SANYO

FILE No.

SERVICE MANUAL

High-pressure Steam Sterilizer
Labo Autoclave

MODEL NO.
MLS-3751L/3781L

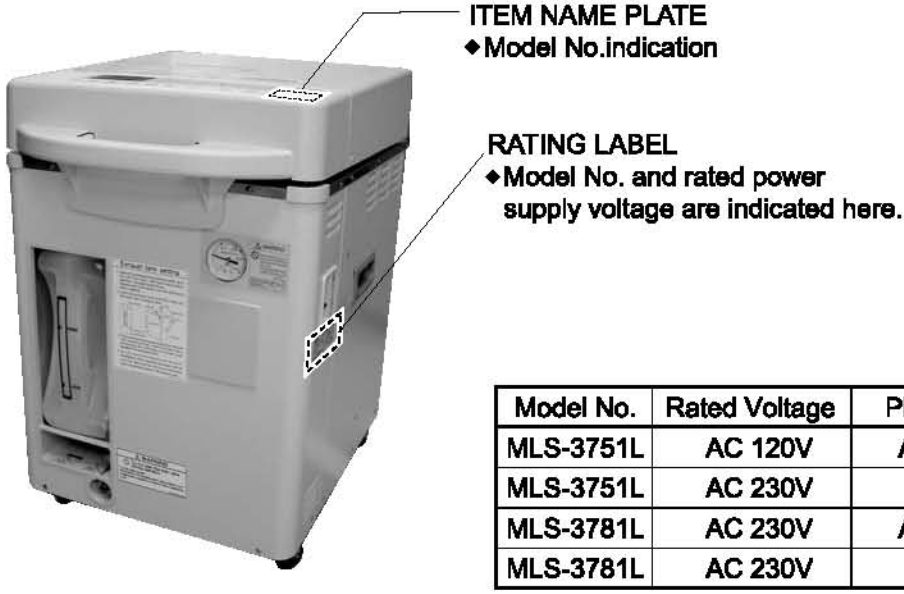


Photo: MLS-3751L

Model No.	Rated Voltage	Plug	Productcord No.
MLS-3751L	AC 120V	A3	131699501
MLS-3751L	AC 230V	-	131699502
MLS-3781L	AC 230V	A3	131699401
MLS-3781L	AC 230V	-	131699402

INDEX

REFERENCE No. SM6610004

1. Safety Precautions in Servicing Work

Please read the "Safety Precautions " section carefully to prevent any accidents during service repair and provide a safe product.

- Loss or damage which may result from failing to heed these precautions and degree of their urgency, the precaution have been classified into the three categories

⚠ Danger	This indication shows the content of the result in the death or serious injure of the operator or other persons.
⚠ Warning	This indicates a potentially hazardous situation arising from the mishandling or mis-operation of the unit which, if not avoided, could result in the death orserious injury of the operator or other persons.
⚠ Caution	This indicates a potentially hazardous situation arising from the mishandling or mis-operation of the unit which, if not avoided, may result in minor injury of the operator or other persons and property damage.

- The figure sign classifies the contents that must be heeded, and is explained. (The following sign is an example.)

△	This symbol calls attention to a danger, warning or caution, so please take care.
⊘	This symbol calls attention to an action which the operator is prohibited from performing, so take care.
●	This symbol calls attention to an action which must be performed or which the operator is instructed to perform, so take care.

⚠ Warning

Always unplug the unit when carrying out inspection or repairs.


Please pull out a power supply plug

- Always unplug the unit from the outlet when assembling, disassembling, inspecting, or replacing parts.Failure to observe the above could lead to electric shock or injury.

- Do not damage or change the power cord .This may lead to electric shocks or fire.Placing heavy objects on the power cord, heating, or pulling it could result in damage.

Always return the wiring to its original condition after carrying out inspection or repairs on the unit.

- Tighten the lead holders so that the lead wires do not touch revolving parts, high-temperature parts, high-pressure parts, or edges (sides) of parts. Contact could lead to malfunctions, electric shock, or fire.

- Do not splice the power cord, plug it into an extension cord, or use it with multiple plugs in a single outlet. Failure to observe the above could result in electric shocks, heating or fire.

Take sufficient care of electric shocks.


Cautious of an electric shock

- Take sufficient care of electric shocks from the charged parts or lead terminals.

- Always replace damaged or worn power cord or lead wires.Failure to observe the above could result in electric shock, heating or fire.

Always use specified parts when repairing.

- Parts marked with ⚠ are safety parts.These parts are important in maintaining safety. While replacing, always use the specified parts.

- Confirm that there is no dust and that the plug is secure, inserting it all the way in. Dust or bad connection could result in electric shock or fire.

- When repairing, always use the part listed on service parts table for the appropriate model and appropriate tools. Also, under no circumstances are modifications to the unit to be carried out. Failure to observe the above could result in electric shock, heating or fire.

⚠ Caution

Beware of burns due to high temperature.


Don't touch

- Take care, as after operation the chamber door, chamber, and piping sections are extremely hot.

- Measure the insulation resistance after repairs and confirm that is at least 5MΩ. A problem in the insulation can lead to electronic shock.

Always wear gloves when repairing or inspecting.

- Use gloves to avoid injury from the edge of metallic surface.

- Confirm that the position of attached parts, condition of the wiring, and soldering, or crimp connections are normal.An abnormality can lead to heating, fire or electric shock.

2. Specifications

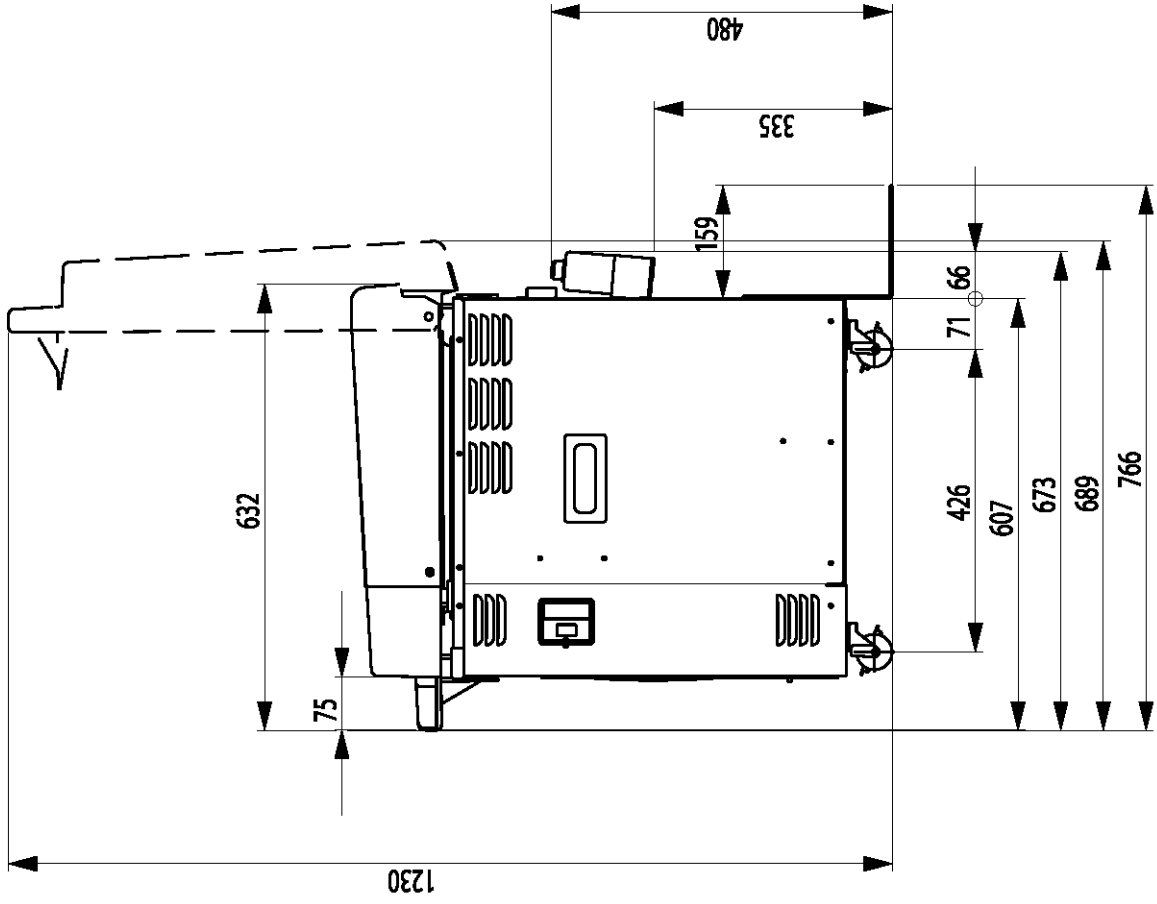
Product Designation		Labo Autoclave (High-pressure Steam Sterilizer)	
Model Designation		MLS-3751/3751L	MLS-3781/3781L
Power supply		120V unit: 120VAC (50/60Hz), 15.8A 220V unit: 220VAC (50/60Hz), 9.1A 230V unit: 230VAC (50/60Hz), 8.7A	220V unit: 220VAC (50/60Hz), 18.2A 230V unit: 230VAC (50/60Hz), 17.4A
Power Consumption		1.9kW (120V only), 2kW	4kW
External Dimensions		478(W) x 632(D) x 748(H) mm	478(W) x 632(D) x 965(H) mm
Weight		Approx. 61kg	Approx. 71kg
Internal Capacity		57L	80L
Effective Internal Capacity		50L	75L
Chamber Dimensions		370 (dia.) x 415(D) (Effective depth including cover: 463) mm	370 (dia.) x630(D) (Effective depth including cover: 688) mm
Chamber Material		SUS304 (Austenitic stainless steel)	
Sterilization Temperature		115°C ~ 135°C	
Melting Temperature		60°C ~ 114°C	
Heat-retention Temperature		45°C ~ 60°C	
Thermometer		Thermistor, digital display (25°C ~ 141°C)	
Safety Valve Releasing Pressure		240kPa (34.8psi, 2.4bar)	
Pressure Gauge Range		-0.1 ~ 0.4 MPa	
Timer	Sterilization	1 min. ~ 5 hrs.	
	Melting	1 min. ~ 5 hrs.	
	Heat-retent	72 hrs. fixed	
	Timer	1 week (Designation: Year, month, day, hour and minute)	
Exhaust Tank		2 liter Polyethylene tank	
Warning and Safety Functions		Pressure safety valve, overheat prevention device, dry-scorch prevention, cover interlock, excessive pressure prevention, earth leakage breaker	
Sound Pressure Level		Max. 75dB (A)	
Accessories		Stainless steel baskets – Large: 1, small: 1	Stainless steel baskets – Large: 2, small: 1
		Drain hose: 1	
		Exhaust tank (1), exhaust tank at rear side (1), tank mounting bracket (1) and tip-resistant metals (2)	
Optional Accessories		Object temperature sensor, external temperature sensor, printer, stainless steel basket (large), stainless steel basket (small), punching basket, sterilization can *Please consult us about the model number, price, delivery date, etc. including other optional accessories than shown as above.	

* The specifications may be subject to change for improvement without prior notice.

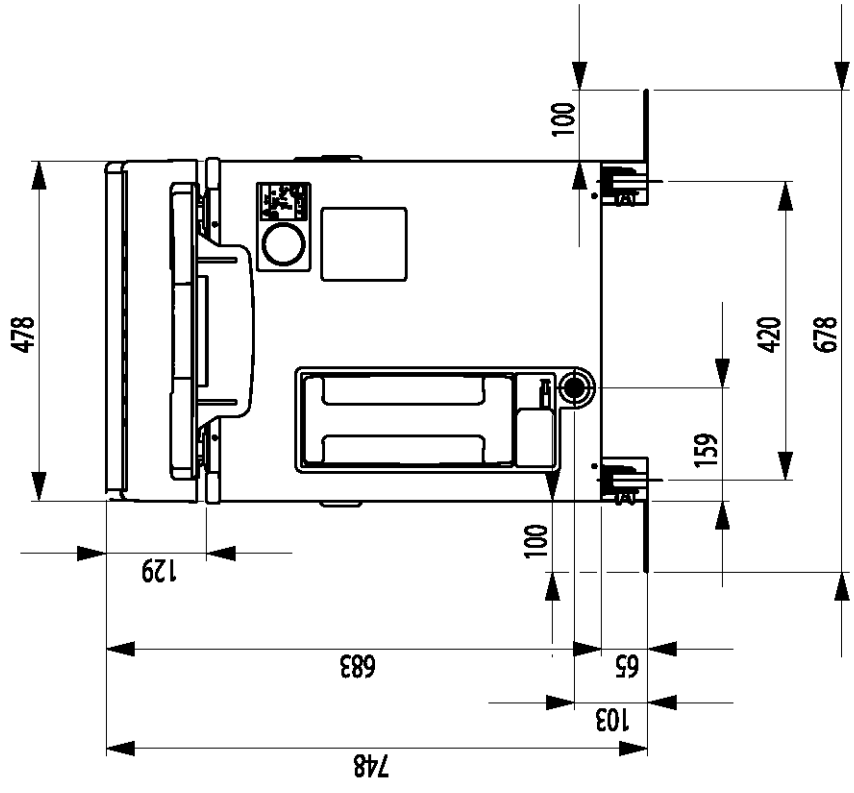
3. Outside Dimensions

■3751L Outside Dimensions [mm]

Lateral Side

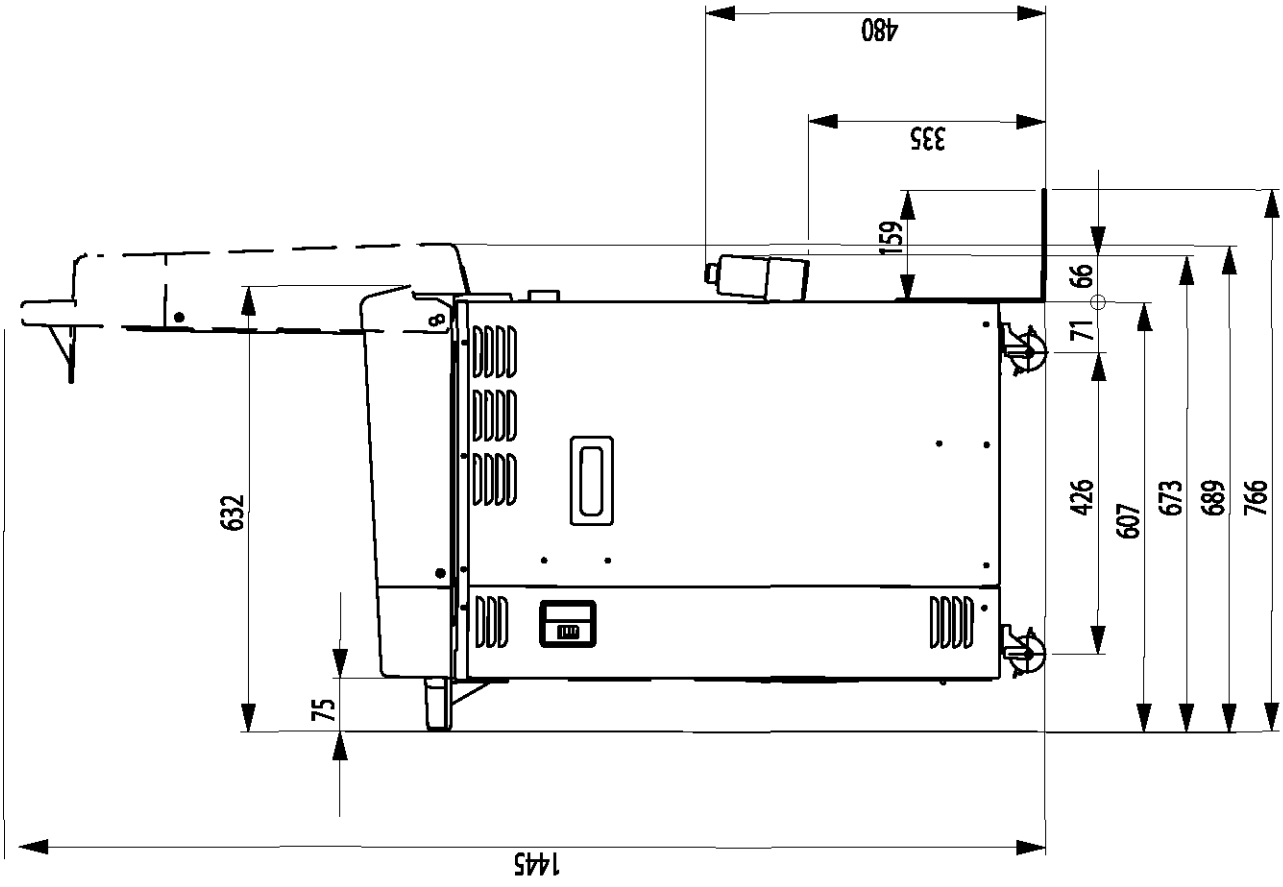


Front Side

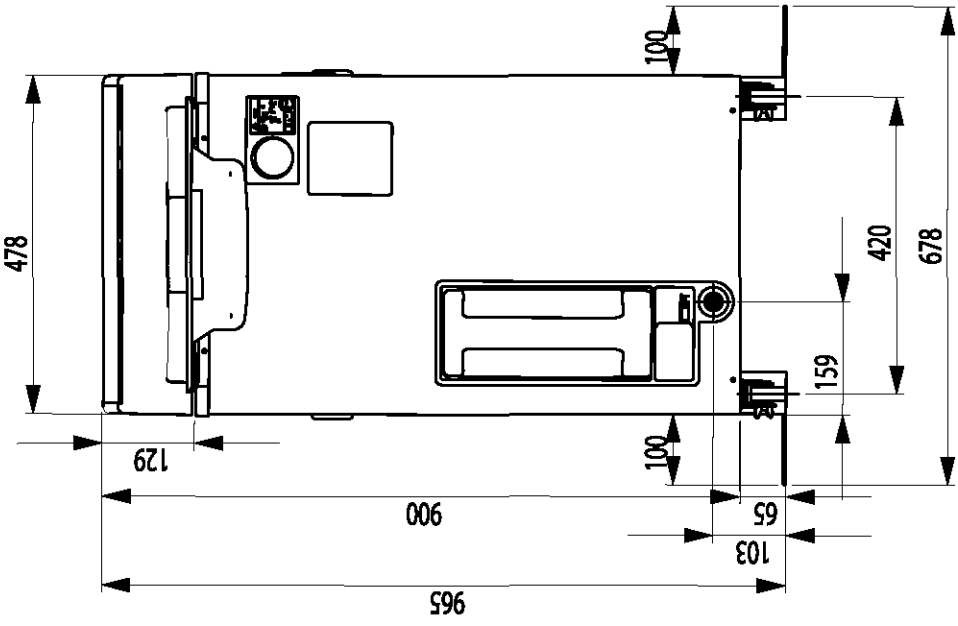


■ 3781L Outside Dimensions [mm]

