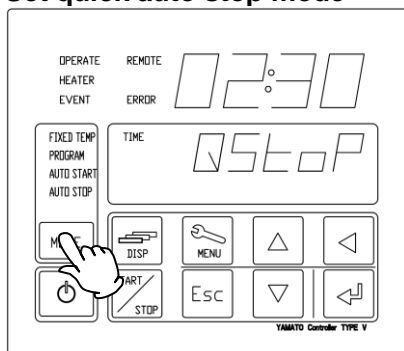
Constant Temperature Mode

4 Start/stop constant temperature operation









Press  to start or stop (terminate) constant temperature operation.

5 Set quick auto stop mode

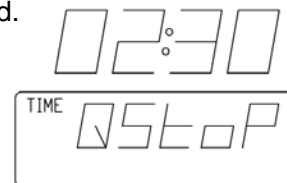


The quick auto stop function is used to automatically stop constant temperature operation at a certain time (clock) or after a certain time (timer) has passed. **(decided during operation)**

- ① Press  while unit is running in constant temperature mode.
- ② QStoP is shown in lower display and the [TIME] lamp will begin flashing.
- ③ Select the stop mode (TIME or CLOCK) using  , and press .
- ④ Set TIME (setting range: 0~99hr : 0~59min) or CLOCK (24-hour time system only) in upper display and press .
- ⑤ When timer reaches 0:00 or when clock and the time setting agree, operation stops and "END" appears in lower display.
- ⑥ Press  to clear "End" from display.

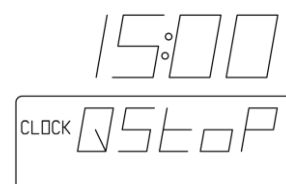
Example 1. Quick auto stop mode w/timer:


In the example below, operation stops automatically in 2 hours and 30 minutes AFTER target temperature is reached.



Example 2. Quick auto stop mode w/clock:

In the example below, operation is stopped automatically at 3:00 p.m. REGARDLESS of when target temperature is reached.

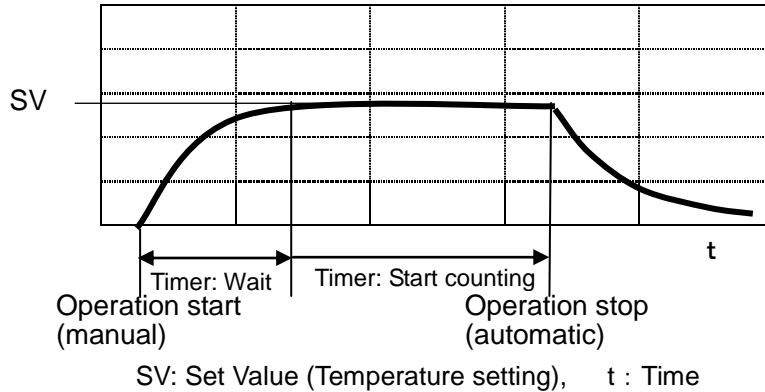


※ Press  to monitor temperature and remaining time during operation, when desired.

4. OPERATION PROCEDURE

Auto Stop Mode

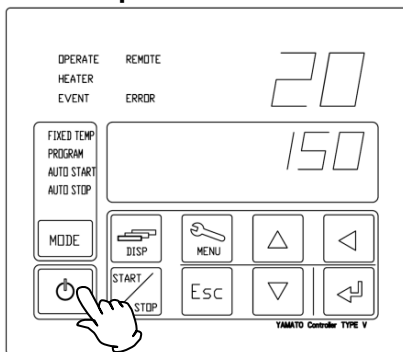
AUTO STOP (Automatic Stop) utilizes timer or clock to automatically stop an operation. Operation must be started manually. See below.



※See explanation regarding “wait mode” on page 29.

Programming auto stop mode

1 Turn on power

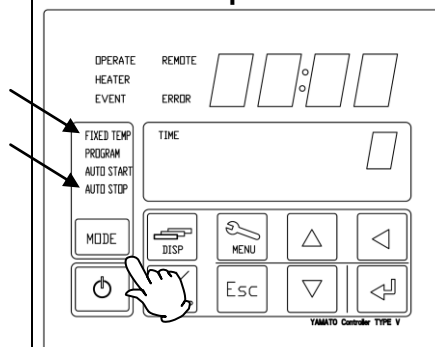


Turn on main power switch (ELB), located on the right panel of unit. (idle)

Press and hold to turn on power. (standby)

Chamber temperature is shown in upper display. Temperature setting is shown in lower display.

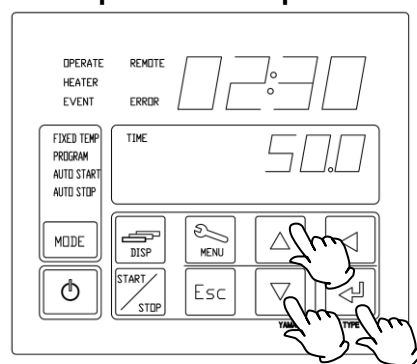
2 Select auto stop mode



Press repeatedly until both the FIXED TEMP and AUTO STOP indicator lamps are illuminated.

※ Constant temperature mode is the factory default setting and will be the mode selected on first-time startup. On subsequent startups will default to last mode run.

3 Set temperature and operation time.



① Press .

Select TIME or CLOCK using , and press .

② Set TIME (setting range: 0~99hr : 0~59min) or CLOCK (24-hour time system only) in upper display and press .

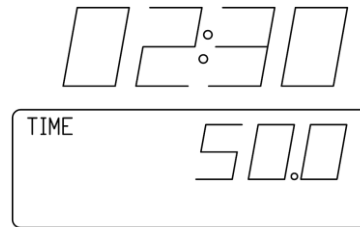
③ Set temperature in lower display and press .

4. OPERATION PROCEDURE

Auto Stop Mode

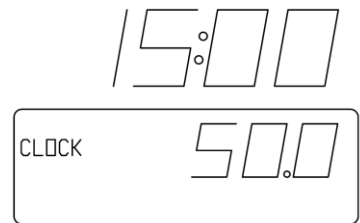
Example 1. Auto stop mode w/timer:

In the example below, operation is stopped automatically in 2 hours and 30 minutes AFTER temperature setting of 50°C is reached.

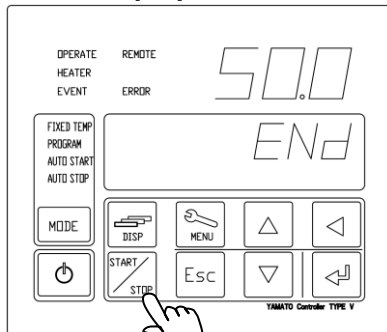



Example 2. Auto stop mode w/clock:

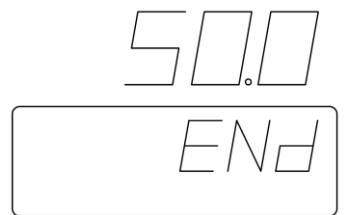
In the example below, operation will automatically terminate at 3:00 p.m. REGARDLESS of when target temperature is reached.





4 Start / stop operation



- ① Press  to start or stop (terminate) operation at any time.
- ② When timer reaches 0:00, or when clock and selected end-time agree, "ENd" will show in lower display.



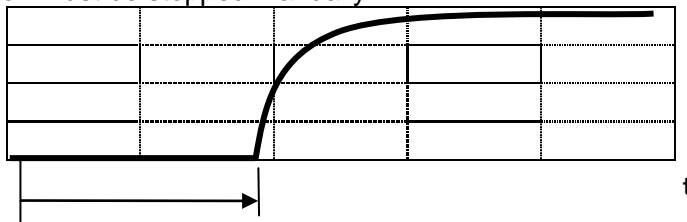
- ③ Press  to clear "ENd" from display.

※ Press  to monitor temperature and remaining time during operation, when desired.

4. OPERATION PROCEDURE

Auto Start Mode

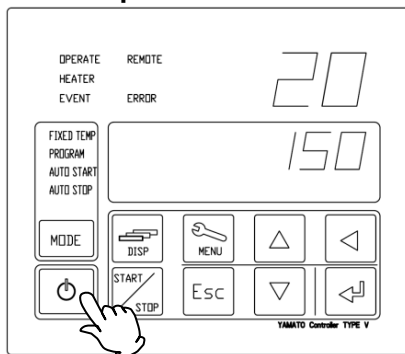
AUTO START (Automatic Start) mode utilizes timer or clock to automatically begin an operation. Operation must be stopped manually.



Start timer counting Start operation (automatically)

Setting Automatic Start Mode

1 Turn on power

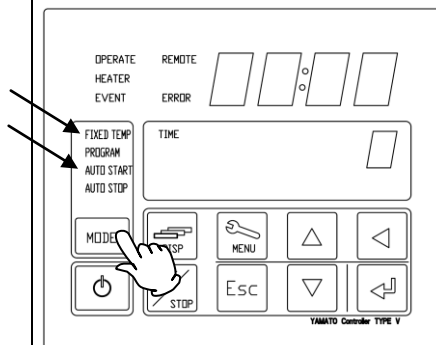


Turn on main power switch (ELB), found on the right panel of unit. (idle)

Press and hold to turn on power. (standby)

Chamber temperature is shown in upper display. Temperature setting is shown in lower display.

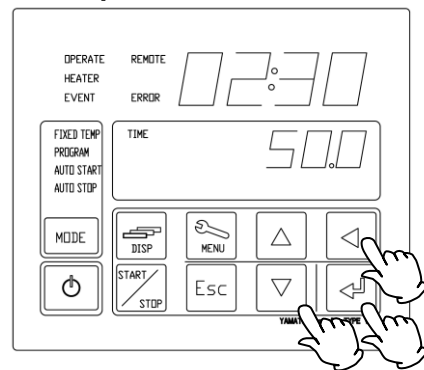
2 Select auto start mode



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

※ Constant temperature mode is the factory default setting and will be the mode selected on first-time startup. On subsequent startups will default to last mode run.

3 Set temperature and start time.



① Press .

Select TIME or CLOCK using , and press .


② Set TIME (setting range: 0~99hr : 0~59min) or CLOCK (24-hour time system only) in upper display and press .

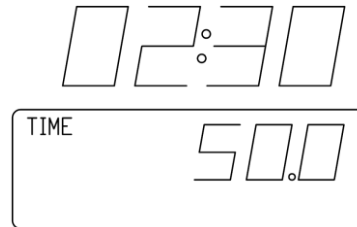
③ Set temperature in lower display and press .

