TOP-LOADING AUTOCLAVE

WITH AUTO STEAM EXHAUST & WARMING CYCLES

AT-HA-240MW/300MW

OPERATING MANUAL

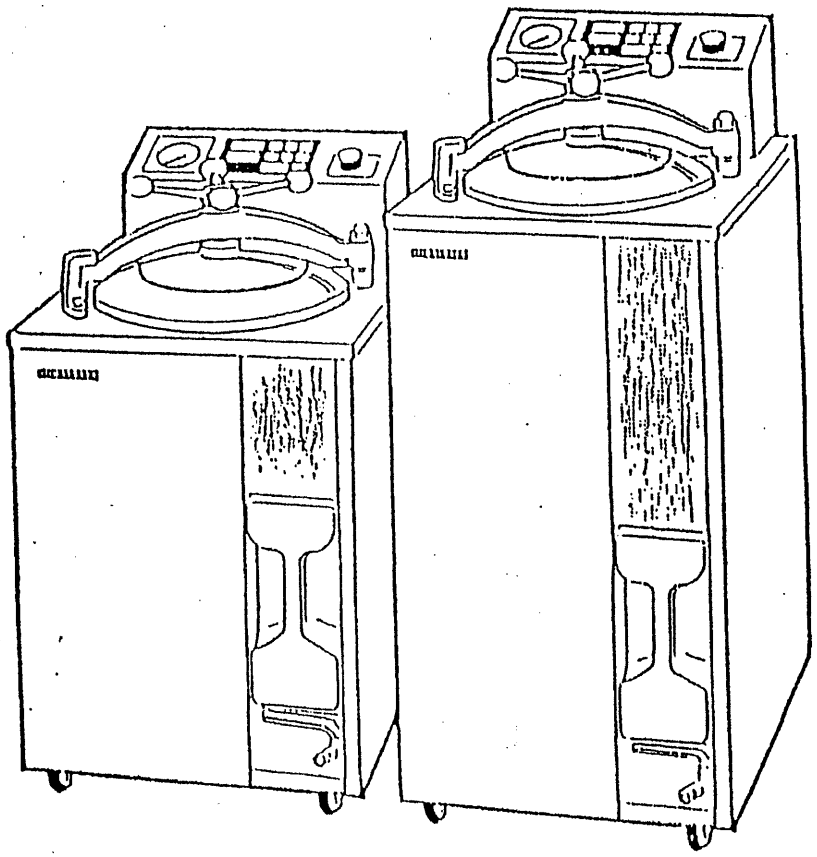
HIRAYAMA

HICLAVE

HA-240MIV/-300MIV *Automatic High Pressure Sterilizer*

Amerex Instruments AT-HA-240MW/300MW

Operation Manual



Please read this manual carefully before commencing actual operation of your HA-240MIV (or HA-300MIV) to ensure its proper use. Keep this manual handy as reference to solve any problems of operation, maintenance and repair.

HIRAYAMA MANUFACTURING CORP.
Supplier of Safe and Reliable Medical-Scientific Equipment

HA-300MW: CONDENSED OPERATING INSTRUCTIONS

1. Plug the power cord into a 120V, 20A electric outlet.

2. Turn on the circuit breaker and the power switch.

3. Fill the chamber with water (tap, distilled, deionized, or RO) until the water level covers the metal strip (by about 1/8") across the middle hole of the round plate in the chamber.

4. Fill the plastic bottle in front of the autoclave with water to or above the minimum level.

5. Make sure that the fine exhaust knob is turned clockwise all the way (closed).

6. Press MODE to access the desired program and set the desired parameters for sterilization temperature (TEMP), sterilization time (STER TIME), and warming temperature (WARM TEMP).

7. Use TEMP, STER TIME, and WARM TEMP buttons plus the up and down arrow buttons to change parameters. For example, to change TEMP, press TEMP and the default value of 121 will flash. Then press the up or down arrow button to change the value and finally store this value by pressing the TEMP button again.

The following five programs are accessible sequentially and cyclically (1,2,3,4,5,1,2....) by pressing the MODE button.

	CONTROL PANEL DISPLAYS			GREEN	
MODE	TEMPERATURE	TIME	LED	LIGHT	PROGRAM
1	121C/50C	15 min	STER	■	Sterilize-->Automatic exhaust-->
			EXHT	■	Post-warming at 50C
			WARM	■	
2	121C/50C	15 min	STER	■	Sterilize-->Natural cooling or
			EXHT	❑	manual exhaust-->Post-warming
			WARM	■	at 50C
3		20 min	STER	■	Sterilize-->Automatic exhaust
			EXHT	■	
			WARM	❑	
4		20 min	STER	■	Sterilize-->natural cooling or
			EXHT	❑	manual exhaust
			WARM	❑	
5	50C		STER	❑	Pre-warm at 50C
			EXHT	❑	
			WARM	■	

NOTE: For liquids, MODES 1 and 3 are preferred over MODES 2 and 4.

HA-240M IV /300M IV Operation Manual

Introduction

We thank you very much for selecting our Automatic High Pressure Sterilizer 'Personal Clave' HA-240MIV/-300MIV.

This operation manual contains information for the proper operation of the HA-240M IV /-300MIV and a simple description of its upkeep and periodical maintenance.