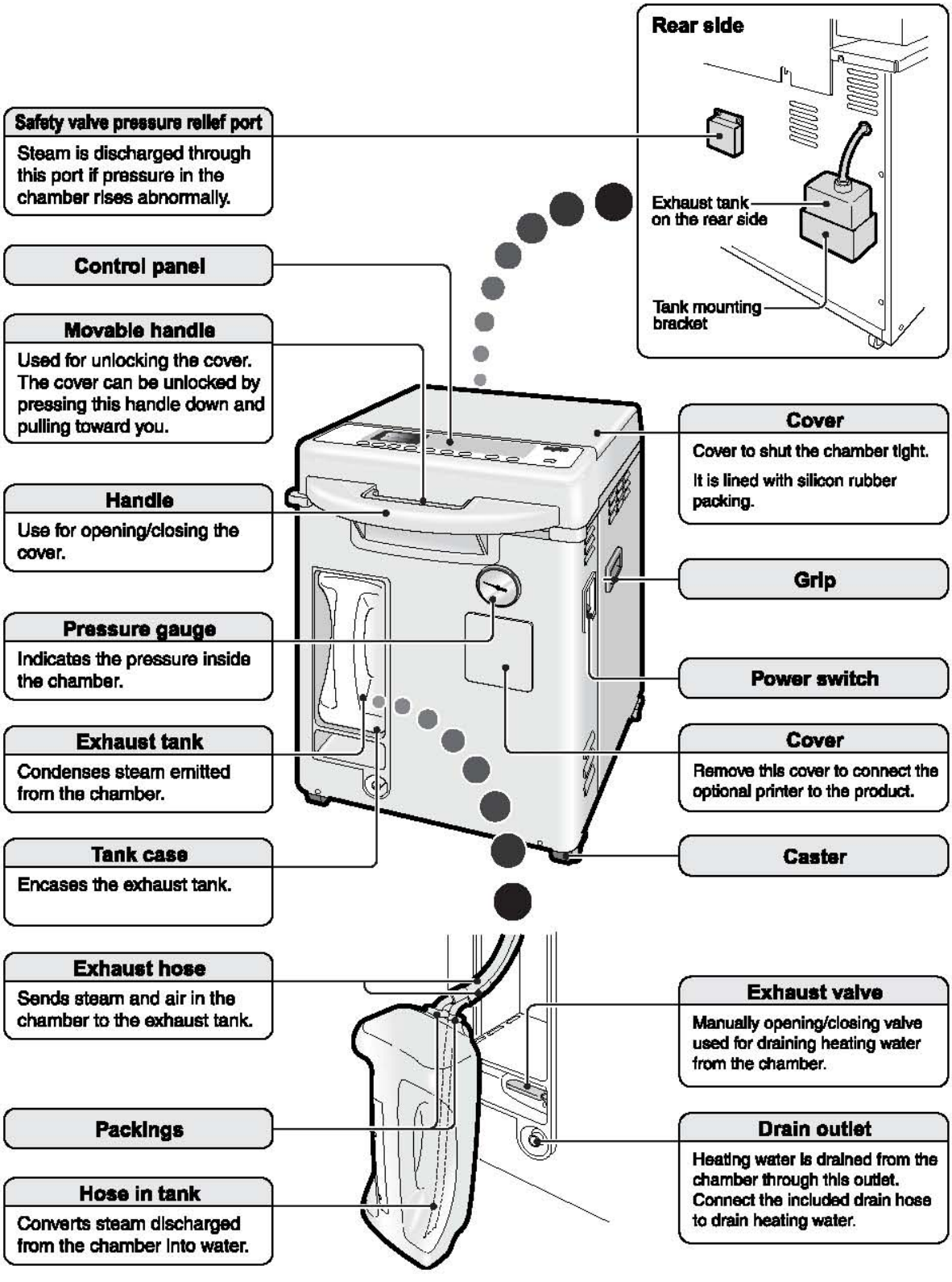
Lateral Side



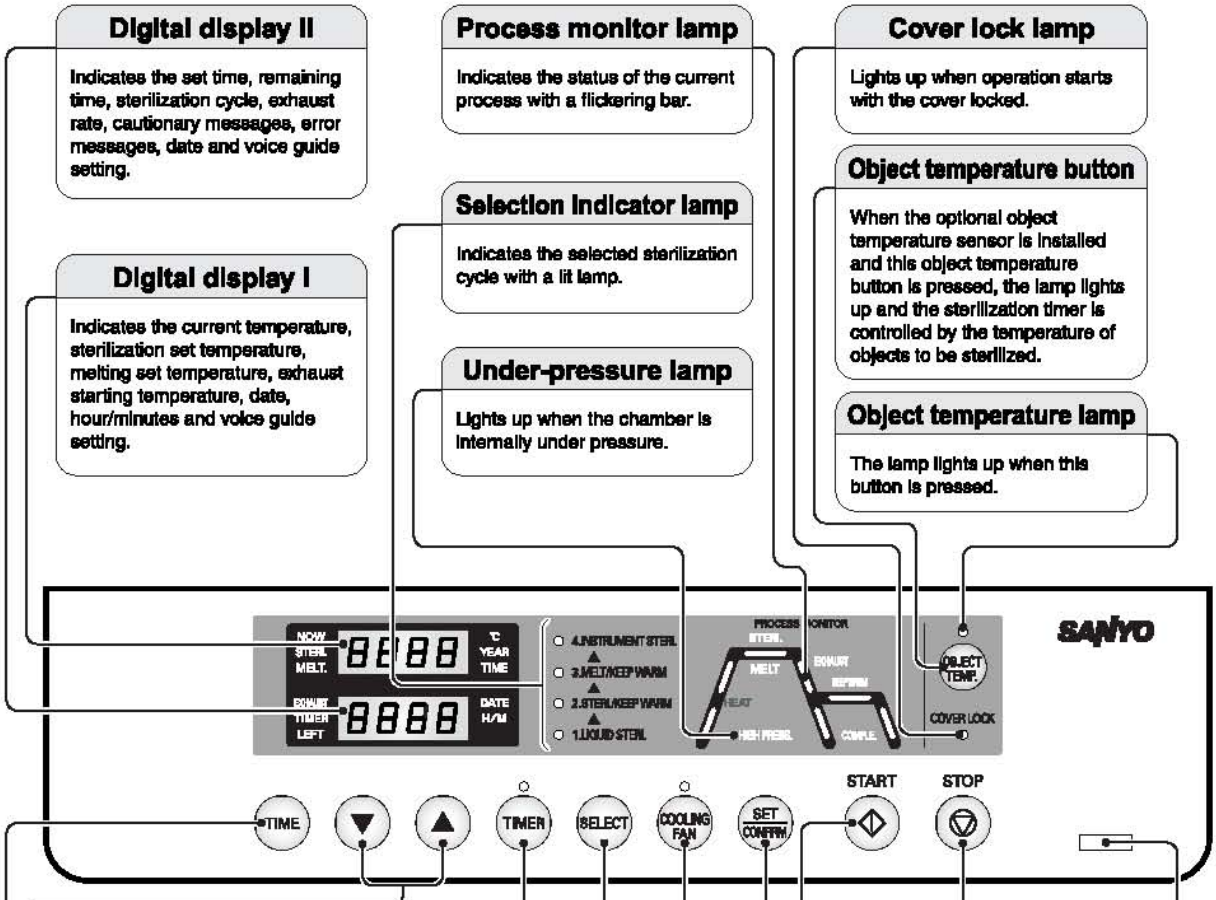
Front Side



4. Names of Parts and Operations



Control panel



Digital display II

Indicates the set time, remaining time, sterilization cycle, exhaust rate, cautionary messages, error messages, date and voice guide setting.

Digital display I

Indicates the current temperature, sterilization set temperature, melting set temperature, exhaust starting temperature, date, hour/minutes and voice guide setting.

Process monitor lamp

Indicates the status of the current process with a flickering bar.

Selection indicator lamp

Indicates the selected sterilization cycle with a lit lamp.

Under-pressure lamp

Lights up when the chamber is internally under pressure.

Cover lock lamp

Lights up when operation starts with the cover locked.

Object temperature button

When the optional object temperature sensor is installed and this object temperature button is pressed, the lamp lights up and the sterilization timer is controlled by the temperature of objects to be sterilized.

Object temperature lamp

The lamp lights up when this button is pressed.

Timer button

Sets the time until the start of operation.

Up/Down buttons

Used for setting and changing the sterilization temperature, sterilization time, melting temperature, melting time, heat-retention temperature, exhaust temperature, start timer and exhaust rate.

Time button

Current time is indicated on digital display I.

Setting confirmation button

Indicates change of settings and settings of current operation on the digital displays I and II.

Cooling fan button

Used to engage the cooling mode during exhausting.

Cycle/program selector button

Selects any of 3 programs and 4 cycles (total 12 selections).

Model No. indication

Stop button

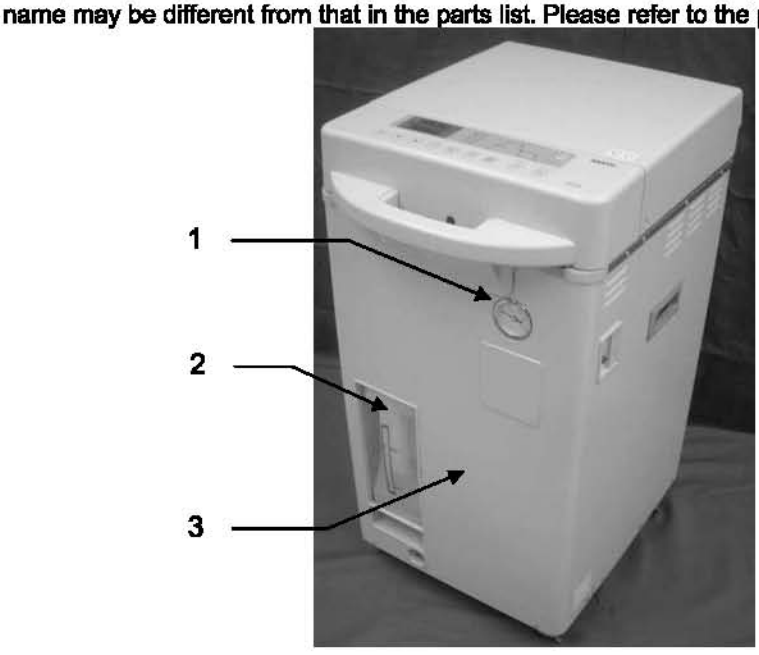
Stops operation and cancels timer settings and heat-retention.

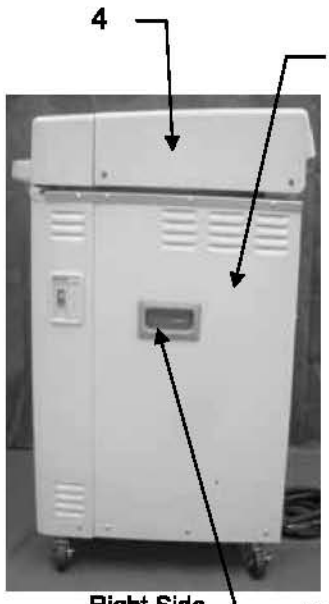
Start button

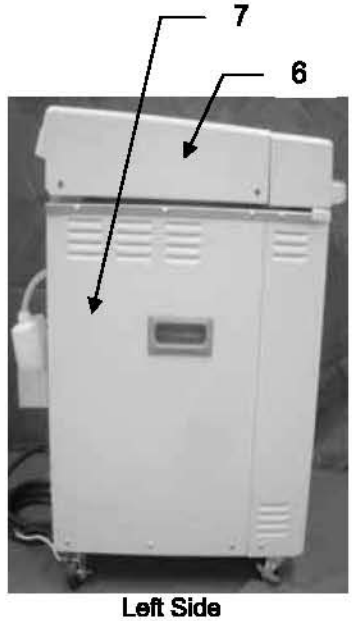
Starts operation and timer-set operation.

5. Construction and Functions

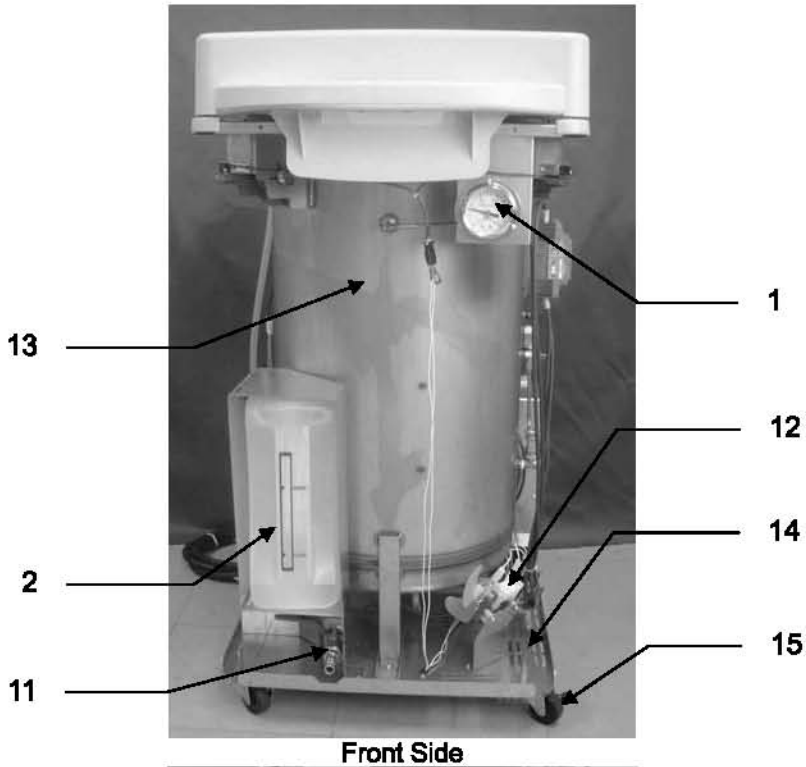
- Names of parts and functions are common to Series 3751L/3781L. The photo shows Model MLS-3781L.
- Part name may be different from that in the parts list. Please refer to the parts list when you place an order.



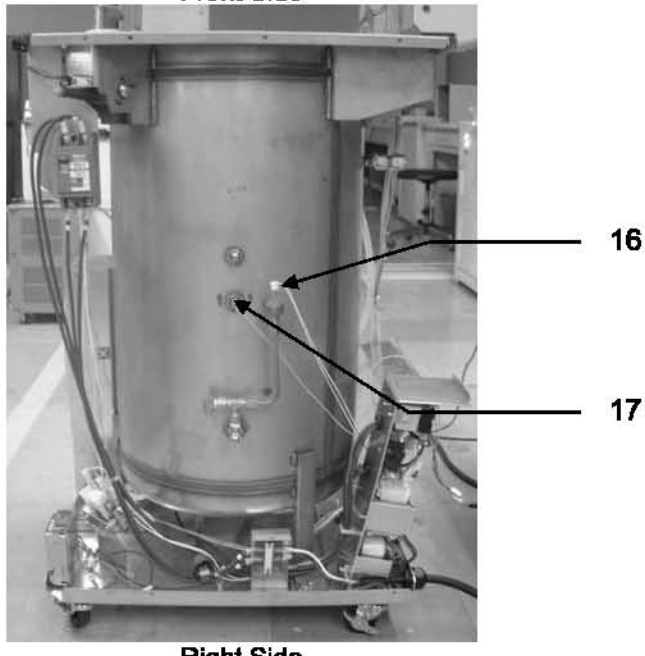




No.	Part Name	Function
1	Pressure gauge	Bourdon tube pressure gauge for displaying pressure in the chamber
2	Tank	Tank for exhausting air in the chamber
3	Front panel	Front side frame constituting the appearance of the temperature detector
4	Right side panel	Constituting the right side appearance of the unit cover
5	Side panel, R	Right side frame constituting the appearance of the unit
6	Left side panel	Constituting the left side appearance of the unit cover
7	Side panel, L	Left side frame constituting the appearance of the unit
8	Safety valve cover	Plate to block steam blowing out when the safety valve is actuated
9	Back side panel	Right side frame constituting the appearance of the unit
10	Handle, frame	Handle for moving the unit



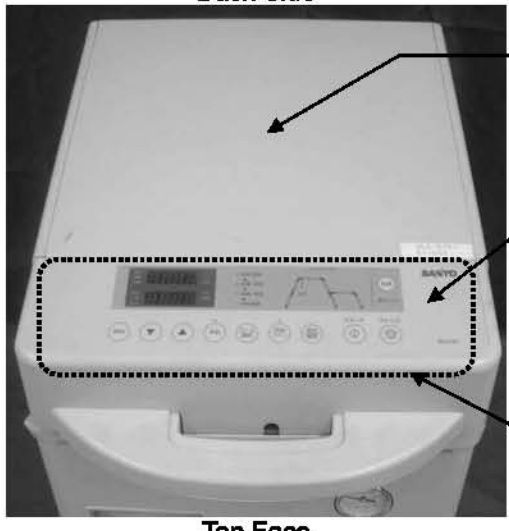
Front Side



Right Side

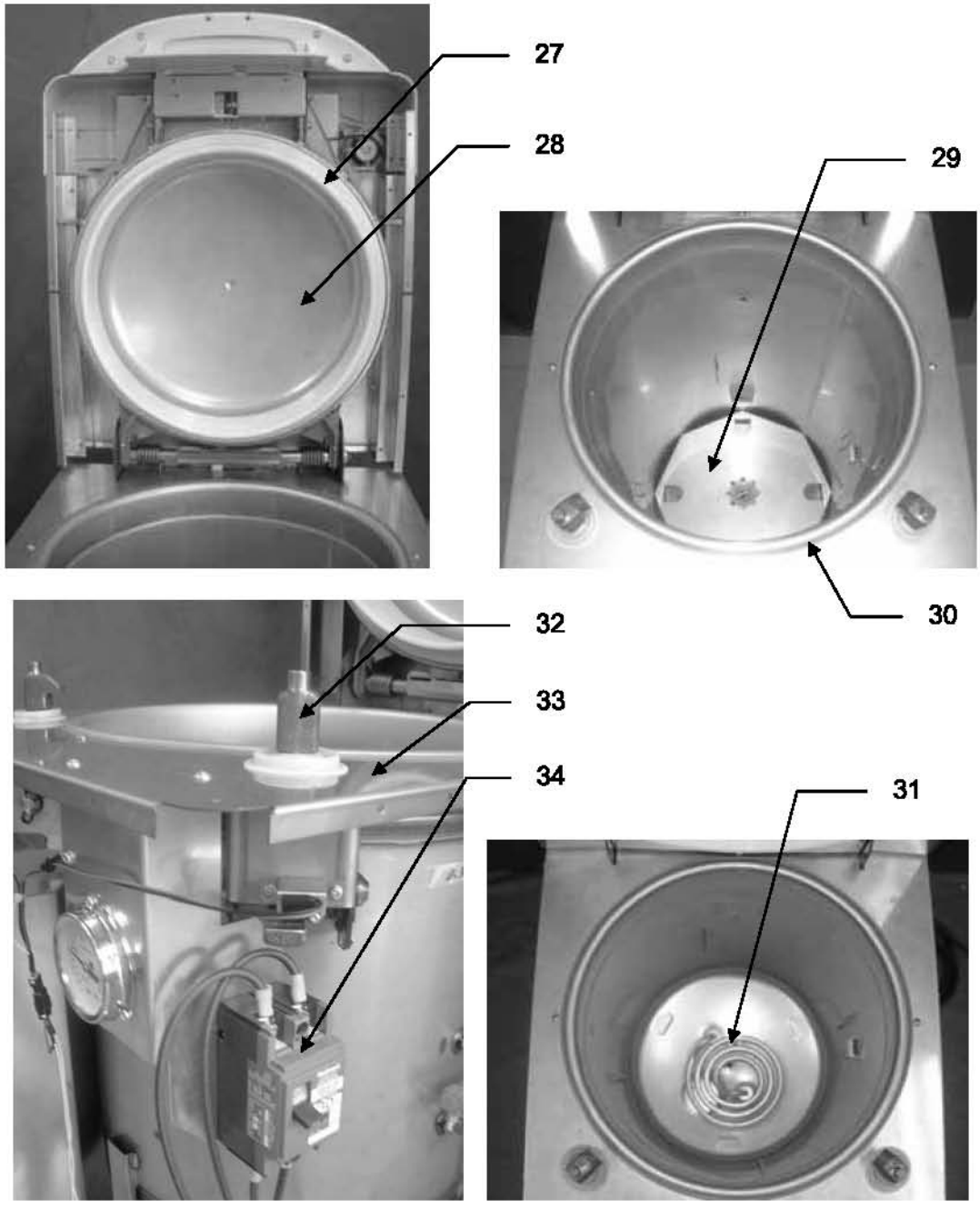
No.	Part Name	Function
11	Valve assembly, 1/2B	Manual valve for draining the water for heating the chamber inside
12	Fan motor	Air blowing fan for cooling the chamber
13	Chamber set	Chamber to seal up steam and perform sterilization
14	Chassis	Base plate to fix the arrangement component parts and support them
15	Caster	Caster for moving the unit. 4 casters are used. Equipped with lock function
16	Pressure sensor	Semiconductor sensor for detecting the pressure in the chamber
17	Thermistor assembly	Sensor for temperature detection