4. OPERATION PROCEDURE


Auto Start Mode

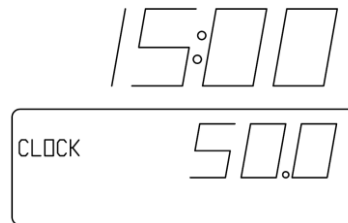
Example 1. Auto start mode w/timer:

in the example below, operation automatically begins 2 hours and 30 minutes, after  is pressed.

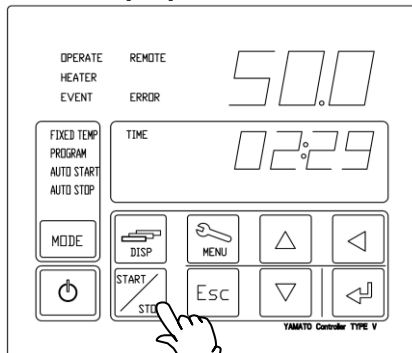


Example 2. Auto start mode w/clock:

When  is pressed in the example below, operation begins automatically at 3:00 p.m.

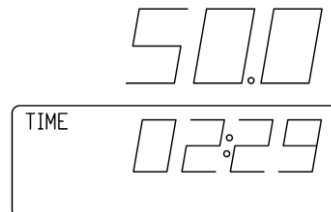


4 Start /stop operation





④ Press  to enter standby (wait) mode.

⑤ The OPERATE indicator lamp begins flashing and start timer or clock shows in the lower display.



※ Chamber temperature is shown in upper display. Timer or clock is seen in lower display, depending on which mode is selected for auto start.

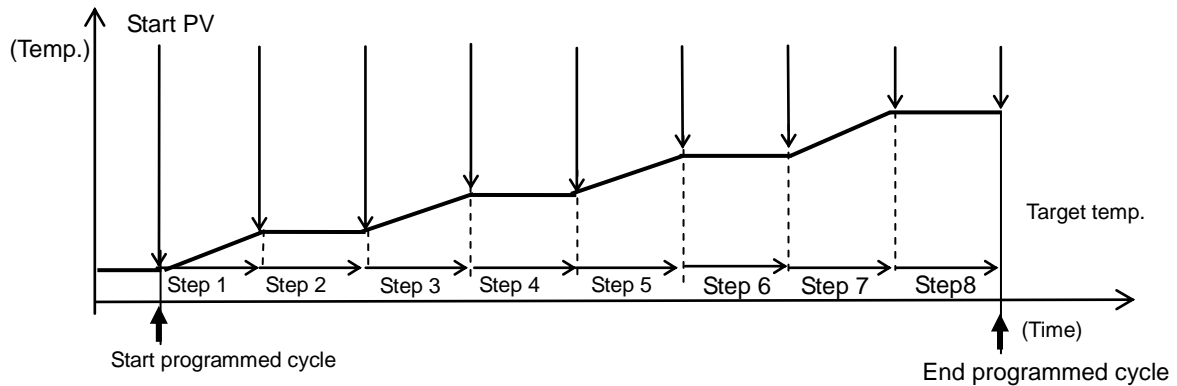
⑥ Press  to terminate operation at any time.

※ Press  to monitor temperature and remaining time during operation, when desired.

4. OPERATION PROCEDURE

Programmed Operation

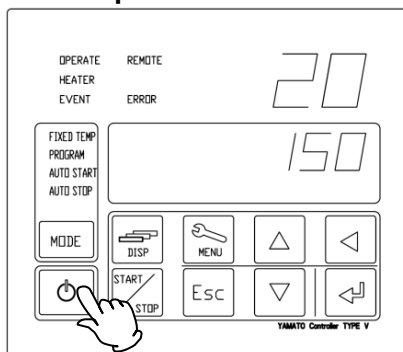
PROGRAM mode runs a combination of times and temperatures in a series of programmed steps as one operation. See below.



PV: Process Value (ambient temperature)

Entering Pattern Programs

1 Turn on power



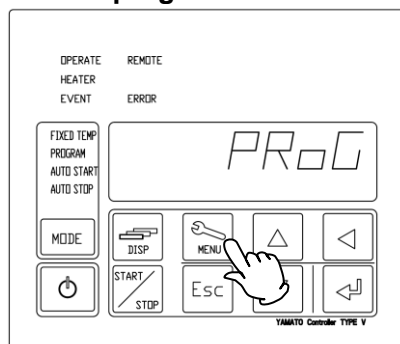
Turn on main power switch (ELB) found on the right panel of unit. (idle)

Press and hold  to turn on power. (standby)

Chamber temperature is shown in upper display. Temperature setting is shown in lower display.

* Enter a target program prior to running first cycle.

2 Enter a program.



Program steps entered and program patterns saved may not exceed 99 in total.

Example:

A total of 11 program patterns can be stored with a maximum of 9 programmed steps each.

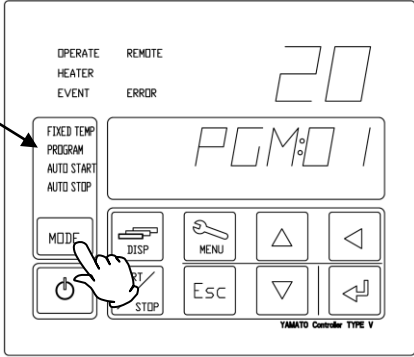

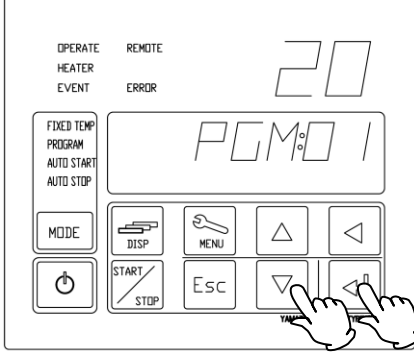




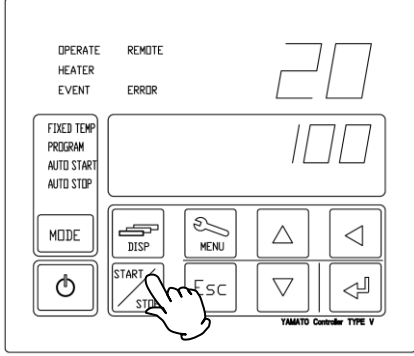

※Note regarding "program repeat function".

It is not possible to cut into and repeat process steps, in part (crossing) or in full (reduplication), from anywhere upstream in the process program, during operation.

See "Programming Procedure" (P.27) for details on program entry.

4. OPERATION PROCEDURE

Programmed Operation

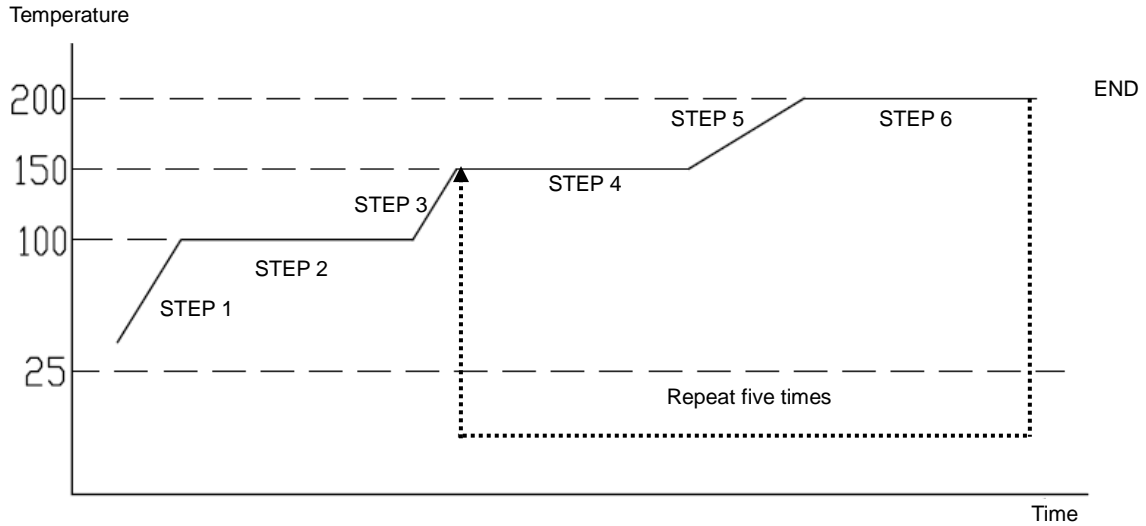
<p>3 Select program mode</p>  <p>OPERATE REMOTE HEATER ERROR EVENT</p> <p>FIXED TEMP PROGRAM AUTO START AUTO STOP</p> <p>MODE DISP MENU Δ ◀</p> <p>START/STOP Esc ▽ ◀</p> <p>YAMATO Controller TYPE V</p>	<p>Press  repeatedly until PROGRAM lamp illuminates.</p> <p>“PGM:XX” will show in lower display. (Last program entered or used will always be the one shown in the display on start-up)</p> <p>※ Constant temperature mode is the factory default setting and will be the mode selected on first-time startup. On subsequent startups will default to last mode run.</p>
<p>4 Select program pattern number</p>  <p>OPERATE REMOTE HEATER ERROR EVENT</p> <p>FIXED TEMP PROGRAM AUTO START AUTO STOP</p> <p>MODE DISP MENU Δ ◀</p> <p>START/STOP Esc ▽ ◀</p> <p>YAMATO Controller TYPE V</p>	<p>Press . “01” begins flashing in lower display. Select the desired program pattern number using   and press .</p>
<p>5 Start program mode</p>  <p>OPERATE REMOTE HEATER ERROR EVENT</p> <p>FIXED TEMP PROGRAM AUTO START AUTO STOP</p> <p>MODE DISP MENU Δ ◀</p> <p>START/STOP Esc ▽ ◀</p> <p>YAMATO Controller TYPE V</p>	<p>Press  to start programmed operation.</p> <p>※ If the “end” setting is left out on the final step of a program pattern, the entire program will not run. If newly entered programs fail to run, confirm that all settings have been entered correctly.</p>

4. OPERATION PROCEDURE

Building Programs

Entering a new program.