Back Side



Top Face

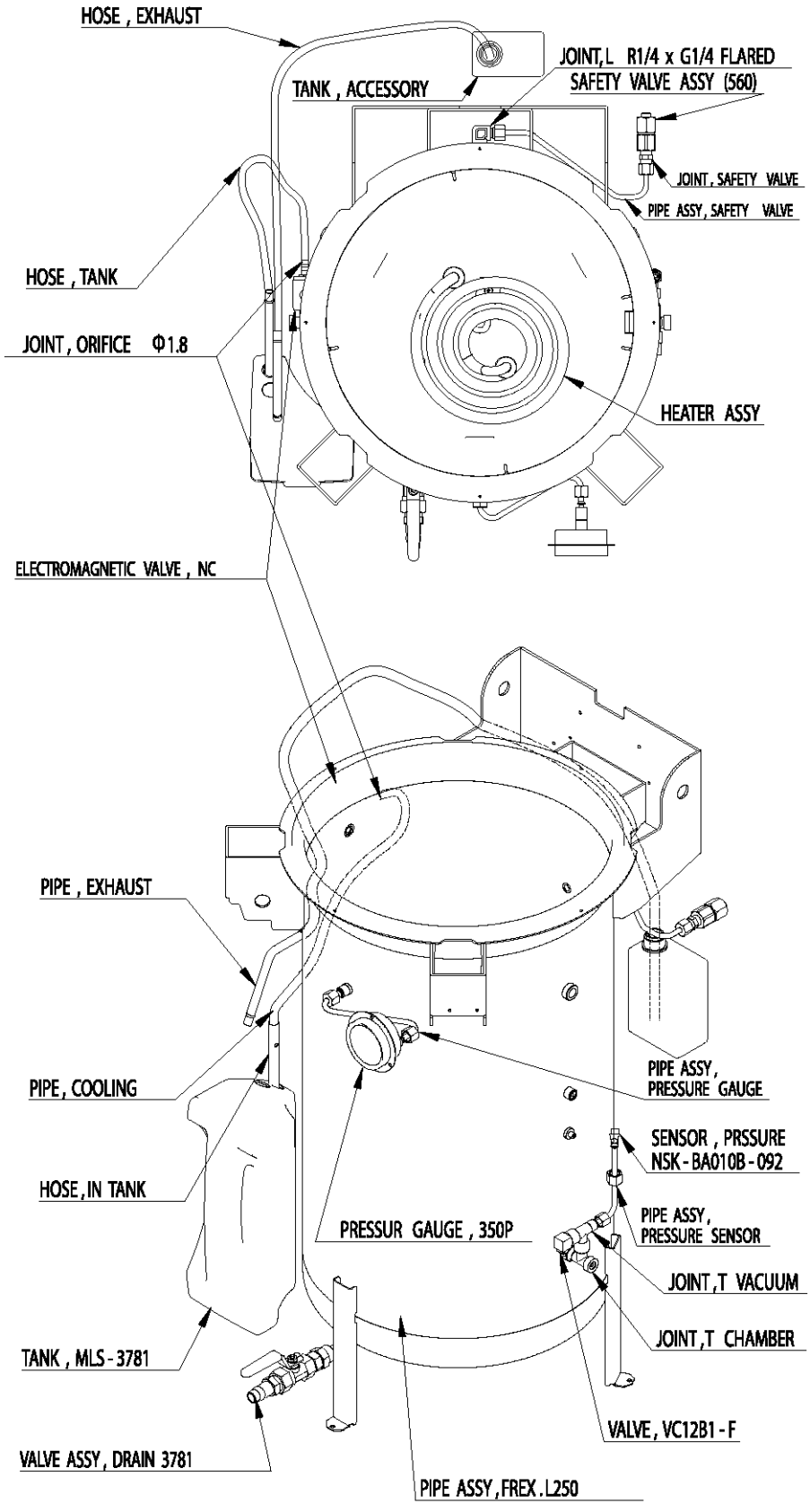
No.	Part Name	Function
18	Safety valve set	Valve to relieve the pressure in the chamber in case of abnormal pressure
19	Printed circuit board (PCB) EMC	Electric parts integrated circuit board for EMC measure for the unit
20	Electromagnetic valve set	For opening/closing valves of the chamber and external piping
21	Exhaust hose	Hose for exhausting air and steam in the chamber
22	PCB mounting plate	Case for mounting control PCB
23	PCB, control	Electric parts integrated circuit board for controlling the unit operation
24	Top panel	Part forming the appearance the unit cover
25	Operation display panel	Name plate to display the running operation and processing
26	Operational unit body	Collective unit of the buttons to perform running operation of the unit



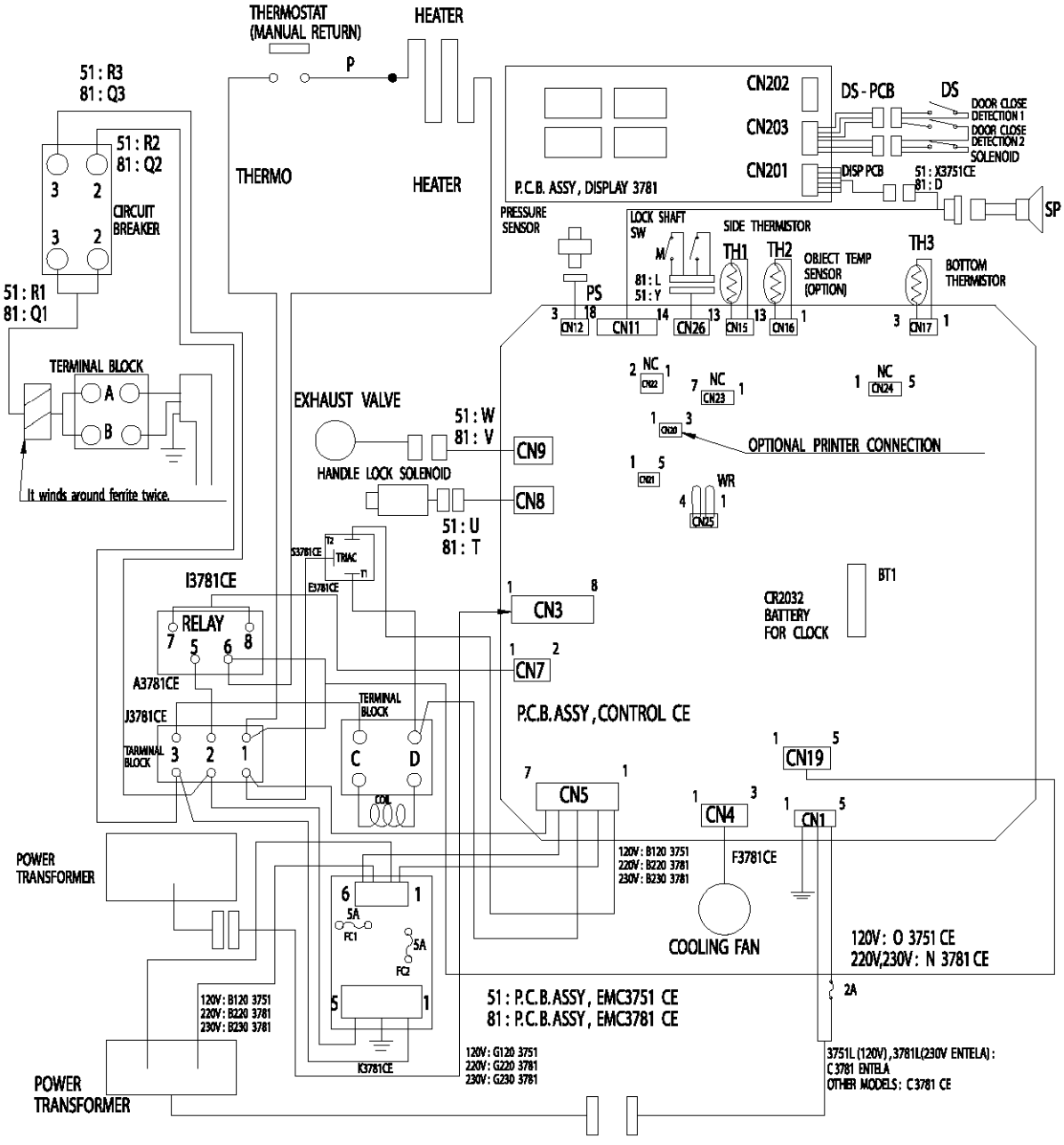
No.	Part Name	Function
27	Packing, chamber	Fitted to the lid by sealing packing for sealing the chamber
28	Lid set, chamber	Chamber sealing lid which can be opened and closed quickly
29	Heater cover	Stand on which sterilization object to be put in the chamber is placed
30	Packing, panel	Packing to seal the gab between the chamber and the panel
31	Sheathed heater set	Heat source heater to generate sterilizing steam
32	Lock shaft	Part for locking to seal and fix the chamber and the cover
33	Panel	Panel to vertically partition the chamber and the cover
34	Circuit breaker	Electric part to shut down the power supply circuit in case of an over-current in the unit

6. Piping Diagram and Wiring Diagram

■ Piping Diagram



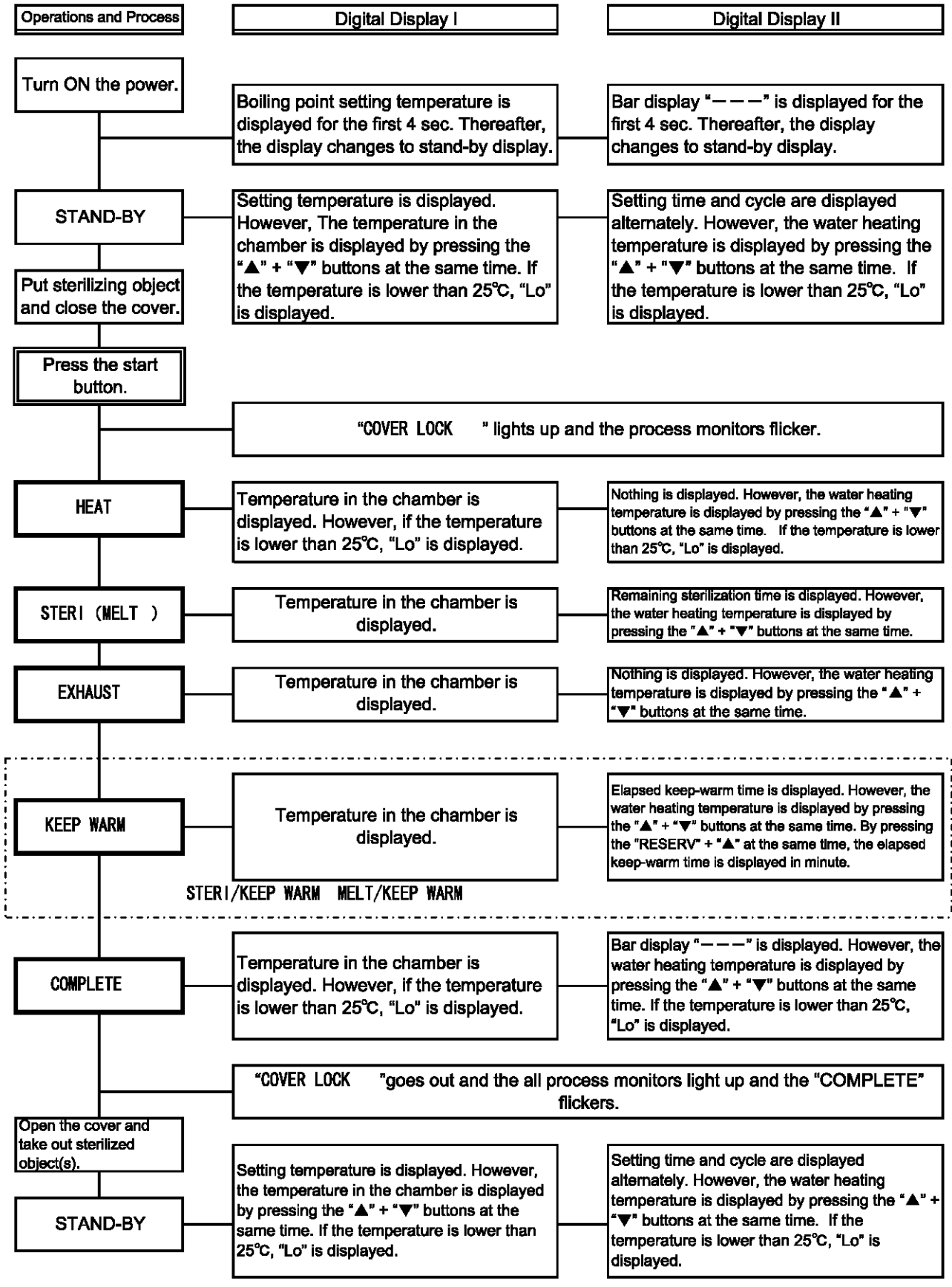
■ Wiring Diagram



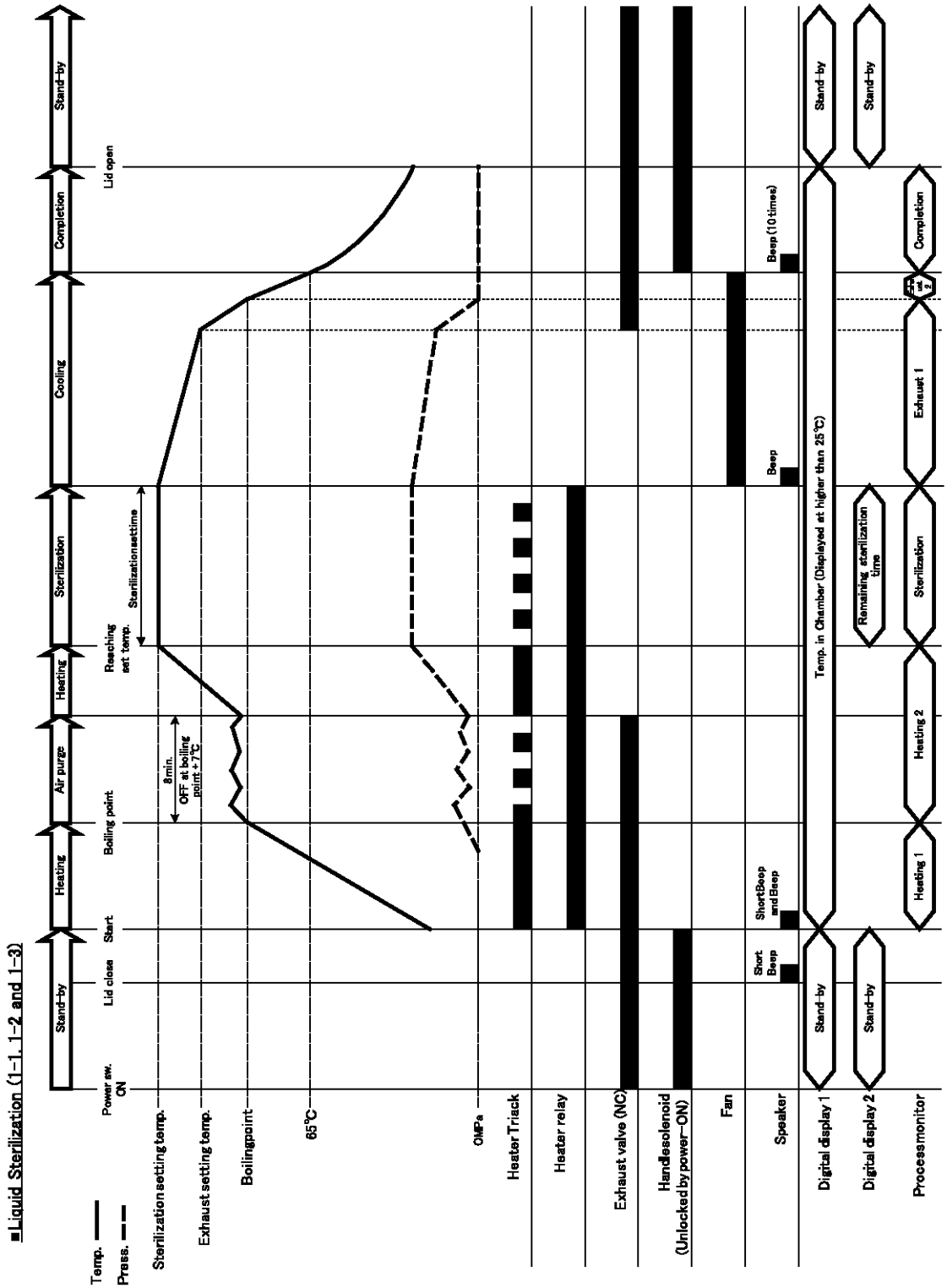
※ Note) 51 in the figure shows MLS-3751L, and 81 shows MLS-3781L.

7. Process Flow and Operations

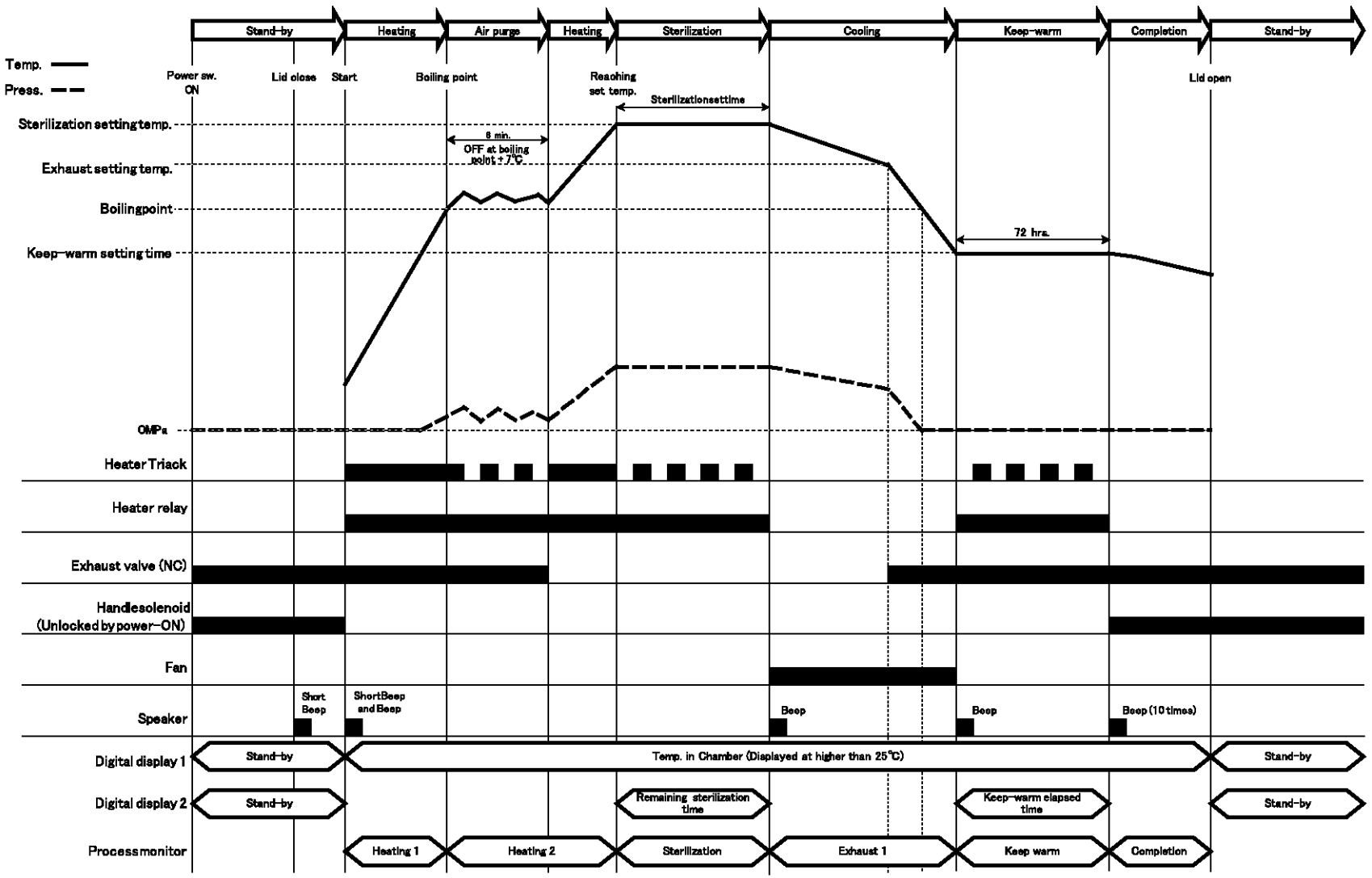
(1) Operations and displays



(2)Process flow chart

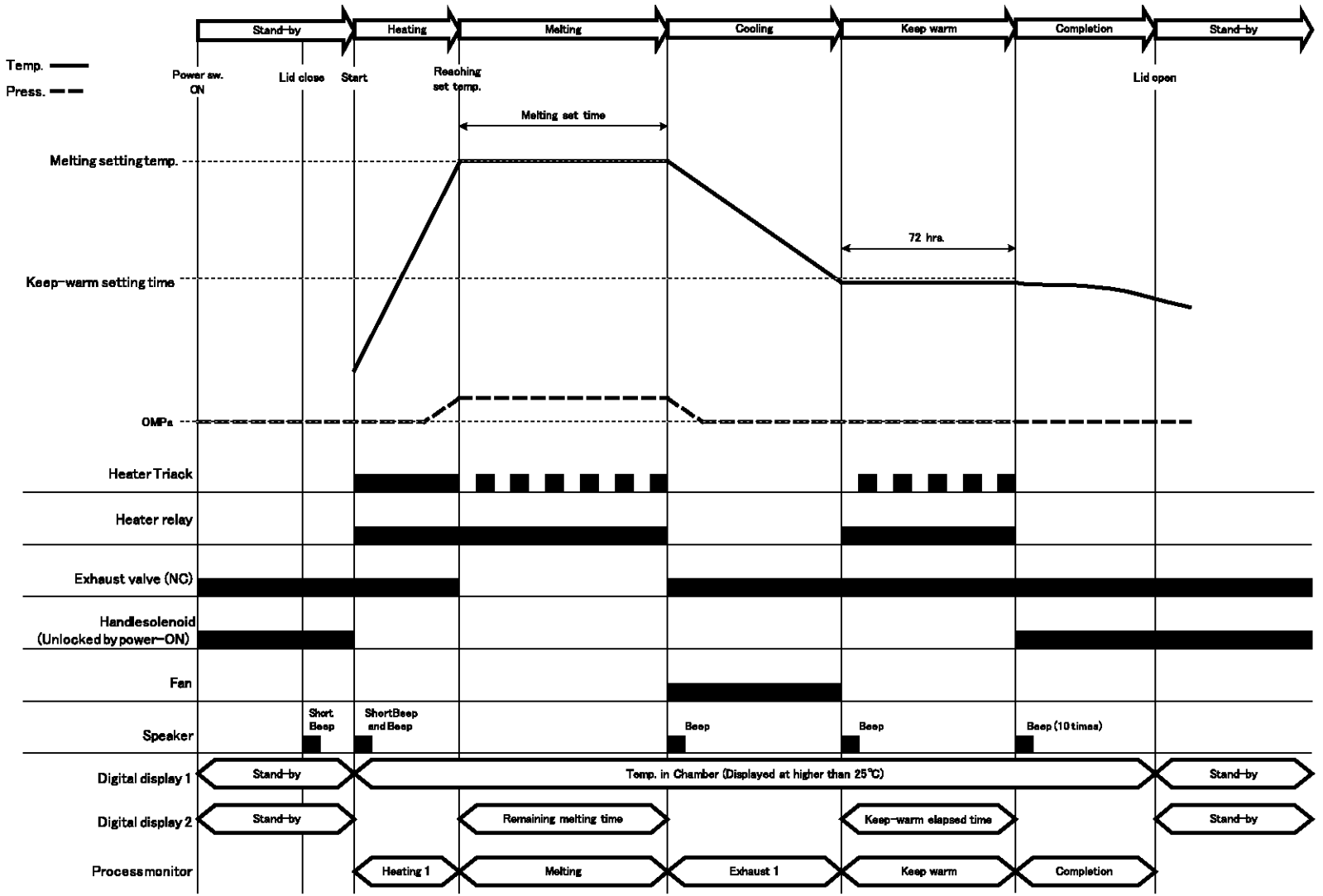


n Sterilization/Keep Warm (2-1, 2-2 and 2-3)

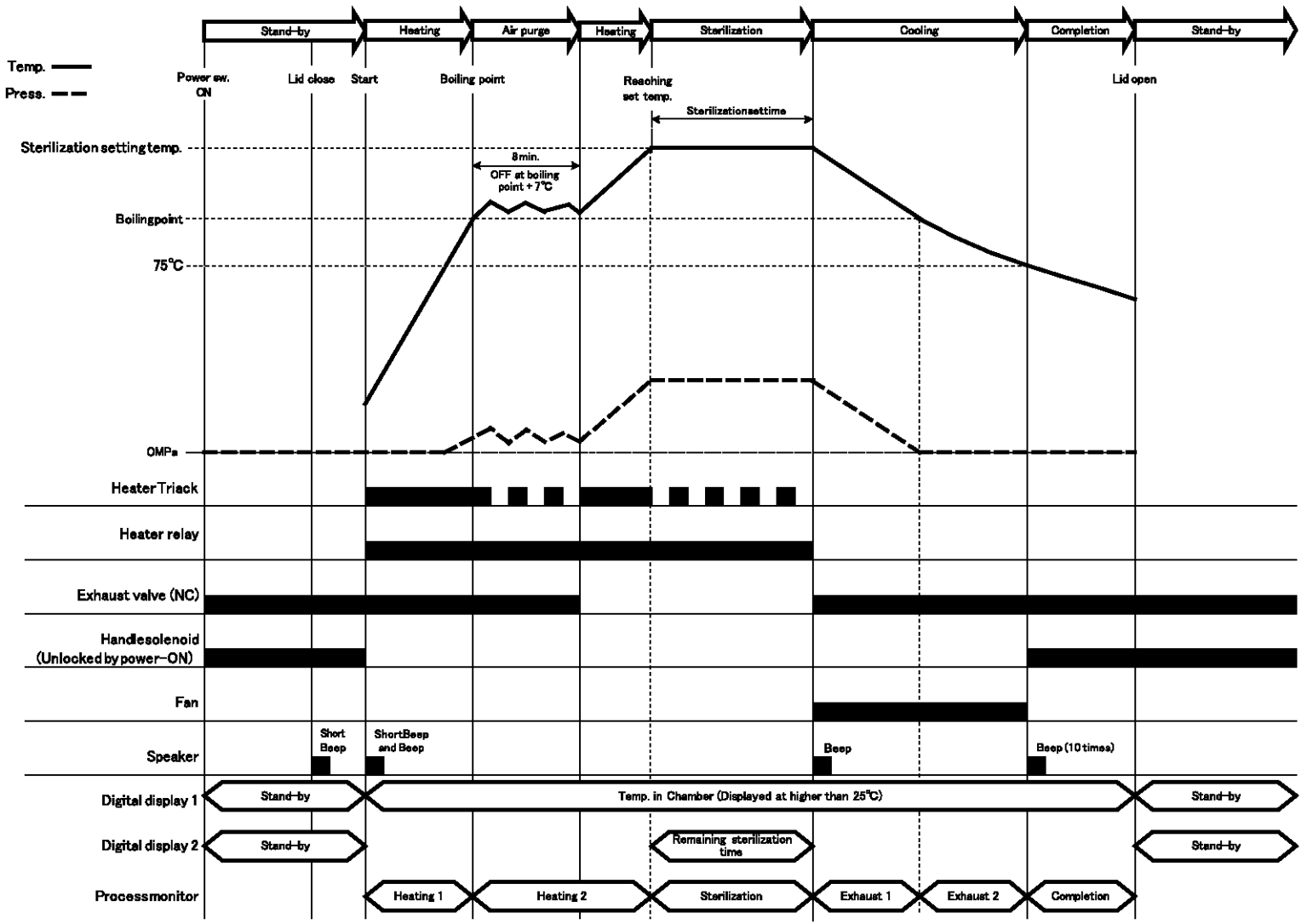


■ Melting/Keep Warm (3-1, 3 - 2 and 3-3)

When the melting temperature is set at higher than 105℃, exhaust operation is performed for 8 min. at boiling point + 5℃ after heating.



■Instrument Sterilization (4-1, 4-2 and 4-3)



(3)Descriptions of process operation

①Set the exhaust tank to the unit.

Fill the exhaust tank with water up to the "LOW" level and set the tank to the unit.

②Turn "|ON" the power switch.

For the first 4 sec., the boiling point setting temperature is displayed on the Digital Display I and the bar display "－－－" appears on the Digital Display II , and then the set temperature, set time or the cycle is displayed.

Press down the handle and pull the movable handle toward you to open the cover. Fill the chamber with water until the end of the water level metal of the heater cover is immersed in the water. Put object(s) to be sterilized in the attached stainless-steel basket, set it in the chamber and close the cover.

③Heating process (Process monitor lamp: "Heating" flickers.)

After checking the detail of the cycle and settings, press the START button. Then, "Beep Beep" sound is heard and the power to the sterilization heater is turned ON to heat the heating water and generate steam. At this time, the air in the chamber is driven out by steam. The steam at that time is discharged into the exhaust tank where it is condensed to water. Also, excess steam which could not be condensed enough flows into the back side exhaust tank at the back side of the unit.

After the completion of air exhausting process, closing of the exhaust valve fills the chamber with steam and raises the pressure. After starting, the COVER LOCK lamp lights up and the cover can not be opened due to interlock function.

④Sterilization process (Process monitor lamp: "Sterilization" flickers.)

When the temperature in the chamber reaches the sterilization temperature, the sterilization timer starts working. During sterilization, the temperature in the chamber is detected by the lateral thermistor (TH1) and the power supply to the sterilization heater is controlled by microcomputer. The temperature can be set every 1℃ between 115℃ and 135℃.

When the set sterilization time elapses, the sterilization process ends and goes to the next exhaust process.

⑤Melting process (Process monitor lamp: "Melting" flickers.)

This process is for melting culture medium, etc. The temperature in the chamber is detected by the lateral thermistor (TH1) and the power supply to the sterilization heater is controlled by microcomputer. The temperature can be set every 1℃ between 60℃ and 114℃.

⑥Exhaust process (Process monitor lamp: "Exhaust" flickers.)

<For INSUMENT STERI>

By shutting down the power supply to the sterilization heater and opening the exhaust valve, steam in the chamber is discharged into the exhaust tank to perform cooling.

This process is to be performed when the sterilization object is instrument, etc.

<For other than INSUMENT STERI>

Shut down the power supply to the sterilization heater and keep the exhaust valve closed so that the temperature in the chamber is cooled naturally. When the temperature in the chamber lowers down to the preset exhaust temperature (initial value or boiling pint), the exhaust valve opens.

This process is performed when the sterilization object is liquid such as culture medium, etc. The sterilization object is prevented from spilling out due to burst boiling.

⑦Keep-warm process (Process monitor lamp: "Keep Work" flickers.)

The temperature of sterilization object such as melted culture medium or sterilized culture medium can be set and maintained every 1℃ between 45℃ and 60℃ and the sterilization object can be kept warm for 72 hours. (The keep-warm process can be completed by pressing the STOP button.) The temperature in the chamber is detected by the lateral thermistor (TH1) and the power supply to the sterilization heater is controlled by microcomputer.

⑧Completion process

<LIQUID STERI cycle/INSTRUMENT STERI cycle> (Process monitor lamp: "Completion" flickers.)

When the temperature in the chamber lowers down to a certain level, the buzzer sound "Beep" is issued ten times, and the bar display "－－－" appears on the Digital Display II to inform the completion of operation.

<Sterilization/Keep-warm cycle・Melting/Keep-warm cycle> (Process monitor lamp: "Completion" flickers.)

After the completion of keep-warm cycle, the buzzer sound "Beep" is issued ten times, and the bar display "－－－" appears on the Digital Display II to inform the completion of operation.

(4)Descriptions of safety device actuation

●Caution signs

Caution Sign	Display Condition	Cause/Checking/Remedy
Lid	Cover is not closed completely.	Press down the handle by force.
Hot	When the START button is pressed, the temperature in the chamber is higher than the preset temperature.	Press the START button after the temperature in the chamber has lowered.
HOSE	Due to bending or clogging of the exhaust hose, abnormal pressure was detected more than 7 times during heating	Pull put the exhaust tank and correct the bending of hose. Check the exhaust circuit for any clogging.
door	①Operation is started without opening the cover immediately after power-ON. ②Trouble with the lock shaft detection switch	①Once open the cover and start the operation. ②Replace the lock shaft detection switch.

●Error signs

Error Sign	Display Condition	Cause/Checking/Remedy
E1 Lateral thermistor (TH1) Open	Lower than 21˚C 5min. after the bottom thermistor becomes 90˚C.	・Check the thermistor (TH1). ・Check the thermistor (TH1) connector.
E2 Bottom thermistor (TH3) Open	Lower than 21˚C for 2min. after starting and 2 min elapsing.	・Check the thermistor (TH3). ・Check the thermistor (TH3) connector.
E3 Lateral thermistor (TH1) Abnormal temp.	Higher than 139˚C	・Check the thermistor (TH1). ・Check the Triack.
E4 Object temp. sensor (TH2) Abnormal temp.	Higher than 140˚C	・Check the thermistor (TH2). ・Check whether or not the tip of the object temp. sensor lips down into the heater unit.
E5 Bottom thermistor (TH3) Abnormal temp	・Higher than 110˚C in heating 1, keep-warm process. ・Higher than 120˚C in heating 2, exhaust process. ・Higher than 140˚C in heating 3, heating 4, sterilization process. ・Or, higher than set temp.+30˚C	・Check the thermistor (TH3). ・Check whether or not the exhaust port is blocked with sterilization object. ・Isn't the amount of heating water reduced and isn't the chamber is heated without water? ・Check for leakage of steam or water.
E6 Unlocking of the movable handle is impossible.	The detection switch is not turned OFF even when the power supply to the solenoid is turned ON and the solenoid is unlocked.	・Doesn't the lock pin catch? ・Check the cover switch.
E7 Locking of the movable handle・cover is impossible.	・The detection switch is not turned ON even when the power supply to the solenoid is turned OFF and the solenoid is locked. ・Lid detection switch is turned OFF during operation. ・Lock shaft detection switch is turned OFF during operation.	・Doesn't the lock pin catch? ・Check the cover switch. ・Check the lock shaft switch.
E8 Abnormally high pressure	・Pressure in the chamber is higher than about 0.33MPa. ・Pressure in the chamber is 0.04MPa higher than the saturated steam pressure in the temperature of the lateral thermistor at heating 4 and sterilization processes.	・Sterilization object which makes the exhaust difficult. ・Exhaust circuit is clogged. ・Exhaust port is blocked with the sterilization bag. ・Deep sterilization can is used.
E9 Low pressure	・Pressure in the chamber is 0.04MPa lower than the saturated steam pressure in the temperature of the lateral thermistor at heating 3 ,heating 4 and sterilization processes.	・Shortage of heating water. ・Exhaust circuit is blocked.
E10 EEPROM communication error	Nothing can be read out or written from or on EEPROM.	・Check and replace PCB.