Example 1: Program pattern #2 has 6 steps and contains a repeat cycle which, repeats steps 4 to 6, five times and ends. (STEP1,2,3→STEP 4, 5 and 6 × five times→END)



Program Criteria:

STEP1: Set 100°C, 0 minute, wait ON

STEP2: Set 100°C, 2 hours, wait OFF

STEP3: Set 150°C, 0 minute, wait ON

STEP4: Set 150°C, 2 hours, wait ON

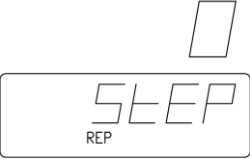

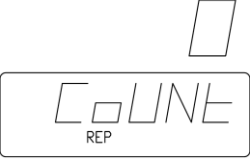

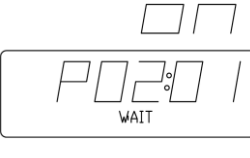

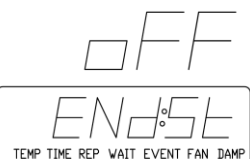
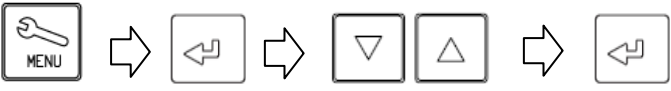




STEP5: Set 200°C, 1 hour, wait OFF

STEP6: Set 200°C, 2 hours, repeat from step #4, repeat 5 times, wait ON, end ON

NO	Display	Entry procedures (for Example1 above)
1-1	Standby screen	
1-2		
Step1 1-3		Enter 02:01 (Pattern #02, step #01)
1-4		Enter 100 (100°C)
1-5		Enter 00:00 (00 hr 00 min)



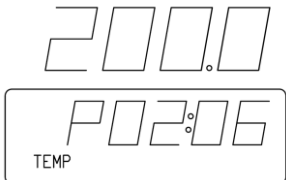

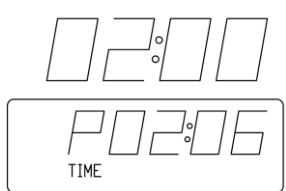



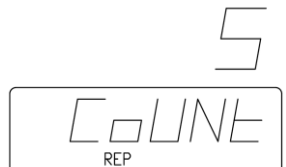

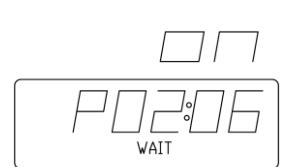

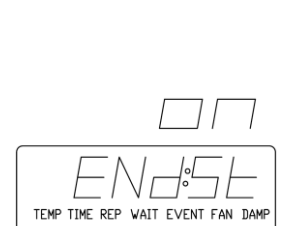
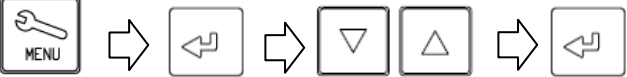
4. OPERATION PROCEDURE

Building Programs

1-6		Enter 0 (no repeat) 
1-7		Enter 0 (no repeat) 
1-8		Select "on" (to activate Wait Function) (A set countdown time to when temperature reading is within $\pm 1^{\circ}\text{C}$ of temperature reading) 
1-9		Select "oFF" (Select "oFF" to program next step. Select "on" to program current step as "end step") 
1-10	Programming for Step #1 complete. Now:	 Press and hold
2-1		Enter 02:02 (Pattern #02, step #02) 
} Step2 } Step3 } Step4 } Step5 }	Enter the parameters for steps #2 to #5 in the same manner as step #1. (repeat entry procedures 1-3~1-9)  ※Press at any time while entering a program to show [RESt.P] in the lower display and see remaining available steps in upper display.	

4. OPERATION PROCEDURE

Building Programs

<p>Step6 6-1</p>		<p>Enter 02:06 (Pattern #02, step #06)</p> 
<p>6-2</p>		<p>Enter 200 (200°C)</p> 
<p>6-3</p>		<p>Enter 02:00 (02 hr 00 min)</p> 
<p>6-4</p>		<p>Enter 4 (to repeat step #4 from the beginning)</p> 
<p>6-5</p>		<p>Enter 5 (to repeat five times)</p> 
<p>6-6</p>		<p>Select "on" (to activate wait function) (A set countdown time to when temperature reading is within $\pm 1^{\circ}\text{C}$ of temperature reading)</p> 
<p>6-7</p>		<p>Select "on" (Select "oFF" to advance to the next step. Select "on" to program as the "end step")</p>  <p>※Last step in the program MUST include "END setting".</p>

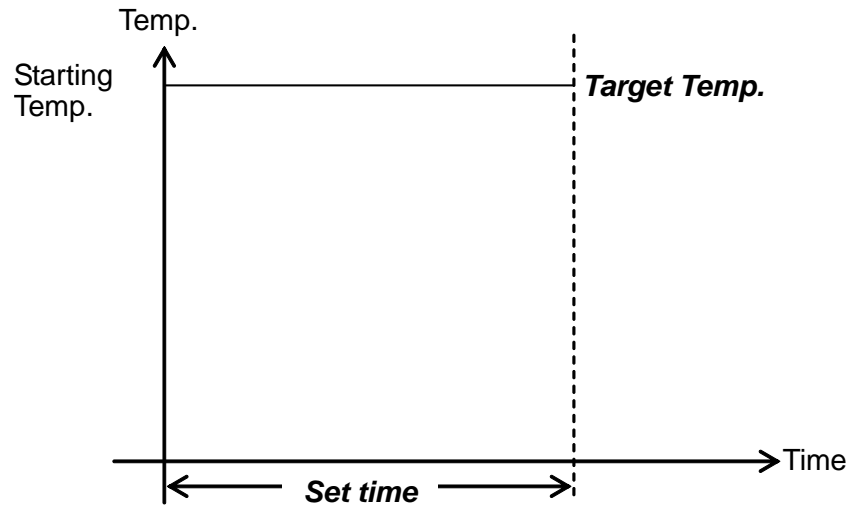
4. OPERATION PROCEDURE

Wait Function

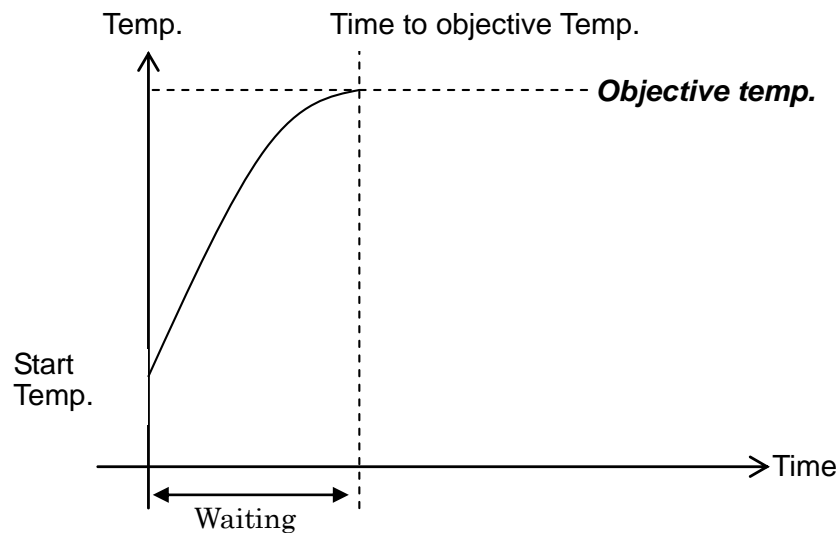
[Wait function explained]

If "starting temperature" and "temperature setting" are equal, chamber temperature is maintained until timer reaches 0 (zero),.

If chamber temperature drops more than 3°C below or goes more than 6°C beyond temperature setting, however, timer countdown stops and unit enters "wait mode" until coolant temperature returns to within -3°C or +6°C of temperature setting. Timer then begins counting down once again, from where it left off, until it reaches 0 (zero) and operation finishes.

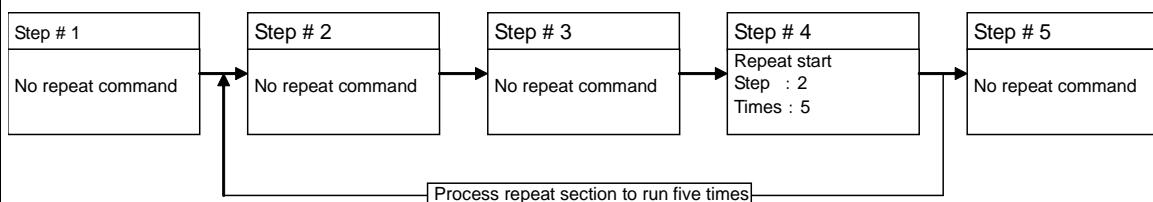


If timer setting is 0 (zero), temperature in chamber is raised to "temperature setting" on full power. If "wait" is set to "on" (program mode), "wait mode" will be activated until chamber temperature is within -3°C or +6°C of temperature setting.



The following flowchart illustrates the repeat function concept.

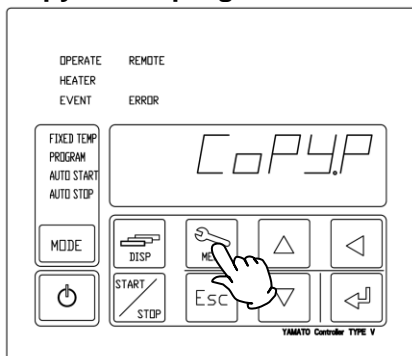
Note that the first cycle of the repeating section is not counted as a repeating cycle.



4. OPERATION PROCEDURE

Program Copy & Delete

Copy/delete program



• Copying a program.

- ① Press repeatedly until [CoPY.P] appears in lower display and press .
- ② [SrC] shows in upper display. Use to select program to copy in lower display and press . Program is copied.
- ③ [dESt] appears in upper display. Using , select a number which the copied program will be stored as and press . Program is duplicated with new designation.

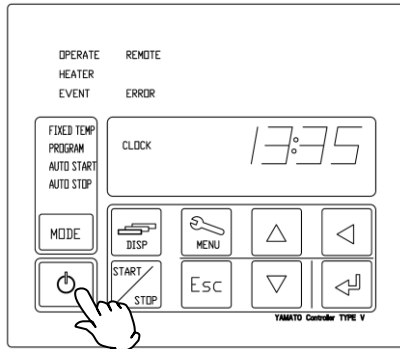
• Deleting a program.

- ① Press repeatedly until [dEL.P] appears in lower display, then press .
- ② [dEL] appears in upper display. Select a program number to delete using , then press and hold .
- ③ [dEL] flashes in upper display as warning that the program number shown is about to be deleted. Press again. Program is deleted.