■Hard limiter

When the temperature in the chamber which was detected by the lateral thermistor (TH1) rises to higher than 140℃, the Triack and the relay control circuit is controlled directly by TH1 temperature detection and the power supply to the heater is shut down.
This circuit is not controlled via micro-computer and it is reset automatically when the temperature lowers. (Actuated in all processes.)

■ Pressure safety valve

This valve opens to exhaust steam in the chamber and prevent abnormal pressure rise so that the pressure in the chamber should not exceed 0.25MPa.

(5) Functions of specific parts and cautions

①Cover interlock

This is a safety device to prevent the user from opening the cover by mistake when the pressure in the chamber is higher than the atmospheric pressure.
In order to check seating tightness between the lid and the chamber, micro-switches are mounted to their lock shafts.
Also, 1 micro-switch is mounted for detection of the position of the solenoid for the movable handle lock and 2 micro-switches to the lid for detection of lid open/close status.

- When the cover is closed, the 2 micro-switches mounted to the lock shaft and the lid detects that the solenoid is in the specified position, and "Beep" sound is issued and the operation turns to stand-by status.
- When the START button is pressed, the live solenoid becomes non-live and the end of the solenoid enters the hole of the movable handle. By so doing, the movable handle is fixed and at the same time, the micro-switch is pushed by the end of the solenoid and the position of solenoid is detected to start the operation.

(Cautions)

If the START button is pressed with the cover lock being incomplete, the caution sign "Lid"* appears on the digital display of the control panel and the buzzer sounds. This is to inform that the lid is not closed up to the normal position. Therefore, the cover handle must be pushed down until the buzzer sound "Short Beep" is heard.

* When the "Lid"* display appears, the following causes are taken account.
  - Handle is not pushed down completely.
    Since the temperature in the chamber is high, repulsive force (force to open the lid) of the chamber lid packing is too strong to push down the handle.
  - The chamber lid packing is removed and the lid bites a part of it.

②About the "door" display

Lock shaft is closed when the cover is open (detection switch "ON"), the lock shaft opens once as the cover closes (detection switch "OFF"), and it closes again (detection switch "ON") when the cover closes.
In order to detect adherence to ON of the lock shaft switch, it is checked by microcomputer that the lock shaft opens and then closes (detection switch turns OFF and ON.), and if it was not detected that the switch is OFF, "door" is displayed.

(Cautions)

If the START button is pressed without opening the lid immediately after the power is turned ON, the "door" display appears, but this is not due to any trouble. Close the cover once and then press the START button to start the operation.

③Back side exhaust tank

When the water temperature in the exhaust tank rises to make it impossible to condense steam to water, the steam is exhausted into the back side exhaust tank.
It is the back side exhaust tank that recovers the steam.

(Cautions)

When connecting the exhaust hose to the back side exhaust tank, be sure to insert it so that its end reaches near the bottom of the back side exhaust tank.
The water in the back side exhaust tank returns from the back side exhaust tank to the exhaust tank. In case of incomplete connection of hose, water remains in back side exhaust tank and the water may splash in all directions in the exhaust process.

④Thermostat

This is the final safety device to prevent abnormal temperature rise due to heating of empty chamber by heater. The power supply is shut down when this device works. The thermostat is of manual reset type. The actuating temperature is 145℃±5℃.
The thermostat is mounted to the bottom of the chamber. To reset it, remove the unit side panel and the reset button must be pressed directly.

(Caution)

Since the thermostat can not be rest at a high temperature, rest it when the chamber is cooled well.

⑤Chamber lid packing

Timing of the chamber lid packing replacement is 1 year as standard. If deterioration of the edge, hardening, remarkable deformation or lowering of elasticity is found, it must be replaced.
When replacing, turn OFF the power supply and then remove the chamber lid packing from the chamber lid.
Make sure that no foreign matters such as dirt, etc. are sticking to the new lid packing and the lid before mounting the packing to the chamber lid.

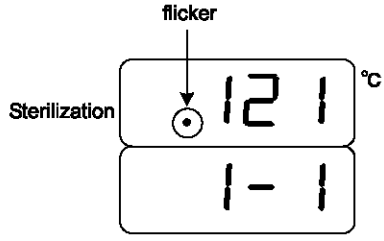
8. About Various Modes

Models MLS-3751L/3781L are equipped with the following modes. As for the detail, refer to the pages of respective modes.

Setting mode: Display of processing frequency, history of errors, etc. and settings. etc.
Test mode: Display of temperature and pressure in the chamber, adjustment of thermistors, pressure sensors, etc.
Demonstration mode: Display of actual operation status and demonstration of operation, etc.

■How to enter into the setting mode

1. Turn ON the power switch.
2. When the "▲"+ "SET/CONFIRM" buttons are pressed for about 2 sec. while pressing the "START" button, "Short Beep ×3" sound is heard and at the same time the decimal point on the Digital Display I flickers. (See the right figure.)
3. After the status has become such as in 2, when the "START" button is pressed within 5 sec. while pressing the "▲"+ "▼" buttons, "Beep" sound is heard, and at the same time the mode becomes the setting mode and model name and speech language are displayed.



■How to cancel the setting mode

When the power switch is turned OFF, the setting mode is cancelled. Or, when the "STOP" button is pressed to enter into the test mode and the operation in the "How to cancel the test mode" is performed, the setting mode reset to the normal mode.

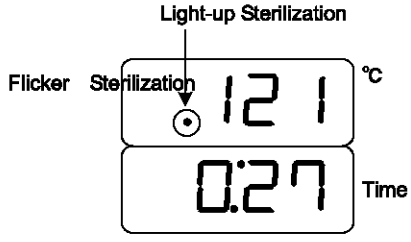
■How to enter into the test mode

A. In stand-by display

Enter into the setting mode according to the procedure in the "How to enter into the setting mode" and press the "STOP" button. Then, "Beep" sound is heard and at the same the mode changes to the test mode. The difference from the normal mode is such that the decimal point on the Digital Display I lights up. (See the right figure.)

B. In operation

When the procedure in the "How to enter into the setting mode" is performed during operation, "Beep" sound is heard and at the same time the mode changes to the test mode.



■How to cancel the test mode

When the power switch is turned OFF, the test mode is cancelled. Or, when the "START" button is pressed for about 2 sec. while pressing the "▲"+ "SET/CONFIRM" buttons, "Short Beep ×3" sound is heard and at the same time the test mode returns to the normal mode.

■How to enter into the demonstration mode

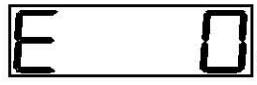
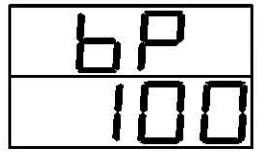
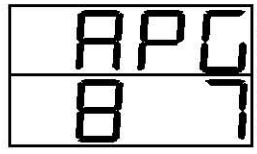
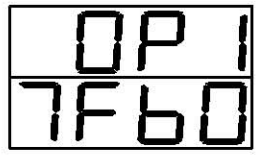
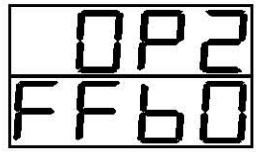
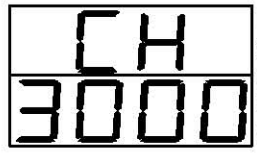
1. Turn ON the power switch.
2. Start the reservation operation.
3. When the "Cycle selection" + "STOP" buttons is pressed within 5 sec. after starting the reservation operation, "Beep Beep Beep" sound is heard and at the same time the stand-by is displayed and the mode changes to the demonstration mode.

■How to cancel the demonstration mode

When the power switch is turned OFF, the demonstration mode is cancelled.

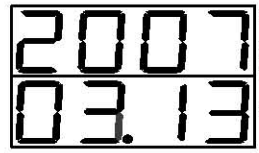
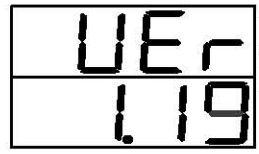
(1) About the setting mode

In the setting mode, product information, factory setting, processing frequency, history of errors, boiling point setting, exhaust setting, address, option 1, option 2 and channel display frequency setting and checking can be performed.

Mode	Operation	Display	
①Product information			Preset model name and speech language is displayed. (In factory, English has been set for 3751 or 3781.)
②Factory setting			"CLr" is displayed.
③Processing frequency			Processing frequency is displayed.
④History of errors	When the "SELECT" button is pressed, the mode progress ①→②･･･⑩→①.		History of errors is displayed.
⑤Boiling point setting			Preset boiling point is displayed. (In factory, boiling point has been set at 100℃.)
⑥Air purge			Preset air purge time and heater OFF temperature are displayed. (In factory, they have been set 8 min. and 7℃, respectively.)
⑦Address			
⑧Option 1			
⑨Option 2			
⑩CH display frequency			Preset CH frequency is displayed. (In factory, the frequency has been set at 3000 times.)

(2) About sub-mode

①Product information

Mode	Operation	Display	
①Model name and speech language display			"3781" or "3751" is displayed. "JPn" or "Eng" is displayed.
	↓ Time button		
②Preparation date display (Note)			"2007 03. 13" is displayed. (March 13, 2007) or fan is operated.
	↓ Time button		
③Version display (Note)			"VEr 1. 19" is displayed. (Version 1. 19)
	↓ Time button		

- Model name can be changed by pressing the "▲"or "▼" button during ① the model name and speech language display.
- Speech language can be changed by pressing the "SET/CONFIRM" button and the "▲"or "▼" button during ① the model name and speech language display. When the "SET/CONFIRM" buttons are pressed again. the model name can be changed…
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in non-volatile memory.
- When the "TIME" button is pressed, the mode changes in the order ①→②→③→①‥.
- When the "OBJECT TEMP" button is pressed during the product information display, all the LEDs are light up.

<<Note>> ② Preparation date and ③ Version display are altered depending on the specification charge.

②Factory setting

- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the alarm sound "Beep Beep Beep" is issued, and the setting is defaulted to the factory setting. When the "START" button is pressed again while pressing "SET/CONFIRM" button, the setting is defaulted to factory setting.

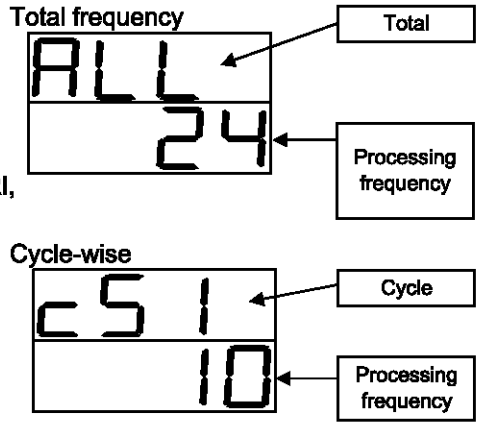
The following items are subject to the factory setting:

(1)Setting values for each cycle (sterilization temperature, sterilization time, etc.)
(2)Error information and frequency
(3)Processing frequency
(4)Boiling point and air purge settings
(5)Address
(6)CH display frequency

③Processing frequency

In the process frequency display, the total frequency of all cycles and the processing frequency of each cycle are displayed.

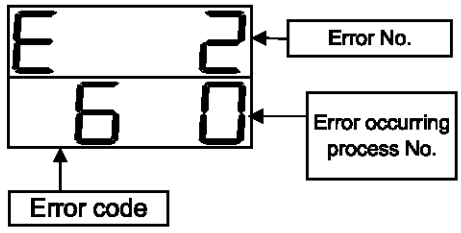
- Each time when the "TIME" button is pressed, the processing frequency of each cycle are displayed.
- "ALL" stands for the total frequency, and "cS1" for LIQUD STERI, "cS2" for STERI KEEP WARM, "cS3" for MERT/KEEP WARM and "cS4" for INSTRUMENT STERI, respectively.
- When the "START" button is pressed while pressing the "SET/CINFIRM" buttons, the total processing frequency and operation frequency of each cycle are cleared.



④History of errors

Error No., error code and error occurring process No. are displayed.
The latest error data is displayed in the first place.

- The error No. is changed by pressing the "▲"or "▼" button and the history of errors can be checked.
  The error No. can be recorded for 8 in number at the maximum.
  If more than 9 errors occur, the oldest error is deleted and new error is recorded instead.
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the error data is deleted.
  (Total errors are not deleted.)



◆Error Codes◆

1 : Lateral thermistor (TH1) Open
2 : Bottom thermistor (TH3) Open
3 : Lateral thermistor Abnormal temperature
4 : Object temperature sensor (TH2) Abnormal temperat
5 : Bottom thermistor Abnormal temperature
6 : Movable handle Unlock impossible
7 : Movable handle and lid Lock impossible
8 : Abnormally high pressure
9 : Low pressure
10 : EEPROM communication error

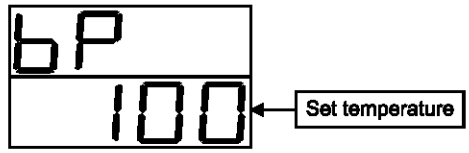
< Error occurring process Nos. >

Process No	Error Occurring Process	Description	Process No	Error Occurring Process	Description
0	Stand-by		6	Heating 4	TH2 temp. rises up to the preset temp.
1	Reservation		7	Sterilization/Melting	
2	Heating 1	Up to 90℃	8	Cooling 1	Down to boiling point
3	Heating 2	From 90℃ to boiling point	9	Cooling 2	Before cooling point
4	Exhaust		10	Keep warm	
5	Heating 3	TH1 temp. rises up to the preset temp.	11	Completion	

⑤Boiling Poing setting

Change the boiling point temperature according to the altitude of the place for installation by pressing the "▲"or "▼" button.

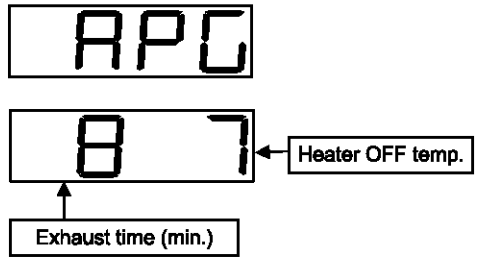
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.
  (The boiling temperature has been set at 100℃ in the factory.)



* When setting the boiling point, refer to the table (P__) of the altitude and atmospheric pressure in the standard atmosphere and the boiling point of water.

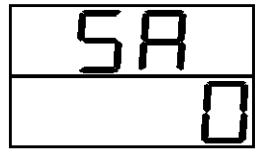
⑥Exhaust setting

- Heater OFF temperature can be changed by pressing the "▲" or "▼" button.
  (Heater ON temperature is fixed at the boiling point temp.+1℃.)
- When the "▲"or "▼" button is pressed while pressing the "SET/CONFIRM" button, the exhaust time can be changed.
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.



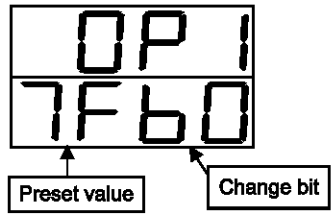
⑦Address

- Address can be changed by pressing the "▲"or "▼" button.
  This address is used for connection of the MTR system.
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.



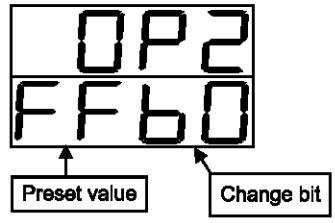
⑧Option 1

- Change bit is selected by pressing the "▲"or "▼" button.
- Preset value can be changed by pressing the "TIMER" button
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.



⑨Option 2

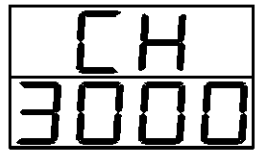
- Change bit is selected by pressing the "▲"or "▼" button.
- Preset value can be changed by pressing the "TIMER" button
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.



⑩CH display ferquency

CH display frequency is set. (CH is displayed when the total processing frequency exceeds the CH display frequency.)
4 kinds of frequency of 1000 ↔ 2000 ↔ 3000 (Factory setting) ↔ 9999.4 can be selected.

- When the "▼" button is pressed, the frequency decreases and when the "▲" button is pressed, the frequency increases.
- When the "START" button is pressed while pressing the "SET/CONFIRM" button, the content of the change is written in the non-volatile memory.

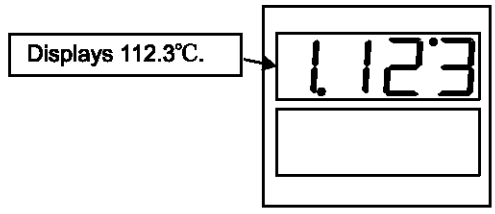


<<Note>> Do not set 9999.

(3)Functions of test mode

1. Minute temperature display

   When displaying the current temperature, the value after the decimal point is also displayed.



2. Expansion of temperature setting range

   Temperature can be set from 20℃ to 150℃.

   Error is prohibited by the sterilization limiter.

   Set value can be changed even after heating process.

3. Remaining time display in exhaust process

   Exhaust remaining time is displayed on the Digital Display II. (in min.)

4. Pressure/Saturated steam pressure display

   By pressing the "TIMER" button, the current pressure is the Digital Display I. (in kPa)

5. Forced exhaust

   By pressing the "▲" and "STOP" buttons at the same time during stand-by, the exhaust valve opens.

   The forced exhaust can be cancelled by pressing the "STOP" button.

6. Timer 60-time speed operation

   While the "TIMER" and the "SET/CONFIRM" button at the same time, the reservation timer, process timer and sterilization timer operate in 60-time speed. (It is preferable to perform the exhaust fast.)

7. Sterilization process start/completion signal output

   Buzzer sounds at the start and completion of the sterilization process.

(4)Functions of demonstration mode

1. Power is not supplied to the heater.
2. Process timer and sterilization timer operate in 60-time speed.
3. When the power is supplied to the heater, the temperature on the Digital Display rises automatically.
4. When the power is not supplied to the heater, the temperature on the Digital Display lowers automatically.
   (For safety sake, however, the temperature does not lower than the actual temperature of TH1.)
5. Pressure Abnormal is not detected.

9.Temperature and Pressure Adjustment and Checking

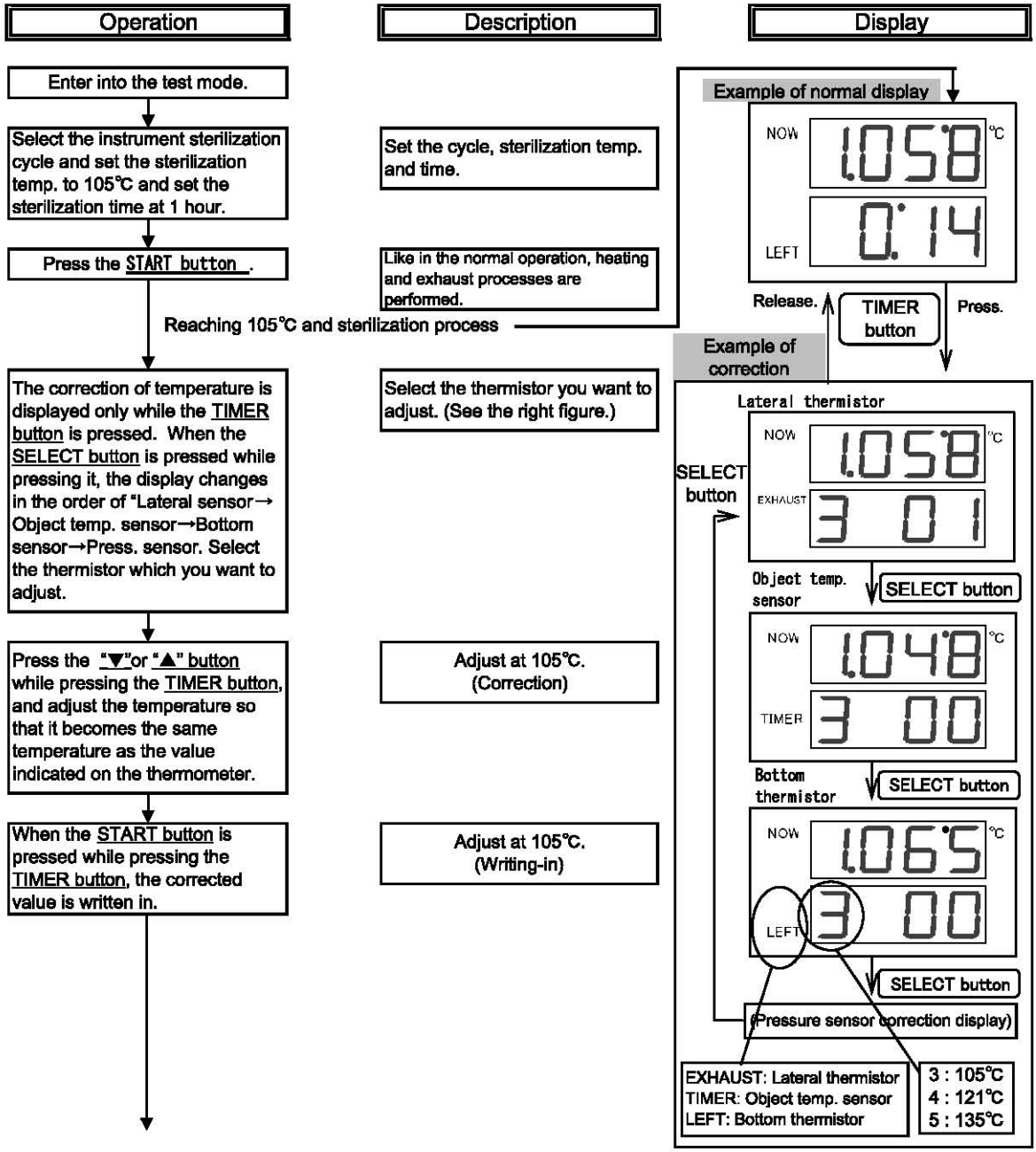
(1)Adjustment of thermistors

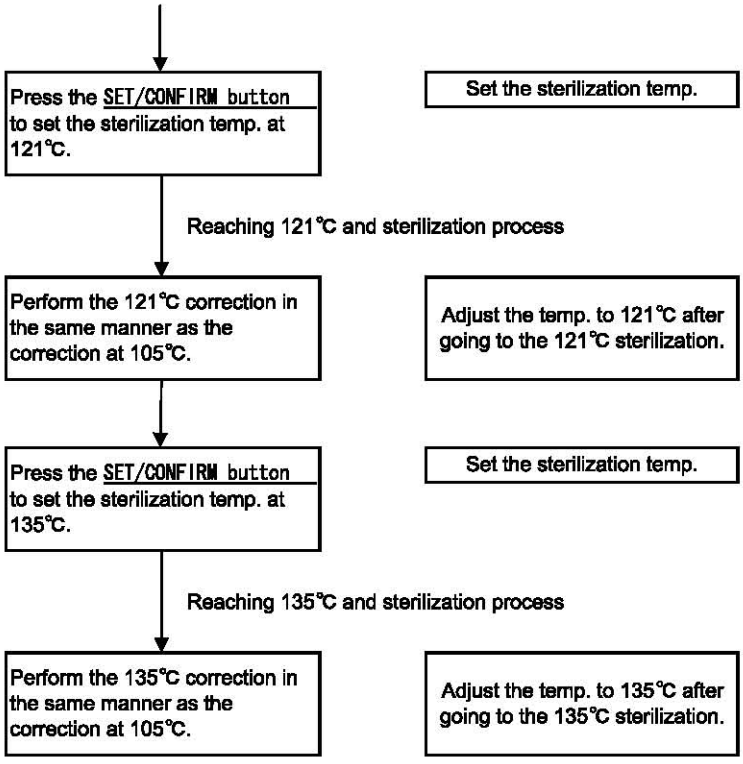
The temperatures of the lateral thermistor, object temperature sensor and bottom thermistor can be corrected manually. The temperature of the lateral thermistor has been corrected in the factory in advance. Use the displays if the correction of temperature is necessary for validation,etc. The correction of temperature is performed at 3 points, namely, 105℃, 121℃ and 135℃.
For prevention of heating without water, check the heating water amount.

Instrument to be prepared

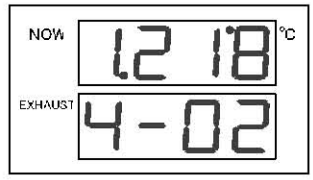
Thermometer that has been calibrated by temperature recording meter, etc.

Since the temperature is corrected on the basis of the temperature indicated by the thermometer, prepare an accurate thermometer. The correction of temperature is performed as minute as 0.1℃.





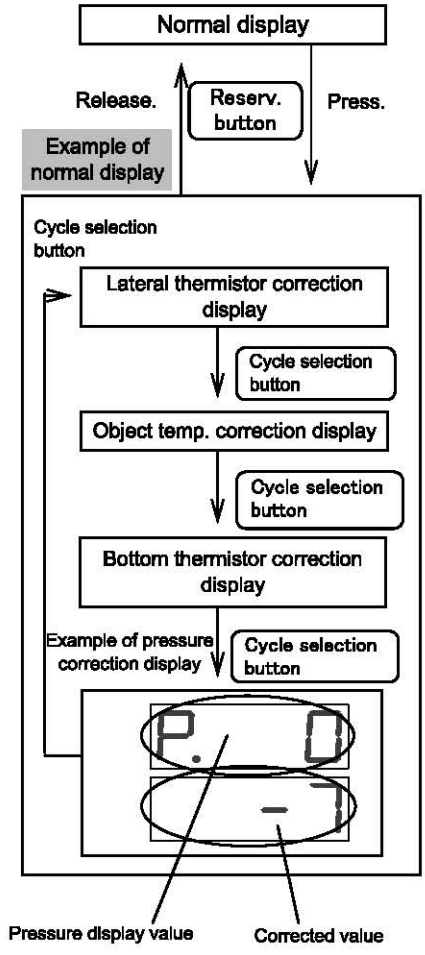
Example of the lateral thermistor correction display (in 121℃ correction)



(2) Adjustment of pressure sensors

Pressure correction of the pressure sensor can be performed manually.
Pressure correction is performed at 2 points, namely, in the status with the lid being opened and at 135℃.
For prevention of heating without water, check the heating water amount.

Operation	Description	Display
Enter into the test mode.		
Fix the 2 shafts found at the back side of the cover by tape, etc. and set it to ON status.		
Close the lid once and then open it.		
Press the **START button** with the cover being opened.	For adjusting the pressure when the pressure is 0 (cover "Open").	
The correction of pressure is displayed only while the **reservation button** is oressed. When the **cycle selection button** is pressed while pressing it, the display changes in the order of "Lateral sensor→Object temp. sensor→Bottom sensor→ Press. sensor. Select the pressure correction display.	Selection of the pressure correction display (See the right figure.)	
Press the **"▽"**or **"△" button** while pressing the **reservation button**, and adjust the pressure so that the pressure display value becomes "P. 0".	Pressure adjustment (Correction)	
When the **START button** is pressed while pressing the **reservation button**, the corrected value is written in.	Pressure adjustment (Writing-in)	
Press the **STOP button** and remove the tape from the shaft.		



Select the instrument sterilization cycle and set the sterilization temperature at 135℃ and the sterilization time at 30 min. Close the cover and press the **STRAT button**.

Set the cycle, sterilization temp. and time.

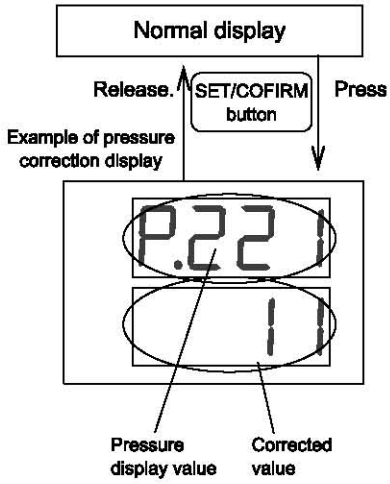
Reaching 135℃ and sterilization process

Press the "▽"or "△" button while pressing the **SET/CONFIRM button** and adjust the pressure so that the pressure display becomes same as the value on the pressure gauge of the product.

Pressure adjustment (Correction) (See the right figure.) The pressure gauge of the product shows the pressure in MPa and the pressure display value in kPa.

When the **START button** is pressed While pressing the **SET/DISPLAY button**, the corrected value is written in.

Pressure adjustment (Writing-in)



(3) Checking the safety valve operation

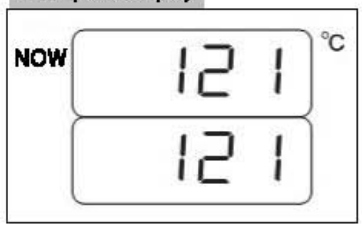
·Checking procedure of the safety valve operation

1. Enter into the test mode. As for the entering method, see the page describing the test mode.
2. Select the instrument sterilization cycle, set the sterilization temperature at 140℃ and the sterilization time at 10 min, and start the operation.
3. When the exhaust process is over, the safety valve is actuated at about 140℃/0.26MPa to belch steam from the back side.
4. When the confirmation is completed, set the sterilization temperature at 135℃ and the sterilization time at 1 min.
5. When the process is completed though the exhaust process after the completion of the sterilization process, turn OFF the power to complete the confirmation.

(4) Conformation of the TH1 and TH3 temperatures

When the "▼"and "▲" buttons are pressed at the same time, the TH1 temperature is displayed on the Digital Display Ⅰ and the TH3 temperature is displayed on the Digital Display Ⅱ.

Example of display



10. Thermistor Temperature Characteristics / Altitude,Atmospheric Pressure and Boiling Point in standard Atmosphere

■Thermistor temperature characteristics

Th1·Th3

Temp. ℃	Standard Resistance Value MΩ	Temp. ℃	Standard Resistance Value kΩ	Temp. ℃	Standard Resistance Value kΩ	Temp. ℃	Standard Resistance Value kΩ
-10	9.71	30	1085	70	189.2	110	45.38
-5	7.17	35	854	75	155.9	115	38.65
0	5.33	40	676	80	129	120	33.04
5	4.01	45	539	85	107.3	125	28.34
10	3.03	50	433	90	89.57	130	24.39
15	2.32	55	349	95	75.12	135	21.05
20	1.78	60	283	100	63.26	140	18.23
25	1.39	65	231	105	53.48	145	15.84

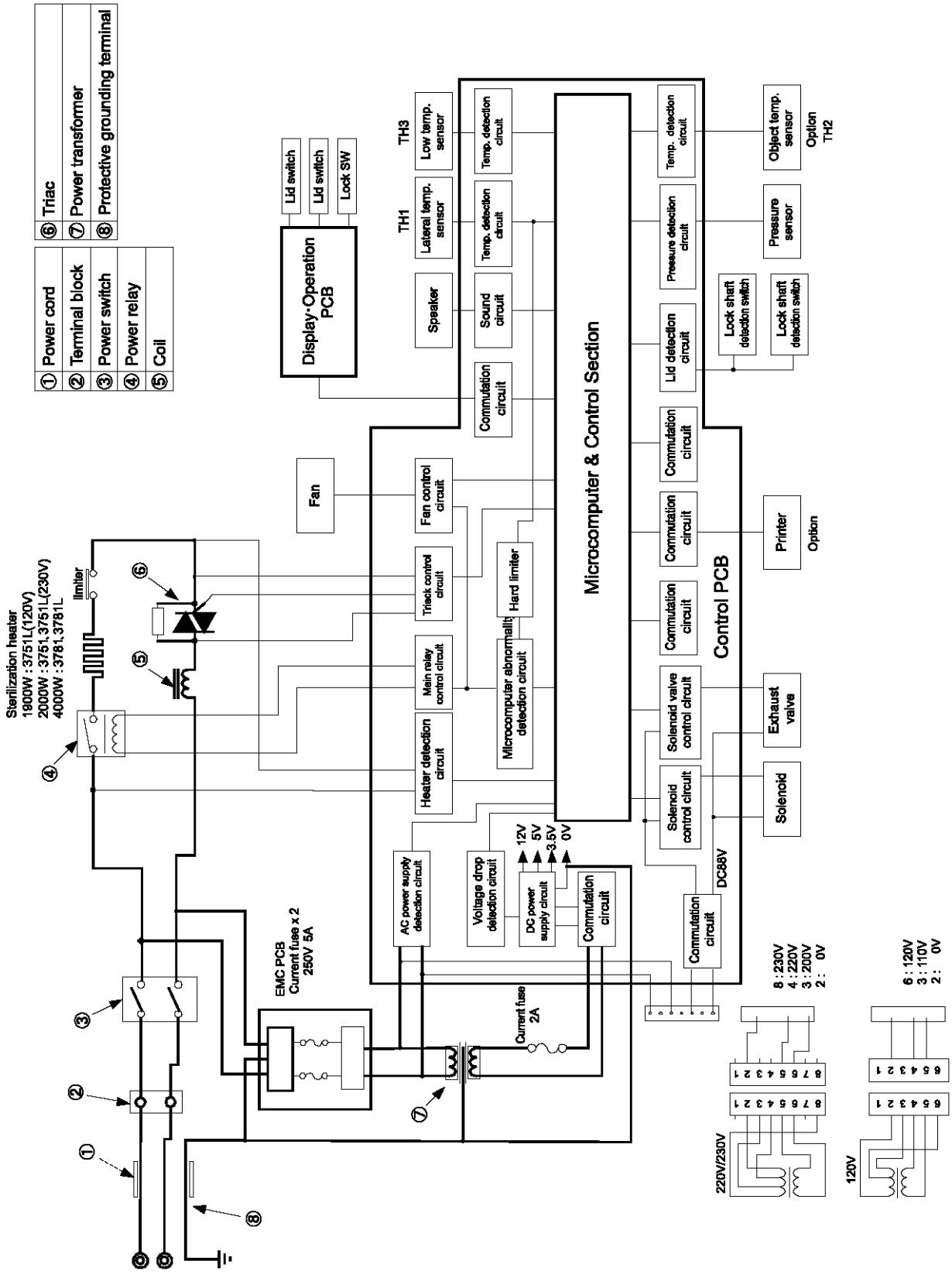
■ Altitude, atmospheric pressure and The Boiling point of water in standard atmosphere

Altitude	Atmospheric Pressure		Boiling Point of Water	Altitude	Atmospheric Pressure		Boiling Point of Water
(m)	(hPa)	(mmHg)	(℃)	(m)	(hPa)	(mmHg)	(℃)
-382	1060	795.0	101.27	1900	805.2	603.9	93.72
-300	1049.0	786.7	100.99	2000	795.0	596.3	93.39
-200	1037.1	777.8	100.66	2100	785.4	589.1	93.06
-100	1025.2	768.9	100.33	2200	775.8	581.9	92.73
0	1013.3	760.0	100.00	2300	766.2	574.7	92.40
100	1001.4	751.1	99.67	2400	756.6	567.5	92.07
200	989.5	742.2	99.34	2500	746.9	560.2	91.74
300	977.6	733.3	99.01	2600	737.7	553.3	91.41
400	966.1	724.6	98.67	2700	728.5	546.4	91.08
500	954.7	716.1	98.34	2800	719.3	539.5	90.75
600	943.3	707.5	98.01	2900	710.1	532.6	90.42
700	931.9	699.6	97.68	3000	701.1	525.9	90.15
800	920.8	690.7	97.35	3012	700.0	525.0	90.11
900	909.7	682.5	97.02	3100	692.6	519.5	89.82
1000	898.7	674.1	96.69	3200	684.2	513.2	89.51
1100	888.1	666.1	96.36	3300	675.7	506.8	89.20
1200	877.5	658.1	96.03	3400	667.2	500.5	88.88
1300	866.9	650.1	95.70	3500	658.8	494.1	88.57
1400	856.3	642.1	95.37	3600	650.3	487.7	88.26
1500	845.6	634.3	95.04	3700	641.8	481.4	87.95
1600	835.5	626.7	94.71	3800	633.3	475.0	87.64
1700	825.4	619.1	94.38	3900	624.9	468.7	87.32
1800	815.3	611.5	94.05	4000	616.4	462.3	87.04

* Environmental conditions for use of equipment
Atmospheric pressure 701.1 ~ 1013.3hPa

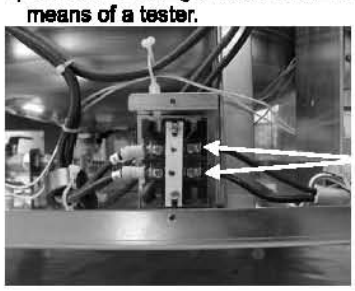
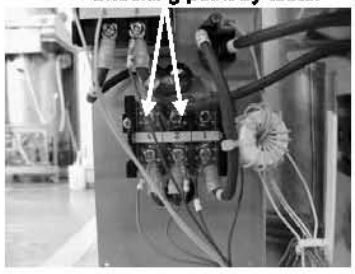
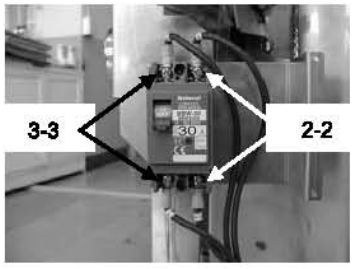
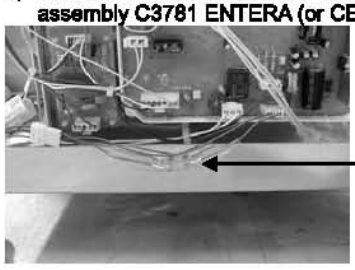
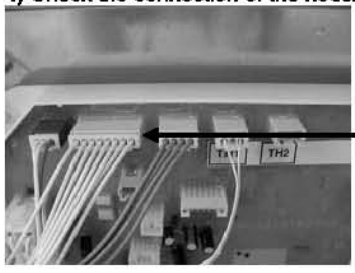
- As for the conversion of the atmospheric pressure(hPa(mba) and mmHg), see the following formula:
1mmHg=13.5951X980.665X10^{-4}hPa(mba)
- As for the calculation of the boiling point, see the following formula:
Boiling point =100+0.0367(P-760)-0.000023$(P-760)^2$
P : mmHg

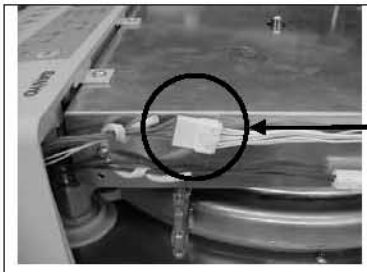
11.Citcuit Diagram



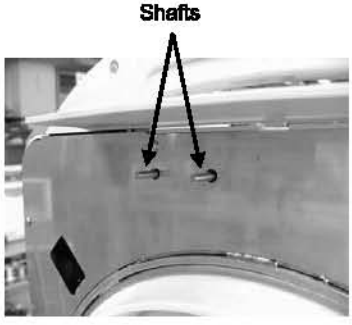
12.Troubleshooting

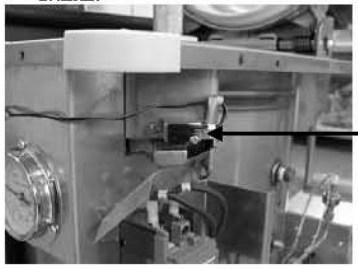
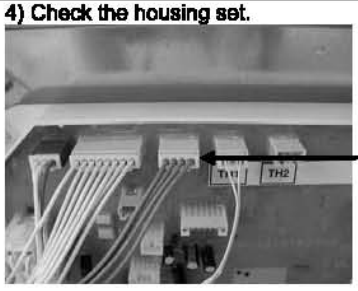
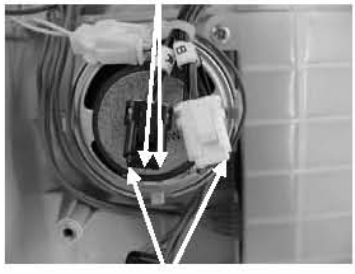
(1)Stand-by is not displayed when the power is turned ON.