4. OPERATION PROCEDURE

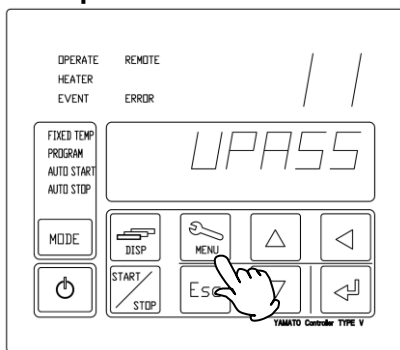
Keypad Lock Function

1 Turn power OFF



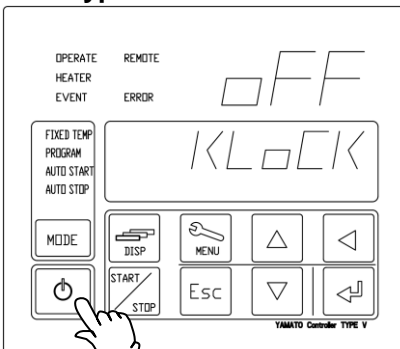
Press and hold to turn power OFF so that current time is showing in lower display (idle).

2 Enter password



- ① Press and hold .
[UPASS] appears in lower display. "00" shows in upper display with right digit flashing.
- ② Use and to enter password "11" in upper display and press (password is locked to "11").

3 Set keypad lock mode



- ① [KLoCK] is shown in lower display. Press .
- ② Use to select keypad lock mode and press .

: All keys enabled. (factory default)
 : All keys disabled except key and START key.
 : key only is disabled.
 : key only is disabled.

- ③ Press and hold to return to initial idle screen.

4. OPERATION PROCEDURE

Calibration Offset Function

The calibration offset feature makes it possible to compensate for any difference between the 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 DP series units.

Example

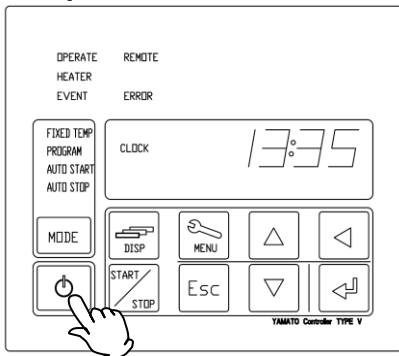
Actual chamber temperature is lower than the control panel temperature reading by 2°C:


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 the actual temperature.

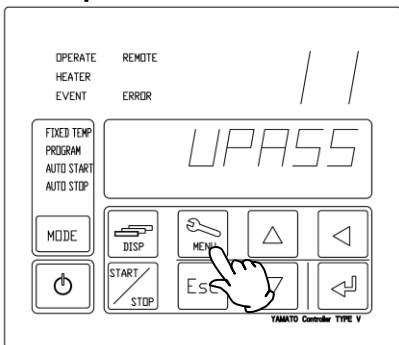
※The -2°C calibration in the example above is applied over the entire temperature setting range (0~250°C for DP200/300, & 0~210°C for DP410/610). Note that offset values may change slightly depending on test sample arrangement in the chamber and/or temperature setting.






1 Turn power OFF.



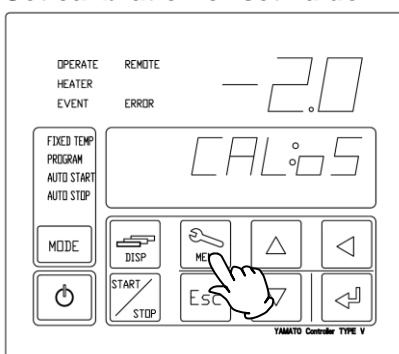
Press and hold  to turn power OFF so that current time shows in lower display (idle).







2 Enter password.



- ① Press and hold .
[UPASS] will show in lower display. [00] shows in upper display.
- ② Using   and , enter password, "11" in upper display and press .

3 Set calibration offset value.



- ① Press  repeatedly until [CAL:oS] can be seen in lower display and [0.0] in upper display. Press .
- ② Enter offset value using   and . Press .

Example

Temperature reading is 200°C, while actual temperature (manually taken) is 198°C

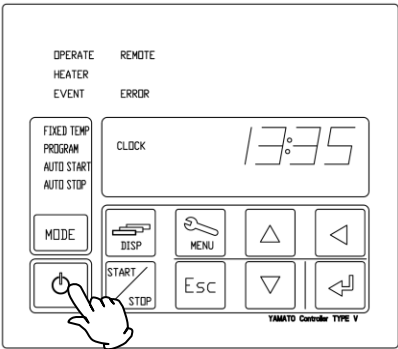

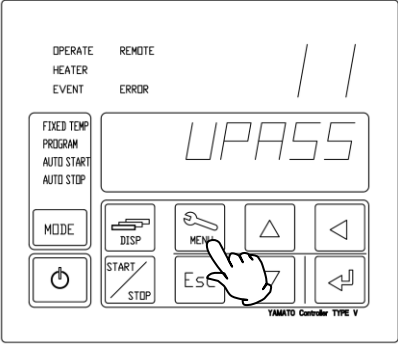





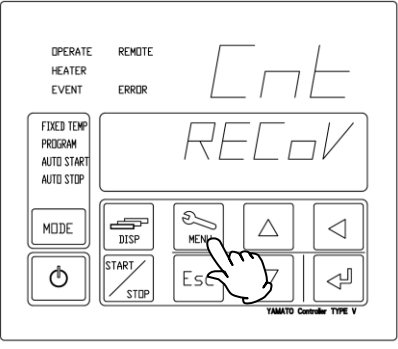






⇒Offset input value: -2

- ③ Press and hold  to return to idle screen.

4. OPERATION PROCEDURE

Recovery Modes

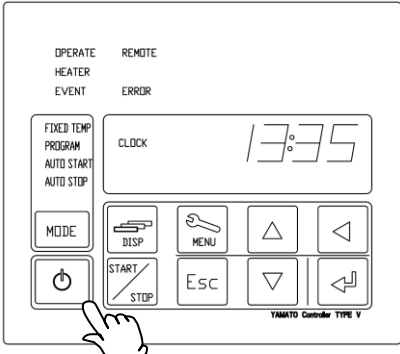

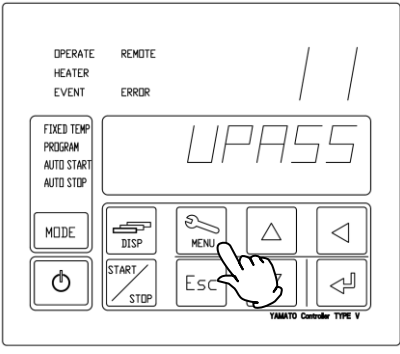





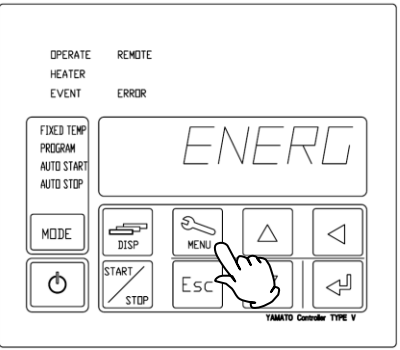
















Setting the recovery option in case of a power failure.

1	Turn power OFF 	Press and hold  to turn power OFF so the current time shows in lower display (standby).
2	Enter the password 	<ol style="list-style-type: none">① Press and . [UPASS] will show in lower display and [00] in upper display.② Use   and  to enter password "11" in upper display and press .
3	Set recovery option. 	<ol style="list-style-type: none">① Press  repeatedly until [RECoV] shows in lower display and press .② Use   to select recovery mode and press . Cnt: Operation will resume where it left off at power failure. (factory default) StoP: Operation will terminate and unit will go into idle when power is restored.③ Press and hold  to return to idle screen.

4. OPERATION PROCEDURE

CO2 Emissions & Power Consumption Settings

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

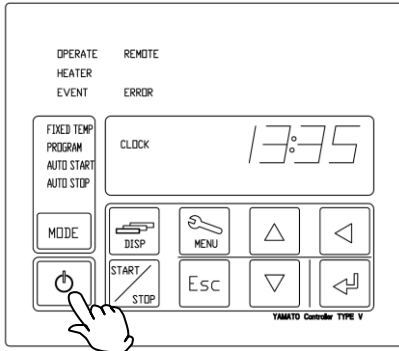
<p>1 Turn power OFF.</p>		<p>Press and hold  to turn power OFF so that current time is showing in lower display (idle).</p>
<p>2 Enter password.</p>		<p>① Press and hold . [UPASS] appears in lower display. "00" shows in upper display with right digit flashing</p> <p>② Use   and  to enter password "11" in upper display and press  (password is locked to "11").</p>
<p>3 Set/reset monitored items.</p>		<p>① Press  repeatedly to show [ENERG] in lower display. Press .</p> <p>② Press  to select an item in lower display :</p> <p>"PoW:Rt" ("oFF" in upper display) : Press  to change "oFF" (constant) to → rUn (flashing) in lower display. Press  to reset accumulated power consumption. Press  to return to [PoW:Rt] screen. KG.K 0555 (denoting 0.555 - factory default value) : Press  to make value changeable (flashing). Use   and  to change conversion factor value. Press , then  to return to [KG.K] screen. "Co2:Rt" ("oFF" in upper display) : Press  to change "oFF" (constant) to → "rUn" (flashing) in upper display. Press  to reset accumulated CO2 emissions. Press  to return to [Co2:Rt] screen.</p> <p>③ Press and hold  to return to initial idle screen.</p>


4. OPERATION PROCEDURE

Data Backup & System Reset

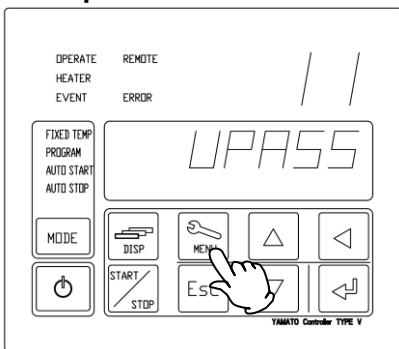
Back up data, show saved data or reset to factory default settings.






1 Turn power OFF.



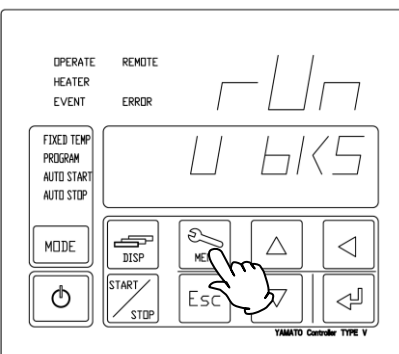
Press and hold  to turn power OFF so that current time is showing in lower display (idle).