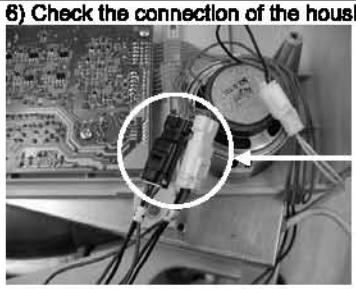
1) Check the voltage between A and B of the terminal block by means of a tester.  Checking point by tester	If the voltage is 0V, (1) Check the main power breaker. If the breaker is OFF, turn it ON. (2) Check the power cord for any breakage. If broken, replace the power cord.
2) Check the voltage between 2 and 3 of the terminal block by means of a tester. Checking point by tester   Check the conductivity between 2 and 2, and 3 and 3.	If the voltage is 0V, (1) Check the conductivity of the powersupply. Turn OFF the main power supply and turn ON the power switch of the unit, and check the conductivity. If not conductive, replace the power switch. (2) Check the lead wire for removal or looseness.
3) Check the connection and current fuse of the housing assembly C3781 ENTERA (or CE).  Fuse	If the fuse is blown out, replace the housing assembly C3781 ENTERA (or CE).
4) Check the connection of the housing set.  Socket of housing set	(1) Check if the socket is inserted completely. (2) Check the lead wire for breakage.

	
5) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".
6) Trouble with the "PCB set, display"	Replace the "PCB set, display".

(2) "Lid" appears on the display and process does not start.

1) Check the 2 shafts mounted to the lid. 	Push the shafts to make sure that they slide in and out smoothly. If the shafts do not slide smoothly, (1) Check the springs fitted to the shafts. (2) Apply grease to the shaft sliding part.
2) Check the position of the both lock shafts. 	When the cover is opened, (1) Check if the shafts are in due position (in just about vertical position). (2) Check if the lock shafts open when pushed outward and they return to the original position by spring force when released. If they can not move normally, (1) Remove any foreign matter which is pinched and jams the shaft. (2) Replace the spring, etc. If in trouble. (3) Apply grease to the shaft sliding part.

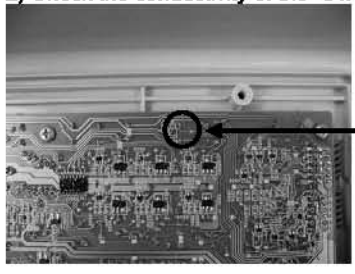
3) Check the conductivity of the detection switch for the both shafts.  Detection switch  Check the conductivity.	(1) If the switch is mounted incompletely, adjust it. (2) If the switch is not conductive when turned ON, replace the housing set M.
4) Check the housing set.  Socket of the housing set	(1) Check if the socket is inserted completely. (2) Check the lead wire for breakage.
5) Check the conductivity of the both detection switches for the lid. Detection switch 1 Detection switch 2  Between Black 1 and 2  Between Black 3 and White 1 Conductivity checking positions ・Detection switch 1 Between Black 1 and 2 ・Detection switch 2 Between White 1 and Black 3 * Wire Nos. are indicated on the connectors.	(1) If the switch is mounted incompletely, adjust it. (2) If the switch is not conductive when turned ON, replace the housing set DS.

6) Check the connection of the housing set.  	(1) Check the connection with the housing set DS. (2) Check that the housings in the same color are connected.
7) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".
8) Trouble with the "PCB set, display	Replace the "PCB set, display".

(3) "door" appears on the display even when the cover is closed.

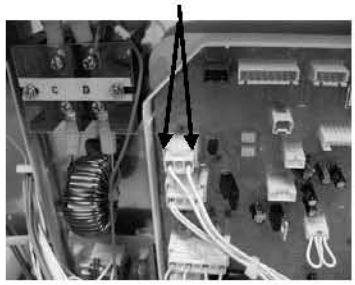
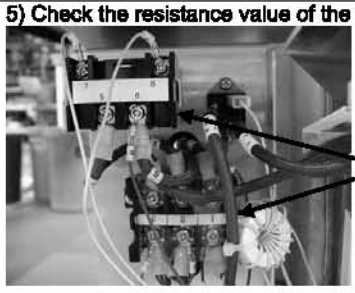
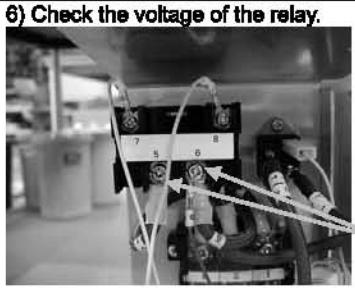
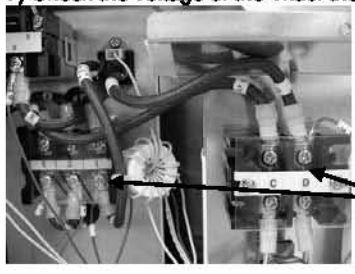
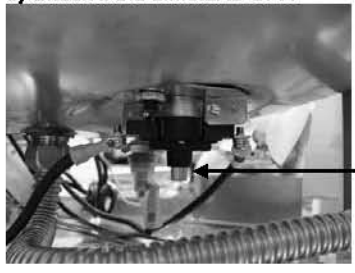
1) Check the items 2) and 3) of "Lid" appears on the display and process does not start.	Correct it if in trouble.
2) Check the conductivity the switch when the both lock shafts open outward. 	Since the switch is turned OFF when the lock shafts open, the switch is not conductive. If the switch is conductive, replace the housing set M.

(4)Process does not start.

1) Check if the "Lid" or "door" appear on the display.	Correct it if in appears.
2) Check the conductivity of the "START" button.  	Replace the "PCB set, display" if not conductive.
3) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".
4) Trouble with the "PCB set, display	Replace the "PCB set, display".

(5) Power is not supplied to the heater.

1) Check the exhaust hose.	Check if the hose is bent or clogged in the product when exhaust tank is installed. Correct it if bent or clogged.
2) Check the hose in the exhaust tank.	Check if the hose is bent or clogged. Correct it if bent or clogged.
3) Check if the exhaust hole is blocked with any sterilization object or sterilization bag.	Remove it if the exhaust hole is blocked.

4) Check the voltage of the exhaust valve. Checking points by tester (DC voltage) 	If conductive, (1) Since the valve does not operate in spite that the voltage is applied, replace the exhaust valve. If the voltage is 0V, (1) Check the connection of the housing set W or V. (2) Replace the "PCB set, control TH set".
5) Check the resistance value of the heater.  Check the resistance value between the terminal block 1 and relay- 6.	Check that the resistance value as follows: 7.6Ω for 3751L (120V), 13.2Ω for 3781L 26.5Ω for 3751L (230V) and 3751. If not, replace the heater.
6) Check the voltage of the relay.  Between the relay-5 and relay-6.	Check the voltage between the relay-5 and relay-6 after stating. If not 0V or so, (1) Check the housing assembly I 3781 CE for connection and breakage. (2) Replace the relay.
7) Check the voltage of the Triac. the terminal block 1and D.  Between the terminal blocks 1 and D.	Check the voltage of the Triac (between the terminal blocks 1 and D.). Check that the voltage between the terminals is same as that of the main power supply and becomes 0V soon. If not 0V, (1) Check the housing assembly B120 3751 or B220 3781 or B230 3781 for connection or breakage. (2) Replace the Triac. (3) Replace the "PCB set, control TH set".
8) Check if the bimetal is OFF.  Press here.	Try to press the button of the bimetal found at the back side of the chamber. It can be restored if a "Click" sound is heard.

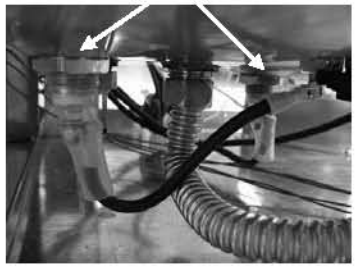
(6) "Hose" appears on the display.

Check the Items 1) ~ 4) of "Power is not not supplied to the heater."	If any trouble, correct it.

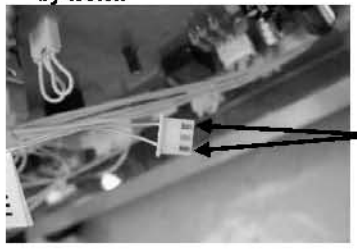
(7) Steam leaks from the periphery of the chamber.

1) Check the chamber lid packing and the chamber hard top face. 	(1) Clean the contact part of the packing and chamber top. (2) Clean the contact part of the packing and chamber lid. (3) If the chamber lid packing is deteriorated, replace it.

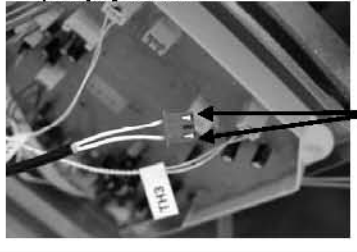
(8) Steam leaks from pipe and joint.

1) Check the heater mounting part (lower side of the chamber) for steam leakage. Checking positions 	If nuts are loosened, retighten them.
2) Check the pipe connection	(1) If the connection is loosened, retighten it. (2) If the hose band is loosened, replace it.

(9) Open error (E1) occurs at the lateral thermistor (TH1). Abnormal temperature rise of the lateral thermistor (E3 occurs.)

1) Check the connector connection	(1) Check if the socket is inserted completely. (2) Check the lead wire for breakage.
2) Check the resistance value of the lateral thermistor (TH1) by tester.  Checking points by tester	Remove the connectors from the "PCB set, control completion" and check the resistance value between the terminals of connector side. Resistance range (90 ~ 110℃): About 80.0 ~ 41.6Ω)
3) Trouble with the "PCB set, control TH set.	Replace the "PCB set, control TH set".

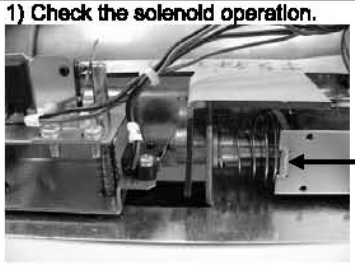
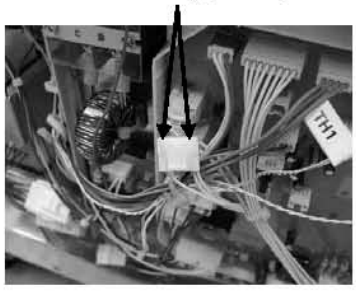
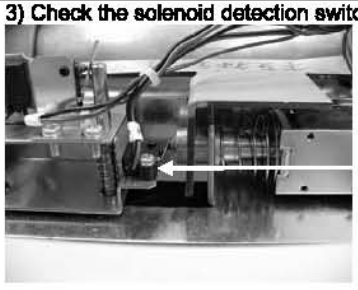
(10) Abnormal temperature of the object temperature sensor (TH2) (E4 occurs.)

1) Check the resistance value if the object temperature sensor (TH2) by tester.  Checking points by tester	Remove the connectors from the "PCB set, control completion" and check the resistance value between the terminals of connector side. Resistance range (90 ~ 110℃): About 80.0 ~41.6Ω)
2) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".

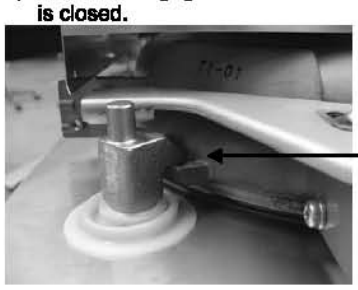
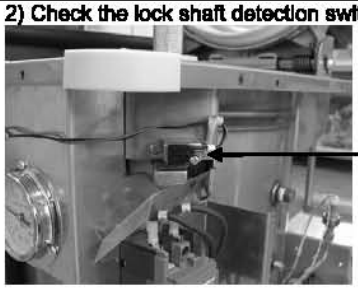
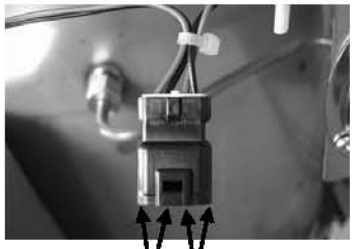
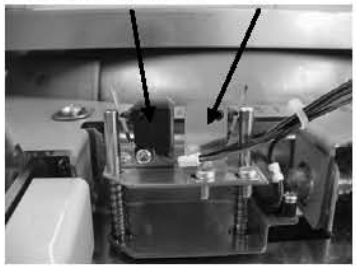
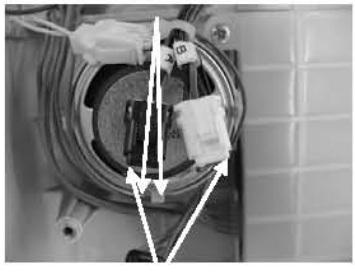
(11) Abnormal temperature of the bottom thermistor (TH3) (E5 occurs.)

1) Check the heating water amount in the chamber.	If the heating water in the chamber is decreased, replenish it.
2) Check the item of "Steam leaks from pipe pipe and joint."	Repair the steam leaking part.

(12) Handle lock is unlockable (E6 occurs.)

1) Check the solenoid operation.  Solenoid Checking points by tester 	When the solenoid is not pulled, (1) Check connector insertion of the housing set X+ U(3751) or D + T(3781). If not completely inserted, correct it. (2) Check the resistance value between the terminals of the solenoid. Range of resistance value: 160 ~ 185Ω In case of short-circuit or breakage, replace the solenoid. (3) Check if the lock pin is caught. Apply grease.
2) Check the housing set.  Check the connection. Housing set DS	Check the housing set DS for connection and breakage. If the incomplete connection or breakage is found, correct it.
3) Check the solenoid detection switch.  Detection switch  Conductivity checking positions • Detection switch 1 Between White 2 and 3 * Wire Nos. are indicated on the connectors. Between White 2 and 3	Check the conductivity of the detection switch. If the switch is short-circuited with the lever being returned, replace the housing set DS.
4) Trouble with the "PCB set, control TH set.	Replace the "PCB set, control TH set".
5) Trouble with the "PCB set, display	Replace the "PCB set, display".

(13) Movable handle and lid lock is not working. (E7 occurs.)

1) Check the engagement of the lock shaft and lid when the lid is closed.  Checking position	Check that the end of the lock shaft is caught in the concave for engagement of the lid. If not caught, (1) Remove any foreign matter, which maybe sticking. (2) If the lock shaft return spring is weakened, replace it. (3) If the lock shaft does not move smoothly, apply grease.
2) Check the lock shaft detection switch.  Detection switch  Check the conductivity.	Check the conductivity of the switch when the lid is closed. If no conductivity, (1) Adjust the switch mounting position. (2) If no conductivity is found ever when the lever is pushed, replace the housing set M.
3) Check the lid detection switches. Detection switch 1 Detection switch 2  Between Black 1 and 2  Between White 1 and Black 3 Conductivity checking positions ・Detection switch 1 Between Black 1 and 2 ・Detection switch 2 Between White 1 and Black 3 * Wire Nos. are Indicated on the connectors	Check the conductivity of the switches when the lid is closed. If no conductivity, (1) Adjust the switch mounting position. (2) If no conductivity is found ever when the lever is pushed, replace the housing set DS.

4) Check the housing set.	Check the housing set Y(3751) or (3781), housing set X+U(3751) or D+T(3781) for connection and breakage. If incomplete connection or breakage is found, correct it.
5) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".
6) Trouble with the "PCB set, display"	Replace the "PCB set, display".

(14) Abnormally high pressure (E8 occurs.)

1) Check the items 1) ~ 4) of "No power is supplied to the heater".	If any trouble is found, correct it.
2) Check the adjustment of the pressure sensor.	Enter into the test mode and check the adjusted value. See the page referring to the adjustment of the pressure sensor.
3) Replace the pressure sensor.  	If the test mode can not be corrected, replace the pressure sensor.

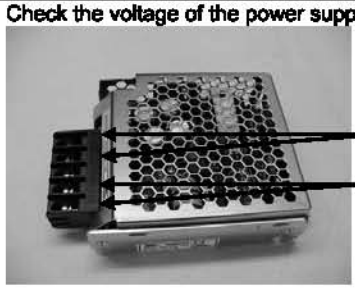
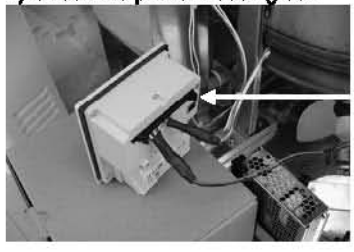
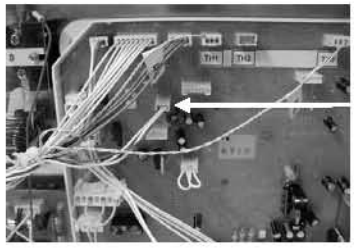
(15) Pressure is low. (E9 occurs.)

1) Check the items 2) and 3) of "Abnormally high pressure".	If any trouble is found, correct it.

(16) Data can not be read from and written in memory. (E10 occurs.)

1) Trouble with the "PCB set, control TH set.	Replace the "PCB set, control TH set".

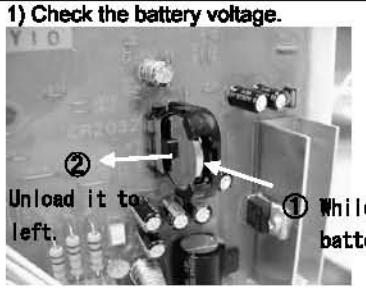
(17) Printing by optional printer is impossible.

Check the voltage of the power supply unit.  	(1) Check the voltage between L and N of the power supply unit. If 100V or 200V is not applied, check the housing set which connects the power supply unit and the product for incomplete connection and wire breakage. (2) Check the voltage between "+V" and "-V" of the power supply unit to make sure that about 5V is outputted. If not, replace the power supply unit.
2) Check the printer housing set.   	Check the printer housing set for connection and breakage. If incomplete connection or breakage is found, correct it.
3) Trouble with the printer.	Replace the printer.
4) Trouble with the"PCB set, control completion"	Replace the the"PCB set, control completion".

(18) No sound Is Issued.

1) Check the sound setting.	If it is set at sound warning mode, change the sound volume to "Loud" or "Medium" to check that the sound is issued, and tell the customer that the sound is not issued in sound warning mode during normal operation.
2) Check the resistance value of the speaker. Checking point by tester 	Check that the resistance value at the both ends of connector is about 8Ω. If short-circuit or wire breakage is found, replace the speaker.
3) Check the housing set.	Check the housing set X+U(3751) or D+T(3781) for incompleted connection and wire breakage. If any trouble is found, correct it.
4) Trouble with the "PCB set, control TH set"	Replace the "PCB set, control TH set".

(19) Date and time are reset.

1) Check the battery voltage.  	Unload the battery and if its voltage is higher than 1.8V, load it. If lower than 1.8V, replace the battery.
2) Trouble with the "PCB set, control TH set	Replace the "PCB set, control TH set".

13. Disassembling Procedure

※ The photos in the figures exemplify the Model MLS-3781L which may differ from the Model MLS-3751L in the number of screws.

⚠ CAUTION

Pull out the plug

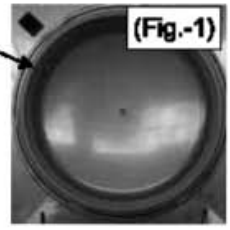
When disassembling and assembling the product, be sure to unplug the power cord from the outlet.

⚠ CAUTION

When disassembling, replacing and assembling the product, pay attention not to get injured by sharp metal edge. Wear

(1) Dismounting the packing of the chamber

① Dismount the packing of the chamber. (Fig.-1)



⚠ CAUTION

Check the coating of adhesive before mounting, apply adhesive (KE-44T) if removed. Apply the adhesive to all over the edge groove. (See Fig.-2) (Drying time: 12 hours)

(2) Dismounting the side panel and back-side panel

① Remove the back-side panel mounting screws (11 pcs.).
(Fig.-3)

② Remove the left side panel mounting screws (6 pcs.).
(Fig.-4)

③ Remove the right side panel mounting screws (9 pcs.).
(Fig.-5)

※"○" shows the screw position.

(3) Dismounting the PC-board assembly for control (Fig.-6)

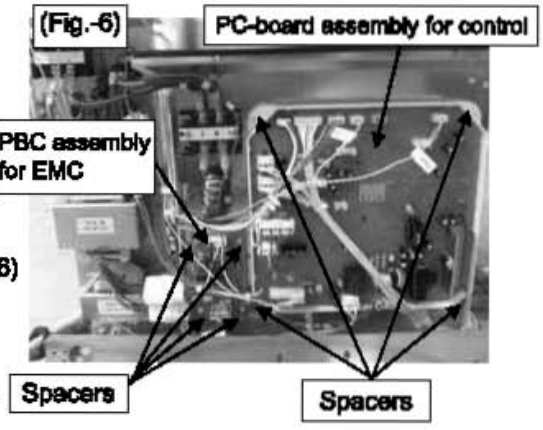
① Disconnect the connectors connected to the PC-board assembly for control.

② Dismount the board from the board mounting spacers.

(4) Dismounting the PCB assembly for EMC (Fig.-6)

① Disconnect the connectors connected to the PCB assembly for EMC.

② Dismount the board from the board mounting spacers.



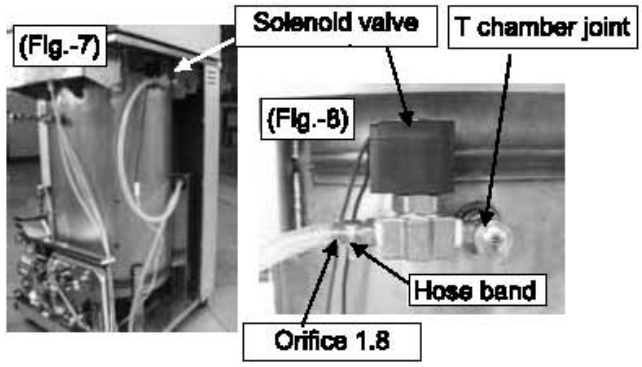
(5) Dismounting the drain valve assembly
(Figs.-7 and -8)

① Disconnect the connectors connected to the drain valve assembly.

② Loosen the hose band and disconnect it.

③ Remove the orifice 1.8 joint.

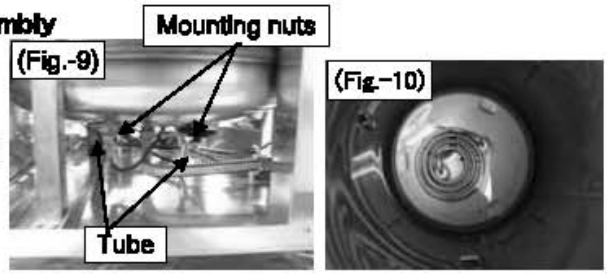
④ Dismount the solenoid valve set together with the T chamber joint.



(6) Dismounting the sheathed heater assembly

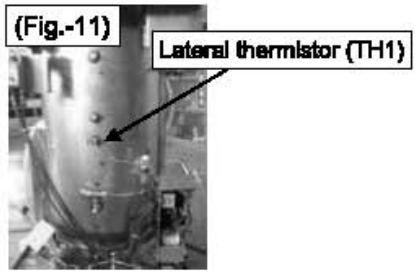
① Turn the tube counterclockwise to move it.

② Remove the heater wires, loosen the mounting nuts and dismount the heater from the chamber. (See Figs.-9 and -10.)



(7) Dismounting the lateral thermistor (TH1)(Fig.-11)

① Loosen the thermistor mounting screws and dismount the thermistor and rubber ring.

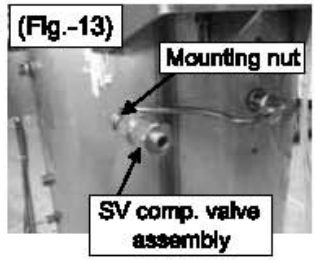


(8) Dismounting the bottom thermistor (TH3) (Fig.-12)

① Loosen the thermistor mounting nuts and dismount the thermistor and rubber ring.

(9) Dismounting the SV comp. valve assembly (Fig.-13)

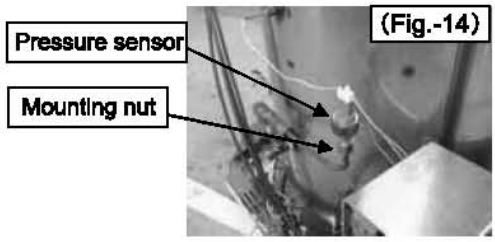
① Loosen the mounting nut to dismount the SV comp. valve assembly.



(10) Dismounting the pressure sensor (Fig-14)

① Cut off the binding band and dismount the connectors from the board.

② Loosen the mounting nut and dismount the pressure sensor.



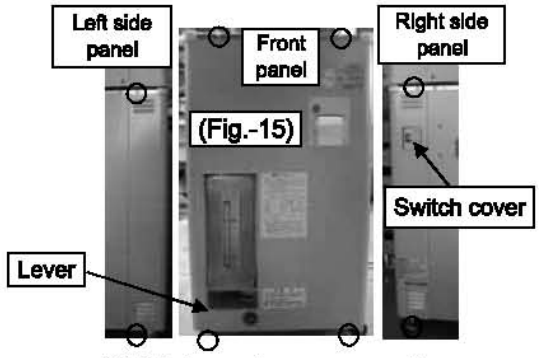
(11) Dismounting the front panel (Fig.-15)

① Make sure that the chamber is not filled with water.

② Turn the lever of the water drain to "Open".

③ Remove the 8 front panel mounting screws.

④ Dismount the front panel, paying attention to the switch cover.

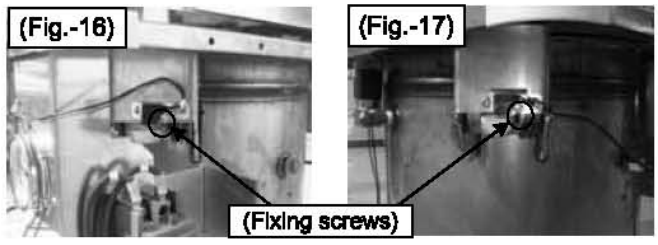


※"○" shows the screw position.

(12) Dismounting the lock shaft switch
(M Housing assembly) (Figs.-16 and -17)

① Disconnect the connectors connected to the switch.
② Remove each 1 screw which fixes the switch.

※When dismounting the switch, pay attention not to allow a tool or finger(s) to hit the actuator of the micro-switch. Otherwise, the

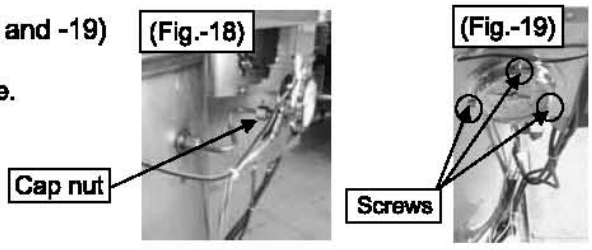


(13) Dismounting the pressure gauge (Figs.-18 and -19)

① Remove the cap nut for piping of the pressure gauge.

② Remove the screws (3 pcs.) which fix the pressure gauge.

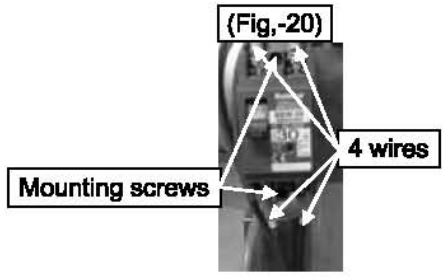
※ Pay attention not to lose the O-ring (P5) which is inserted between the pressure gauge and the pipe. Also, do not tighten the cap nut too much



(14) Dismounting the breaker (Fig.-20)

① Remove the 4 wires.

② Remove the 2 breaker mounting screws.

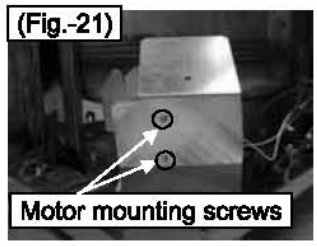


(15) Dismounting the fan motor (Fig.-21)

① Remove the power supply connectors which are connected.

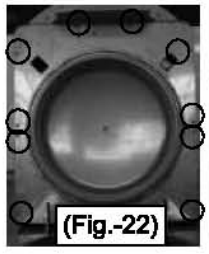
② Remove the 2 motor mounting screws.

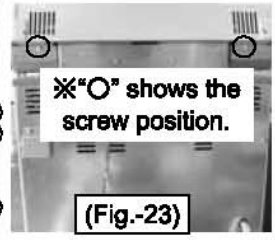
(Fig.-21)



(16) Dismounting the chamber cover plate
(Figs.-22 and -23)

① Remove the 12 cover chamber lid mounting screws.
(2 screws are found at the back side.)


(Fig.-22)

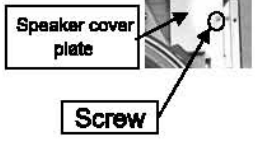


(Fig.-23)

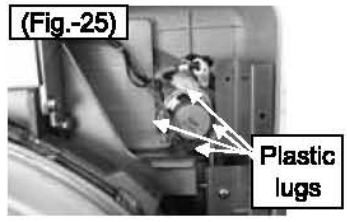
(17) Dismounting the speaker (Figs.-24 and -25)

① Remove the 1 speaker cover plate mounting screw.
② Remove the plastic lugs and dismount the speaker.

(Fig.-24)



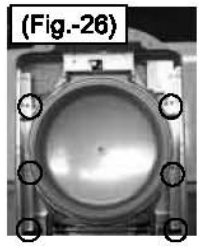
(Fig.-25)



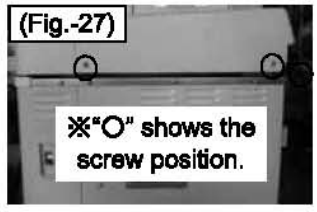
(18) Dismounting the top plate

① Remove the 6 mounting screws at the back side.
(Fig.-26)
② Remove the 4 screws at the both sides. (Fig.-27)

(Fig.-26)



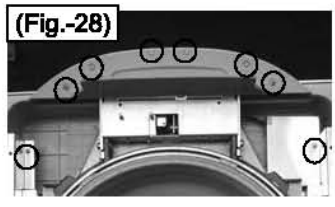
(Fig.-27)

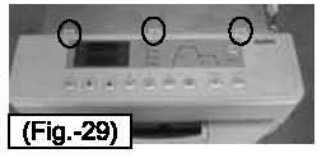


(19) Dismounting the operation body

① Remove the 6 handle cover mounting screws. (Fig.-28)
② Remove the 2 mounting screws at the back side. (Fig.-28)
(The mounting screw at the right side is tightened together with the speaker.)
③ Remove the 3 mounting screws at the top plate side. (Fig.-29)
④ Since the wires are connected, turn them over on the top plate.
⑤ Remove the connectors which are connected.

(Fig.-28)




(Fig.-29)

※"○" shows the screw position.

※ If the body is opened with the wires being connected to it, wires of the speaker, etc. may be broken. Pay attention to the

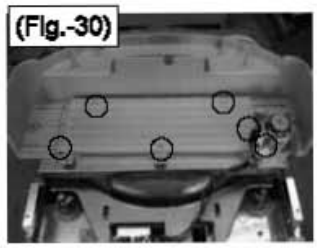
(20) Dismounting the display PC-board assembly

① Remove the 5 board cont. cover plate mounting screws. (Fig.-30)

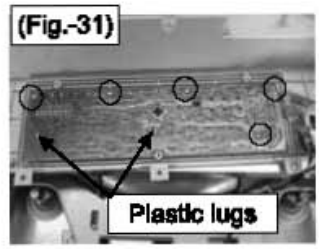
② Remove the 5 display PC-board assembly mounting screws. (Fig.-31)

③ Remove the plastic lugs. (Fig.-31)

(Fig.-30)



(Fig.-31)

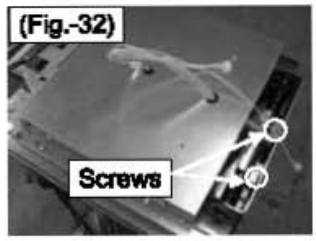


(21) Removing the brake packing

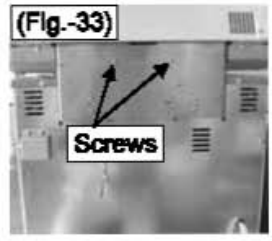
① Remove the 2 brake tightening screws and dismount the brake upper hand bracket. (Fig.-32)

② Loosen and remove the 2 brake mounting screws. (Fig.-33)

(Fig.-32)



(Fig.-33)



(22) Removing the right and left hinge springs

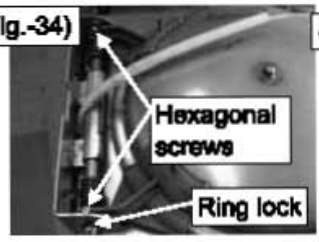
① Remove the hexagonal screws which lock the springs. (See Figs.-34 and 35.)

② Remove the 4 hand bracket spring mounting right and left screws.

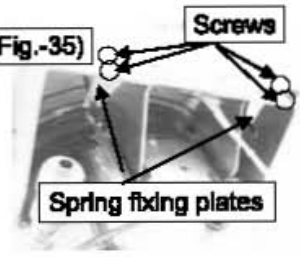
③ Remove the rear shaft lock ring.

④ Fully open the lid and pull out the rear shaft.

(Fig.-34)



(Fig.-35)



(23) Dismounting the solenoid assembly

① Remove the 4 top plate fitting plate mounting screws. (Fig.-36)

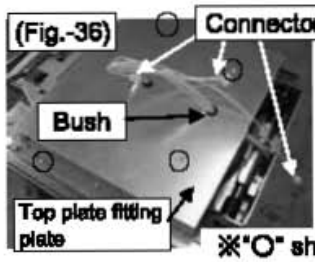
② Pull out the bush from the connector. (Fig.-36)

③ Remove the 2 lock shaft activate plate mounting screws. (Fig.-37)

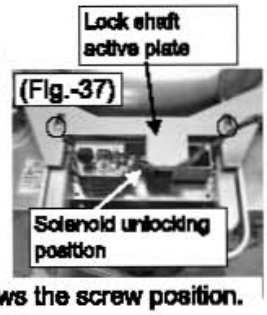
④ Manually unlock the lock shaft and dismount the lock shaft active plate. (Fig.-37)

⑤ Remove the 4 screws at the both sides of the handle support plate assembly. (Fig.-38)

(Fig.-36)



(Fig.-37)



※"O" shows the screw position.

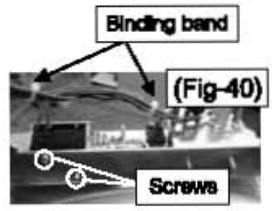
(Fig.-38)

⑥ Remove the 4 solenoid fitting plate mounting screws. (Fig.-39)

⑦ Remove the 2 solenoid mounting screws. (Fig.-40)

⑧ Cut off the binding band. (Fig.40)

※ When dismounting the solenoid manually, pay attention not to allow tool and finger(s) to hit the solenoid switch actuator. Otherwise, the actuator may be removed.



(24) Dismounting the solenoid switch and lid switch (DS housing assembly) (Fig.-41)

① Remove the 1 solenoid switch mounting screw.

② Remove the 2 screws of each of the switch fitting plate.

③ Remove each 1 lid switch mounting screw.

④ Cut off the binding band.

※ When dismounting the solenoid switch and lid switch, pay attention not to allow tool and finger(s) to hit the solenoid switch actuator. Otherwise, the actuator may be removed.