2 Enter password.



- ① Press and hold . [UPASS] appears in lower display. "00" shows in upper display with right digit flashing.
- ② Use   and  to enter password "11" in upper display and press  (password is locked to "11").

3 Save data/show saved data/reset.





- ① Press  repeatedly to toggle through the following items respectively in lower display:
 - U Bks: Backs up all setting information.
 - U bKR: Displays back up data.
 - INI.U: Resets all settings to factory default.
- * Backup items include programs entered, temperature offset values and other data, such as keypad lock modes, calibration offsets, recovery modes, etc.
- ② Select one of the 3 modes described above.
 - Press . [rUn] will be shown in upper display.
 - Press .

4. OPERATION PROCEDURE

Data Monitoring

※Current power consumption, accumulated hours of operation, etc. can be viewed by using the data monitoring feature on this unit.

Setting information shown in upper display cannot be modified.

<p>1</p>	<p>Values appear in upper display</p> <p>※Data can be viewed in standby mode or during operation.</p> <p>Press and hold the  key to view current power consumption (kW).</p> <p>Now press the  key repeatedly to scroll through and view the following items respectively:</p> <p>↓ Accumulated power consumption (tot:MW)</p> <p>↓ Accumulated power consumption (tot;kW)</p> <p>↓ Total CO2 Emission (Co2:t)</p> <p>↓ Total CO2 Emission (Co2:KG)</p> <p>↓ Heater output (Pid:MV)</p> <p>↓ Accumulated hours in power-on (PoW:tM) (□ × × × ×) Shows first digit only(of 5).</p> <p>↓ Accumulated hours in power-on (PoW:tM) (× □□□□) Shows last four digits only (of 5).</p> <p>↓ Accumulated operation run hours (RUN;tM) (□ × × × ×) Shows first digit only(of 5).</p> <p>↓ Accumulated operation run hours (RUN:tM) (× □□□□) Shows last four digits only (of 5).</p> <p>↓ Return to standby or mode screens.</p>	<p>* Current power consumption is power consumed from moment of activation and calculated in hourly increments. Accumulated power consumption is updated hourly by using the sum total of current power consumption.</p> <p>* CO2 emission (CE) is calculated using CE=(Conversion Coefficient)x(Power Consumption) Coefficient value will differ by local power supply company and must be confirmed and set accordingly in order to view accurate data. (Coefficient of -0.555 is set for TEPCO by default)</p> <p>* Heater operation output is a parameter to control the output power ratio of heater's rated capacity in percentile units. Heater output will be controlled by a PID operation value between 100 and 0% until reaching objective temperature.</p> <p>* Accumulated hours in power-on is the sum total of hours, aggregated between ELB ON and OFF. Maximum total for this value is 65,535 hours.</p> <p>Example First digit : 2 last four digits : 35 ⇒Accumulated hours in power-on: 20035 hours</p> <p>* Accumulated operation run hours is the sum total of hours, aggregated between the start and end of operation runs. Maximum total for this value is 65,535 hours.</p> <p>Example Top digit : 0 Lower four digits : 135 ⇒Accumulated operation run hours: 0135 hours</p>
-----------------	--	--

4. OPERATION PROCEDURE

Independent Overheat Prevention Device

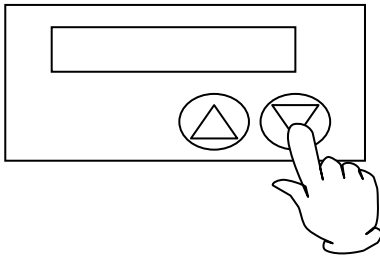
DP series units feature redundant safety devices: 1) The internal automatic overheat prevention (automatic reset) feature, and 2) the Independent Overheat Prevention Device (IOPD) with discrete power supply, circuit and sensor; completely independent of the CPU control board.

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.

Set temperature on Independent Overheat Prevention Device (IOPD)

* Set temperature using the ▼▲ 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 must be set at least 20°C higher than target temperature.

Note: main function of IOPD is to keep DS 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.

IOPD factory settings and temperature setting ranges are shown below by model:

Model	Factory default temperature setting	Temperature setting range
DP200	270°C	0°C~270°C
DP300	270°C	0°C~270°C
DS410	230°C	0°C~230°C
DS610	230°C	0°C~230°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 the display and operation will be terminated.

When changing the IOPD temperature setting, it takes a few seconds for the changes to finalize. For this reason, wait 5 seconds after entering the change before turning the power 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.58) for more information on these items.

2. 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.



Caution

1. DO NOT climb on top of 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 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 after operation.



Do not leave DP unit door open (i.e. to cool test samples in the chamber down, etc.) following an operation run. Heat from chamber may damage and/or deform control panel, causing CPU 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. Although chamber interior is manufactured of 304 stainless steel, damage may still occur from exposure to strong chemicals. Likewise, vacuum lines contain copper and nylon, which are easily damaged by corrosive substances. Avoid processing test samples which contain corrosives such as acid alkaline, heavy metal salts, etc. or solvents such as halogens, aminities, esters, etc.

6. ALWAYS run equipment within specified temperature range.




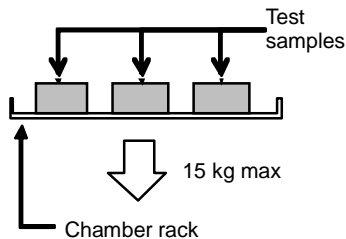
Operating temperature range is 40°C~240°C for DP200/300 and 40°C ~200°C for DP410/610. Never attempt to operate unit outside of the above specified temperature range. Doing so may cause equipment malfunction or damage.

5. HANDLING PRECAUTIONS

 **Caution**

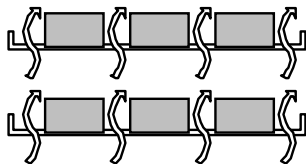
7. Arrange test samples appropriately.

-  Weight capacity for one chamber rack is approximately 15kg. Test sample load total for each rack should thus 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 prevent 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 rule of thumb, leave 30% or more of the total space on each rack unoccupied.




Leave 30% of total rack space open


8. DO NOT place items in bottom 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 guide rails, to avoid placing items directly on chamber floor. Further, 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), the START/STOP key can be pressed and 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 Modes" (P.33) for details.

10. Confirm equipment stability.

-  If unit has not been stabilized, it 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 ensure safe operation.

5. HANDLING PRECAUTIONS



Caution

11. Chamber door seal.

⊘ Chamber door seals are manufactured of 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 may be requested as an option.
Note that acids, alkaline, and halogenated solvents are all corrosive to rubber.

【Caution】

Substances which are corrosive to the silicon or fluoro rubber used for chamber door seals are shown in Table 5.1.
Do not process test samples that contain any of the substances shown in this table.
For further assistance, contact a Yamato sales office or dealer..

Table 5.1 - Substances corrosive to rubber used in chamber door seals

Substance 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
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

5. HANDLING PRECAUTIONS



Caution

Table 5.1 - Substances corrosive to rubber used in chamber door seals (continued)

Material Classification	Silicon Rubber	Fluoro-rubber
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

12. Temperature sensor.

- The temperature sensor for this unit is installed on the inside wall of the chamber and used to control chamber temperature. The chamber temperature reading, as read by the sensor, may not always be the same as that of test samples/specimens.

13. Inspect equipment regularly.

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

See "Inspection & Maintenance" (P.43) for details.

14. Independent Overheat Prevention Device activation temperature must be set.

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

Note that temperature on the IOPD should be set 20°C above chamber temperature setting.

See "Independent Overheat Prevention Device" (P.37) for more on setting up this device and for other warnings.

15. Solvents and excess moisture in test samples.

- Remove excess and unneeded moisture and water from test samples (i.e. thoroughly dry test sample container exterior, etc.) before processing.

A cooling trap, such as model CA301/801 by Yamato Scientific, should be installed between the chamber and vacuum pump, particularly when processing test samples containing organic solvents. This device will dispel gases/fumes thrown off by processing caustic test samples, and prolong the life of vacuum lines, door seals and other system components that are easily damaged by solvents.

5. HANDLING PRECAUTIONS



Caution

16. Samples/specimens containing powder.

- ⊘ Powder may spew suddenly from unit if purge valve or pump valve is opened abruptly with chamber still decompressed. Open these valves and restore normal pressure gradually when processing test samples containing powder or micro-particle substances.

17. High temperature operation.

- ⊘ When running DP series units at high temperature, exercise extreme caution so that hands and skin do not contact hot surfaces. Always wear heat-resistant gloves when inserting and removing test samples/specimens from oven chamber.
Also note that extended high temperature use may cause chamber door seal to become adhered to window glass, preventing the door from being opened. Avoid more than 72 hours of continuous operation.

18. Shutting vacuum pump down.

- ⊘ Shut vacuum pump down using following procedure:
 - 1) Close pump valve.
 - 2) Gradually open purge valve.
 - 3) Confirm that ambient pressure has been restored to chamber.
 - 4) Open pump valve, then shut down vacuum pump.**Warning:** oil from the vacuum pump may flow backward into the chamber, if vacuum pump is shut down with chamber decompressed.

19. Maintaining chamber decompression.

- ⊘ To keep chamber decompressed, leave the vacuum pump running with the pump valve open.
Warning: oil from the vacuum pump may enter the vacuum lines if pump is shut down with valve closed.

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

- ⊘ Never attempt to clean DP 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.

21. Read instruction manual before operation.

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

22. DO NOT remove polycarbonate covering from window.

- ⊘ Do not attempt remove polycarbonate covering from outer surface of viewing window. The viewing window itself can shatter from even the smallest scratch (even those not seen with the naked eye) or impact. The polycarbonate covering acts as a protective screen in the event of such incidents.
Covering may cloud over time, depending on operating environment and use. Do not attempt to replace covering. All such repairs should be done by a certified technician.

6. MAINTENANCE PROCEDURE

Inspection and Maintenance

Warning

- Be sure that main power switch (ELB) is OFF before daily inspection and maintenance of DP series units.
- Perform inspections and maintenance when inside of chamber 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.
- * Main power switch (ELB) and overheat prevention device must be inspected, as prescribed above, prior to every instance of extended or overnight operation.
- Check oil level of vacuum pump (sold separately).
 - Check oil level in vacuum pump at least once a month. Add or change oil as required.
 - Check pump oil periodically and change **ahead** of specified life span, if possible. Depending on operation environment and other factors, oil may degrade quickly and cause poor performance or damage to pump.
 - See vacuum pump instruction manual for additional information on oil changes.
 - Having vacuum pump overhauled annually by original manufacturer is recommended for best performance.

◆ Contact a local dealer or Yamato sales office for further assistance.

7. EXTENDED STORAGE & DISPOSAL

Extended Storage / Unit Disposal

 Warning	 Caution
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.	Unit disposal. <ul style="list-style-type: none"> ● Remove door handle and hinges to prevent unit from being locked. ● Do not leave unit unattended, or in a place where children may have access. ● 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 DP series units are listed in table 7.1 below:

Table 7.1 Major Components of DP Series Units

Component	Material
External Structure	Chrome free electro-galvanized carbon steel, sheet coated w/chemical-proof baked-on finish
Chamber	304 Stainless steel
Heat Insulator	Mineral wool
View Window	Reinforced glass and Polycarbonate resin
Major electrical components	
Switches and Relays	Resin composites, copper and other material
Operation Panel	Polycarbonate resin
Printed Circuit Boards	Fiber glass composites and other material
Heater	Mica heater
Power Cable	Composite of synthesized rubber coating, copper, nickel and other compound material
Wires	Composite of fiber glass, fire-retardant vinyl, copper, nickel and other material
Stickers	Resin material
Sensor (Pt&K TC Sensor)	304 stainless steel and other material

8. TROUBLESHOOTING

Error Code Guide

All possible error codes are shown in Table 8.1 below.

On DP series units, operation stops and a sounding alarm accompanies occurring errors.

Error codes will appear in the upper display of control panel. Confirm code and see associated details in Table 8.1 below.

Turn off main power switch (ELB) immediately and block access to unit.

Table 8.1 Error Code Table

Display code	Description	Possible causes and solutions
<i>Er 01</i>	Sensor Failure	<ul style="list-style-type: none"> ● Failure in temperature input circuit. ● Open circuit in temperature sensor line. ● Temperature out of specification range. Contact a local dealer or Yamato sales office.
<i>Er 02</i>	SSR Short Circuit	<ul style="list-style-type: none"> ● Electrical short in SSR circuit. ● Failure in current transformer (CT) sensor. Contact a local dealer or Yamato sales office.
<i>Er 03</i>	Faulty Heater Line	<ul style="list-style-type: none"> ● Heater line faulty or severed. ● Failure in current transformer (CT) sensor. ● Drop in supply voltage. Contact a local dealer or Yamato sales office.
<i>Er 07</i>	Independent Overheat Prevention Device (IOPD) activated	<ul style="list-style-type: none"> ● Independent Overheat Prevention Device (IOPD) activated. Turn ELB on again and check both chamber temperature and IOPD temperature setting. Contact a local dealer or Yamato sales office, if unit does not activate when ELB is switched back on.
<i>Er 10</i>	Main relay contact failure	Turn ELB back on and confirm: <ul style="list-style-type: none"> ● whether contact point on main relay is damaged. ● whether current transformer (CT) sensor(s) has failed. Contact a local dealer or Yamato sales office.
<i>Er. 14</i>	RAM Failure	Turn ELB back on and confirm whether there is a drop in backup battery capacity or whether backup battery is dead. Replace backup battery Contact a local dealer or Yamato sales office, if this error cannot be reset by turning ELB back on.
<i>Er. 15</i>	EEPROM Failure	Turn ELB back on and confirm whether there is a change in data code on EEPROM. Replace backup battery Contact a local dealer or Yamato sales office, if this error cannot be reset by turning ELB back on.

8. TROUBLESHOOTING

Troubleshooting Guide

Table 8.2 - Troubleshooting Guide

Symptom	Possible causes	Possible solutions
Unit does not turn on/nothing is displayed in control panel displays when power switch is turned "ON".	<ul style="list-style-type: none"> No power ELB failure CPU board failure 	<ul style="list-style-type: none"> Check connection to power supply and check power supply performance Replace ELB. (※) Replace CPU board. (※)
Nothing displayed in both upper and lower displays when START/STOP key is pressed and held	<ul style="list-style-type: none"> Power supply failure (must be within $\pm 10\%$ of required voltage) CPU board failure 	<ul style="list-style-type: none"> Connect to adequate power supply Replace CPU board (※)
Temperature in chamber does not rise.	<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 in this chapter (※)
Temperature fluctuates during operation.	<ul style="list-style-type: none"> Heavily fluctuating ambient temperature Power supply failure (must be within $\pm 10\%$ of required voltage) Temperature affected by test samples CPU 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 (※)
Chamber will not decompress	<ul style="list-style-type: none"> Pump valve is either open or closed Pump valve or purge valve has failed Chamber door seal is either contaminated or damaged. Vacuum line failure Vacuum line connection failure Vacuum pump failure Vacuum pump oil severely degraded 	<ul style="list-style-type: none"> Close purge valve and open pump valve. Replace failed valve.(※) Clean or replace chamber door seal (※) Replace vacuum line (※) Check vacuum line connections Replace failed vacuum line components Repair or replace vacuum pump (※) Change vacuum pump oil. (Refer to vacuum pump instruction manual)

※Contact a local dealer or Yamato sales office for further assistance.

If problem(s) persists, turn off power immediately, disconnect power cable from outlet or terminal and contact a local dealer or Yamato sales office for further assistance.

Recovering from a power outage.

Selecting whether or not to restore an interrupted operation process must be done prior to a power outage event, according to the following:

- * **Resume operation after a power outage by selecting [Cnt] from the recovery function menu:**
 - Restores unit to the status it was in just before power outage occurred.
 - Resumes process from where it left off at power loss.
- * **Terminate operation by selecting [StoP] from the recovery function menu:**
 - Unit goes into idle when power is restored.
 - Stops process when power outage occurs.

See P.21for details.

9. SERVICE & REPAIR

Requests for Repair

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

Contact a local dealer or Yamato sales office for assistance.

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

} Refer to serial no. and rating sticker on unit.
See "Component Names and Functions" (P.11&12) for sticker location.

Guaranteed Supply Period for Repair Parts

Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for DP200/300/410/610 vacuum drying ovens. "Repair parts" is defined as components which, when installed, allow for continued unit operation.

10. SPECIFICATIONS

Specifications

Product Name		Vacuum Drying Oven			
Model Name		DP200	DP300	DP410	DP610
System		Vacuum drying by directly heating decompressed chamber			
Power supply(Required)		Single-phase 100V 7A	Single-phase 100V 11A	Single-phase 200V 11.5A	Single-phase 200V 16A
		50/60Hz、 Allowable Input Voltage : Required Voltage±10%			
Performance	Operating Temperature Range	40~240°C		40~200°C	
	Operating Pressure Range	101~0.1kPa (760~1Torr)			
	Temperature Control Accuracy	±1°C (at 240°C) JTM K05		±1°C (at 200°C) JTM K05	
	Temperature Fluctuation	±1°C (at 240°C) JIS C60068		±1.5°C (at 200°C) JIS C60068	
	Time to Maximum Temperature	Approx. 60 min.	Approx. 120 min.	Approx. 80 min.	Approx. 100 min.
Composition	Exterior	Cold rolled steel plate with baked-on melamine resin coating			
	Chamber	Stainless Steel, 304 type			
	Insulation Material	Mineral wool			
	Door	Left Hinged Door			
	Heater (mica)	0.68KW	1.05KW	2.25KW	3.15KW
	Vacuum Gauge	Bourdon Tube type 0~0.1MPa			
	View Window	Reinforced Glass (inner) + polycarbonate plastic (outer)			
	Pump Connection Port	O.D. φ 18 (in mm)		NW25 KF Flange	
	Purge Port	Rc1/4 (Taper pipe thread – 1/4" Female)			
Controllers	Temperature Control Method	PID control by microcomputer			
	Temperature Display Method	Upper display : Green 4-digit LED Digital Display (Resolution : 1°C) Lower display : Orange 5-digit LED Digital Display (Resolution : 1°C)			
	Timer	0 min~99 hrs 59 min (Resolution : 1 minute or 1 hour)			
	Operation Modes	Constant Temperature/Quick Automatic Stop Operation Automatic Start Operation Automatic Stop Operation Programmed Operation (Repeatable Operation Function up to 99 steps or 99 patterns)			
	Built-in Functions	Time Integration (up to 65,535 hours); Calendar Time (24 hours); Calibration Offset; Monitor Display of Total Power Consumption, Total CO2 Emission, and Heater Operating Output; Power Recovery Mode; Storage and Access of Operator Setting Data			
	Heater Control	Triac with Zero-cross Control			
Sensor	K type Thermocouple (Double Sensor: one for temperature control, one for temperature detection)				

10. SPECIFICATIONS

Specifications (continued)

Product Name		Vacuum Drying Oven			
Model Name		DP200	DP300	DP410	DP610
Safety Devices	Earth Leakage Breaker (ELB)	15A			20A
		Leak Current/Short Circuit/Over-current Protection, Rated Sensitivity Current 30mA			
	Independent Overheat Prevention Device(IOPD)	Temperature Setting Range : 0~270°C		Temperature Setting Range : 0~230°C	
	CPU Control Board	Self-diagnosis Functions (Sensor Failure, SSR Short Circuit, Heater Line Disconnection, Main Relay Contact Melted, Automatic Overheat Prevention), Key Lock Function			
Standard Measurements	Chamber Dimensions (W×D×H) ※2	200×250×200 mm	300×300×300 mm	450×450×450 mm	600×600×600 mm
	External Dimensions (W×D×H) ※2	400×410×682 mm	510×460×782 mm	670×669×1500 mm	820×819×1650 mm
	Chamber Volume	10ℓ	27ℓ	91ℓ	216ℓ
	Approx. Weight	45 kg	72 kg	210 kg	310 kg
Accessories	Chamber Racks	Perforated Stainless Steel Plate: 2 Racks w/4(four) brackets			
	Instruction Manual	1 copy			
Remarks	※ 1 Performance data above based on power supplied at specification rating, 23°C ±5°C (room temperature), 65%RH ±20% humidity, and no process load. ※ 2 Dimensions do not include protruding components.				

11. ACCESSORIES

Optional Accessory Guide

Table 11.1 below shows a list of accessories, which provide a wide variety of options for DP series vacuum drying ovens.

Note that these options must be ordered before purchase and installed at the factory.

Table 11.1 List of Options

Option	Product Code	Compatible Models	Description
K type sensor with sheathed lead-in wire 500mm (1 pc)	281601	DP200/300 DP410/610	This sensor is installed in an optional chamber port, for taking temperature measurements at a selected point. Output for device is through a connector located on the rear panel of unit.
K type sensor with sheathed lead-in wire 1,500mm(1 pc)	281602	DP200/300 DP410/610	
External Communications Terminal	281603	DP200/300	Unit can be controlled and monitored remotely using this option.
	281608	DP410/610	
External Communications Adapter Kit	211880	DP200/300 DP410/610	Unit can be connected to a PC and controlled by remote access, using this kit. (software included)
Analog Temperature Output Terminal	281604	DP200/300	Output terminal with 4–20 mA analog signal for connecting external temperature sensors.
	281609	DP410/610	
External Alarm Output Terminal ※1	281605	DP200/300	Output terminal for connecting an external alarm device. Specific error will be shown in lower display of control panel.
	281610	DP410/610	
Timeup Output Terminal ※1	281606	DP200/300	Output terminal for connecting an external device, which signals the end of automatic stop or programmed operation.
	281611	DP410/610	
Operation Signal Output Terminal	281612	DP410/610	Output terminal for connecting an external device, which signals when unit is in operation.
Event Output Terminal	281613	DP410/610	Output terminal for connecting an external device, which sends ON-OFF signals, indicating individual unit status, such as standby, operation, end of operation, program steps, etc.
Digital Vacuum Gauge	281607	DP200/300	Simple, inexpensive digital vacuum gauge with reading accuracy equal to that of standard analog gauge. If better accuracy is required, the Pirani vacuum gauge (below) is recommended.
	281618	DP410/610	
Vacuum Pump Switch (AC100V)	281625	DP410/610	Vacuum pump switch, installed on the front panel of unit, for turning vacuum pump ON/OFF externally; compatible with single-phase 100V/200V AC, or three-phase 200V AC motor rating, 0.75KW maximum. Also provided with this option is an onboard power outlet for vacuum pump. Power source for this outlet, however, must be separate from main unit power source.
Vacuum Pump Switch (AC200V)	281614		

11. ACCESSORIES

Optional Accessory Guide

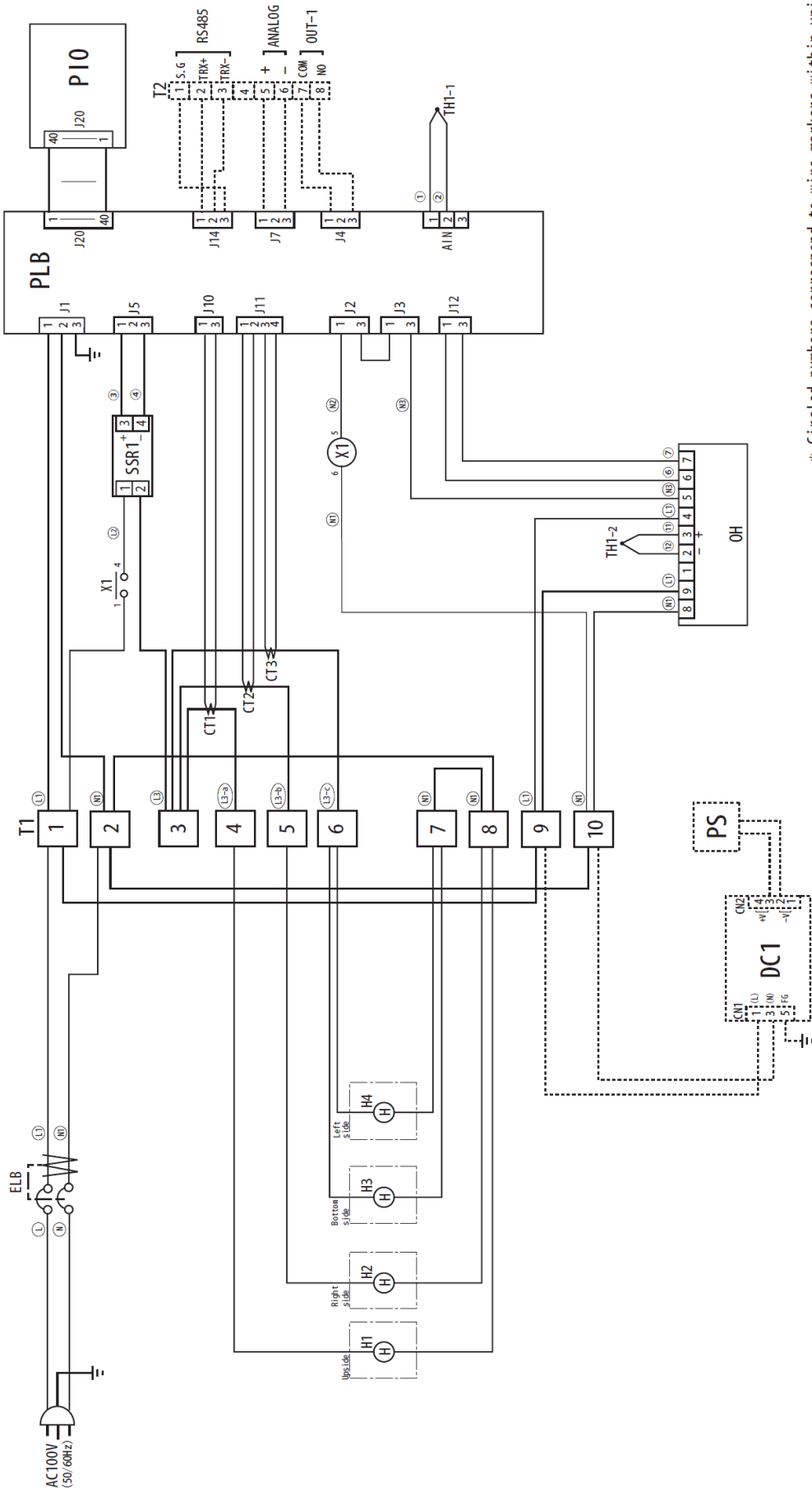
Table 11.1 List of Options (continued)

Option	Product Code	Compatible Models	Description
0 -10 millivolt (※2) analog Pirani Vacuum Gauge	281615	DP410/610	Most accurate analog vacuum gauge, connected to to 0 – 10millivolt output terminal installed on the rear panel of unit
0 -10 millivolt (※2) digital Pirani Vacuum Gauge	281616	DP410/610	Most accurate digital vacuum gauge, connected to to 0 – 10millivolt output terminal installed on the rear panel of unit
Memory Recorder	281617	DP410/610	6 (six) channel AL4706 model by Chino corp, with memory function. Records chamber temperature and decompression level simultaneously (with Pirani gauge only).
N2 Gas Injection System (with flow meter) ※2	281619	DP410	Protects interior chamber surfaces and test samples from oxidation by injecting inert N2 gas into chamber. Flow meter makes possible the adjustment and control of N2 gas flow rate.
	218622	DP610	
Vacuum Pump Slide Tray	281620	DP410	Slide tray installed in pump cabinet pulls forward, making pump easily accessible for oil changes and maintenance. Compatible with NeoDry15E (Kashiyama Industries Ltd) or PK250 (Yamato Scientific Co., Ltd). Contact a local dealer or Yamato sales office for information on compatibility of other pumps.
	281623	DP610	
	281621	DP410	Slide tray installed in pump cabinet pulls forward, making pump easily accessible for oil changes and maintenance. Compatible with PK203 (Yamato Scientific Co., Ltd). Contact a local dealer or Yamato sales office for information on compatibility of other pumps.
	281624	DP610	

- ※1: If these options are required for DP200/300 models, only one output terminal will be installed for use with an external alarm OR time-up device. It is not possible to use both options simultaneously on these models.
- ※2: If any of these options is required for DP410/610 models, only one output terminal will be installed for use with, Pirani analog vacuum gauge, Pirani digital vacuum gauge OR N2 gas injection. It is not possible to use more than one of these devices at a time on these models.

12. WIRING DIAGRAM

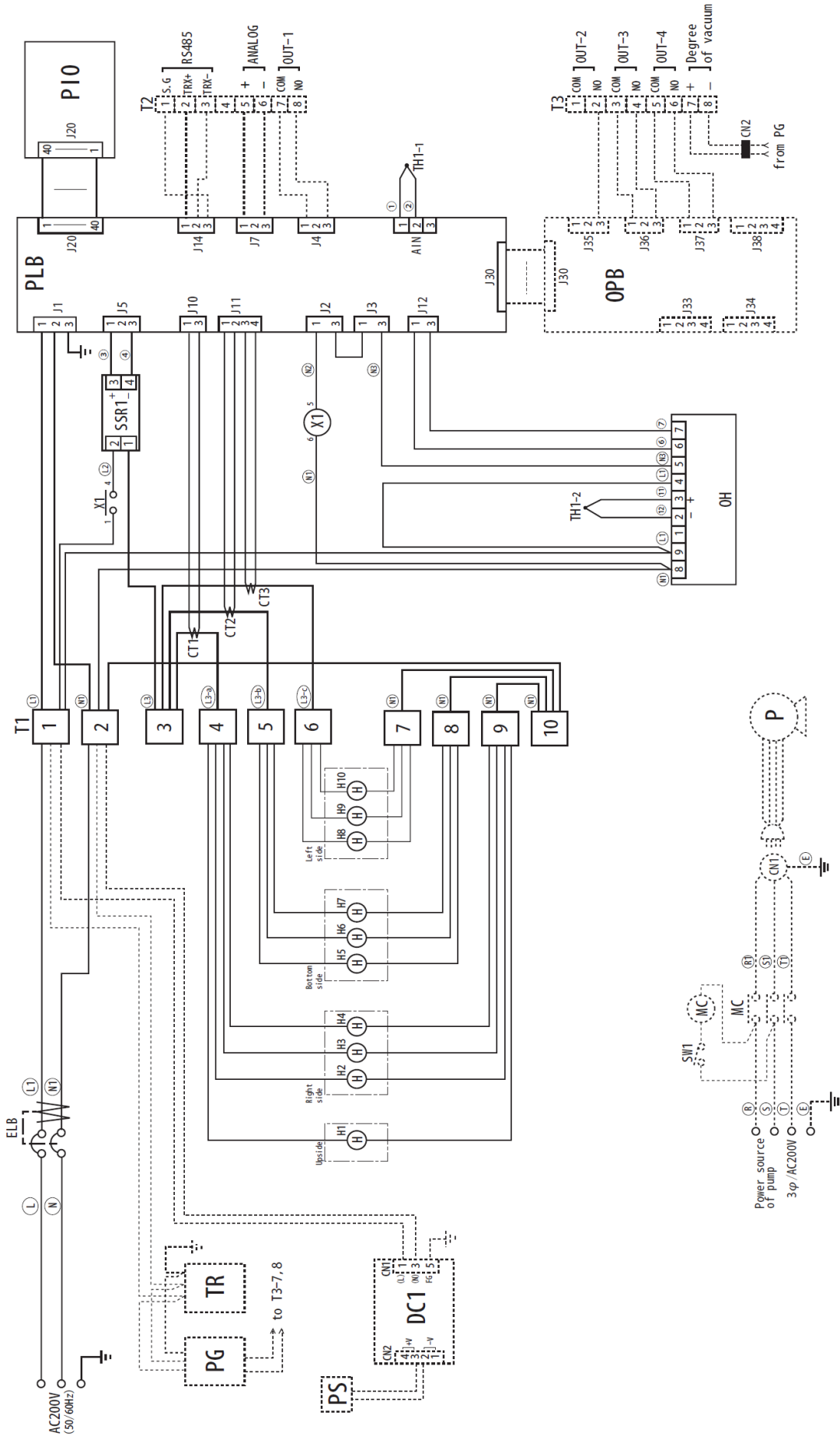
DP200/300 wiring diagram



* Circled numbers correspond to wire markers within unit.
 * Dotted lines (-----) indicate optional components.

12. WIRING DIAGRAM

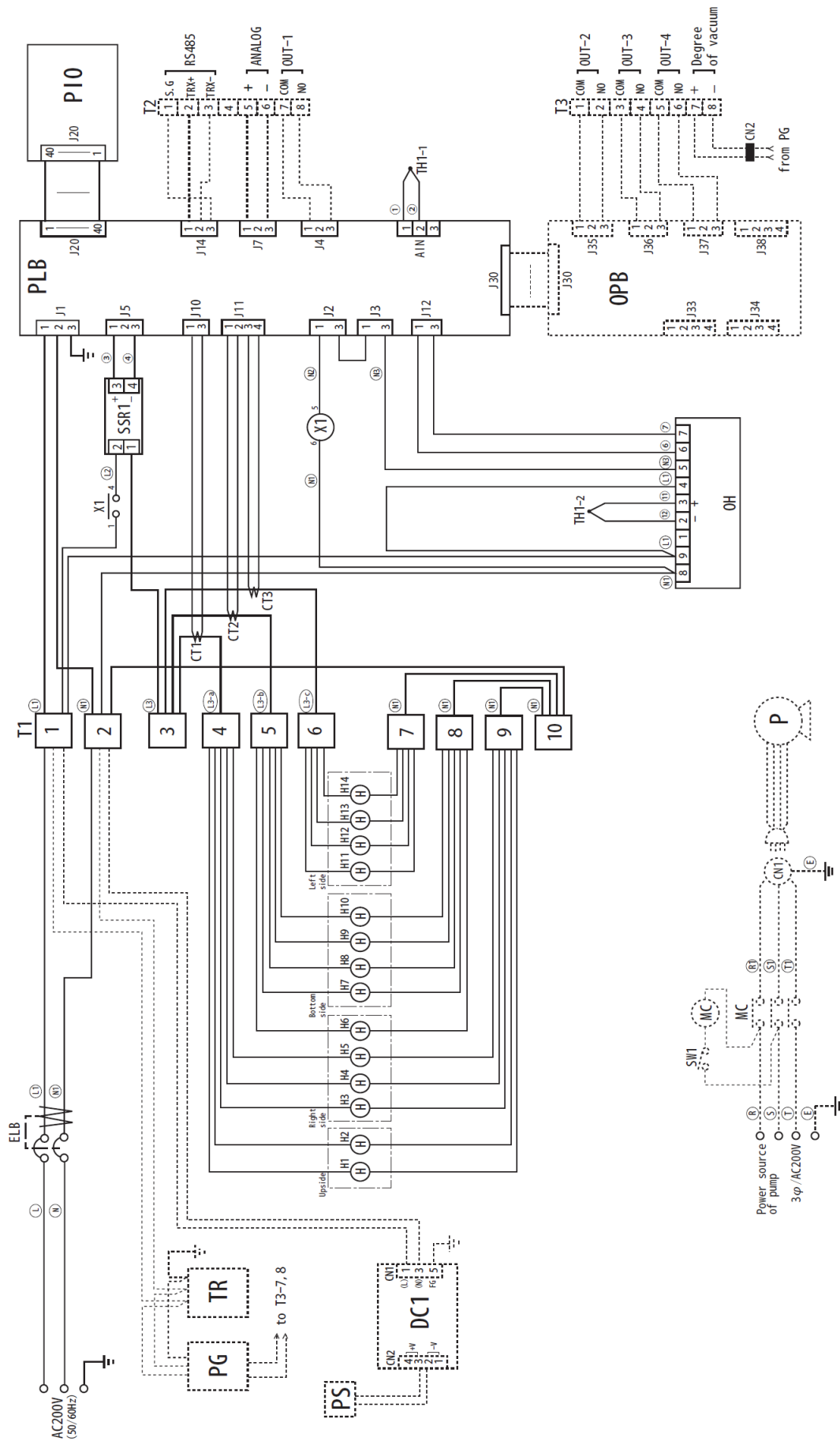
DP410 wiring diagram



* Circled numbers correspond to wire markers within unit.
 * Dotted lines (-----) indicate optional components.

12. WIRING DIAGRAM

DP610 wiring diagram



* Circled numbers correspond to wire markers within unit.
 * Dotted lines (-----) indicate optional components.

12. WIRING DIAGRAM GLOSSARY

DP200/300 wiring diagram symbol glossary

Symbol	Component	Symbol	Component
E L B	Earth Leakage Breaker (ELB)	P L B	Planar (CPU) Board (Printed Circuit Board)
T 1	Terminal Block	P I O	Display Board (Printed Circuit Board)
X 1	Main Relay (AC100V)	O H	Independent Overheat Prevention Device
S S R 1	Solid State Relay (SSR) (for Heater)	T H 1	Temperature Sensor (K - Double Sensor)
H 1	Heater (chamber ceiling)	C T 1	Current Transformer Sensor-1
H 2	Heater (right chamber wall)	C T 2	Current Transformer Sensor-2
H 3	Heater (chamber floor)	C T 3	Current Transformer Sensor-3
H 4	Heater (left chamber wall)		

Optional parts

Symbol	Component	Symbol	Component
T 2	Terminal Block	P S	Pressure Switch (D C 2 4 V)
D C 1	DC24V Power Supply		

DP410/610 wiring diagram symbol glossary

Symbol	Component	Symbol	Component	
			DP410	DP610
E L B	Earth Leakage Breaker (ELB)	H 1	Heater (chamber ceiling)	Heater (chamber ceiling)
T 1	Terminal Block	H 2	Heater (right chamber wall)	Heater (chamber ceiling)
X 1	Main Relay (AC220V)	H 3	Heater (right chamber wall)	Heater (right side wall of Chamber)
S S R 1	Solid State Relay(SSR) (for Heater)	H 4	Heater (right chamber wall)	Heater (right chamber wall)
P L B	Planar (CPU) Board (Printed Circuit Board)	H 5	Heater (chamber floor)	Heater (right chamber wall)
P I O	Display Board (Printed Circuit Board)	H 6	Heater (chamber floor)	Heater (right chamber wall)
O H	Independent Overheat Prevention Device	H 7	Heater (chamber floor)	Heater (chamber floor)
T H 1	Temperature Sensor (K - Double Sensor)	H 8	Heater (left chamber wall)	Heater (chamber floor)
C T 1	Current Transformer Sensor-1	H 9	Heater (left chamber wall)	Heater (chamber floor)
C T 2	Current Transformer Sensor-2	H 10	Heater (left chamber wall)	Heater (chamber floor)
C T 3	Current Transformer Sensor-3	H 11	—	Heater (left chamber wall)
TR	Transformer	H 12	—	Heater (left chamber wall)
		H 13	—	Heater (left chamber wall)
		H 14	—	Heater (left chamber wall)

13. WEAR ITEMS

Parts needing periodic replacement due to wear are shown in the table below. Because deterioration of these items may result in difficulty maintaining chamber decompression and temperature, regular inspection and replacement is strongly recommended.

Contact a local dealer or Yamato sales office for wear item replacement.

MODEL	PART	DESIGN NO.	PART NO.
DP200	Door Seal	DP21S-40051	DP112
	Inner View Window Seal	DP32S-40470	DP238 (length 0.8 m)
DP300	Door Seal	DP31S-30011	DP142
	Inner View Window Seal	DP32S-40470	DP238 (length 1.2 m)
DP410	Door Seal	DP41-40720	P4001
DP610	Door Seal	DP61S-40390	P6001
	Inner View Window Seal	DP610-40210	DP61040210

14. LIST OF HAZARDOUS SUBSTANCES



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

Explosive Substance	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.
ExplosiveSubstances	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	① Ethyl Ether, Gasoline, Acetaldehyde, Propylene Chloride, Carbon Disulfide, and other substances having ignition point of 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 Gas	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C under air pressure.

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

15. SETUP CHECKLIST

Setup DP 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 49~50	
2	Installation	<ul style="list-style-type: none"> Check site visually. Caution: check for hazards Prepare installation space. 	2. Pre-operation Procedures 1. Choose Appropriate Site for Installation. 4	
		<ul style="list-style-type: none"> Position 2 (two) leveling feet Place 2 (two) racks in chamber. 	2. Pre-operation Procedures 12. Position Leveling Feet (DP410/610 only) 8	
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 4~10 7. Connect power cable to outlet or terminal 6 9. Ground wire must be connected 7 10. Specifications Power Supply (Required) 49~50	
2	Operation	<ul style="list-style-type: none"> Start operation. 	2. Pre-operation procedures 4~10 Installation Precautions 4. Operation procedure Setting Time & Date ~ Service & Repair 16~37	
Orientation				
1	Operation	Explain function of each component as written in instruction manual.	4. Operation Procedure Setting Time & Date 16~37 1. Safety Precautions ~ 1~58 14. List of Hazardous Substances	
2	Error codes	Explain error codes and reset procedures as written in instruction manual.	8. Error Codes ~ 45~59 15. Setup Checklist	
3	Maintenance and inspection	Explain function of each component as written in instruction manual.	6. Maintenance Procedures Inspection & Maintenance 43	
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". Explain how to contact technician. 	9. Service & Repair 48	

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 DP 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.

Instruction Manual
Vacuum Drying Oven
DP200/DP300/DP410/DP610
First Edition June 25, 2013
Last Revised June 18, 2014

Yamato Scientific Co., Ltd.

2-2-1 Nihonbashi Muromachi, Chuo-ku,
Tokyo, 103-0022, Japan
<http://www.yamato-net.co.jp>