When your HA-240MIV /-300M IV is delivered to you, please make sure no parts or components are missing, and check that no damage was caused during transportation. Should you find any discrepancy, please contact the dealer from whom you purchased this machine.

Hirayama Manufacturing Corporation develops and perfects its product on a continuous basis. For this reason you may find that some of the latest improvements to the actual product may be missing from this manual.

Contents

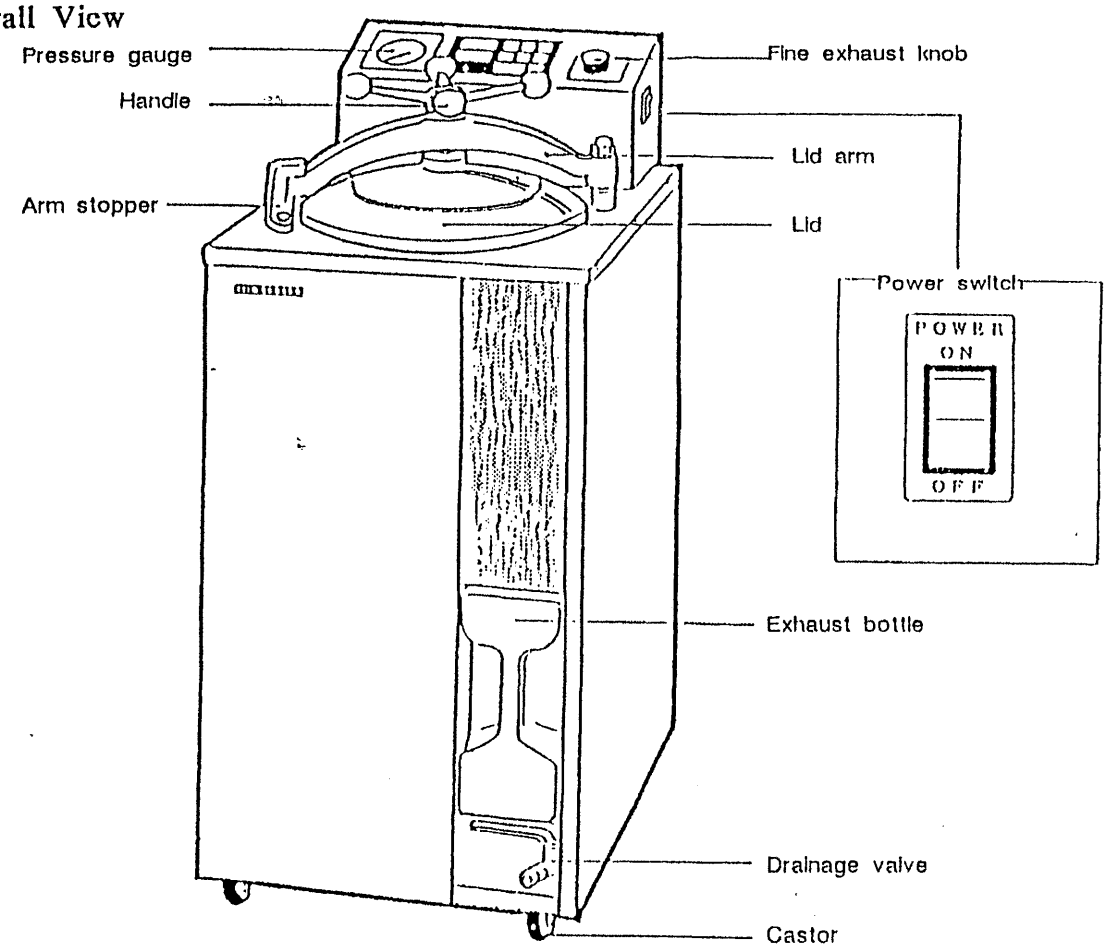
Specifications

Model:	HA-240M II	HA-300M II
Outer dimensions	385(w) x 845(h) x 485(d)mm	440(w) x 1070(h) x 5200(d)mm
Effective chamber size	240 ϕ x 450(d)mm (effective capacity 20 ℓ)	300 ϕ x 670(d)mm (effective capacity 47 ℓ)
Power requirements	AC 100/115/120/200/220/230V 50/60 Hz ※	
Power consumption	1.5KW (15A)	2.0KW (20A)
Weight	43kgs.	62kgs.
Chamber type	Simple pressure chamber	Small pressure chamber
Chamber material	SUS304 stainless steel	
Ster. temp. range	105~126℃ (variable, temp. preset by one-touch action)	
Heat temp. range	45~80℃ (variable, temp. preset by one-touch action)	
Safety valve pressure	1.6kg/cm^{2}G	
Timer	Digital, range 1 to 999 min.; Remaining duration indicated (applicable in continuous operation)	
Thermometer	Digital display, 15 to 127℃ (below 14℃, indicated by a symbol 'Lo')	
Pressure gauge	0~4kg/cm^{2}G	
Safety alarm devices	Pressure safety valve, Excess pressure prevention switch, Excess current breaker, Lack-of-water prevention device; Error indications (Insufficient-water heating, Wire disconnection in sensor, Excessive heating/cooling/pressure, Abnormality in heater)	
Accessories	Exhaust bottle (1) Bottom plate (1) Grounding adaptor (1) Drainage hose (1)	Exhaust bottle (1) Bottom plate (1) Drainage hose (1)

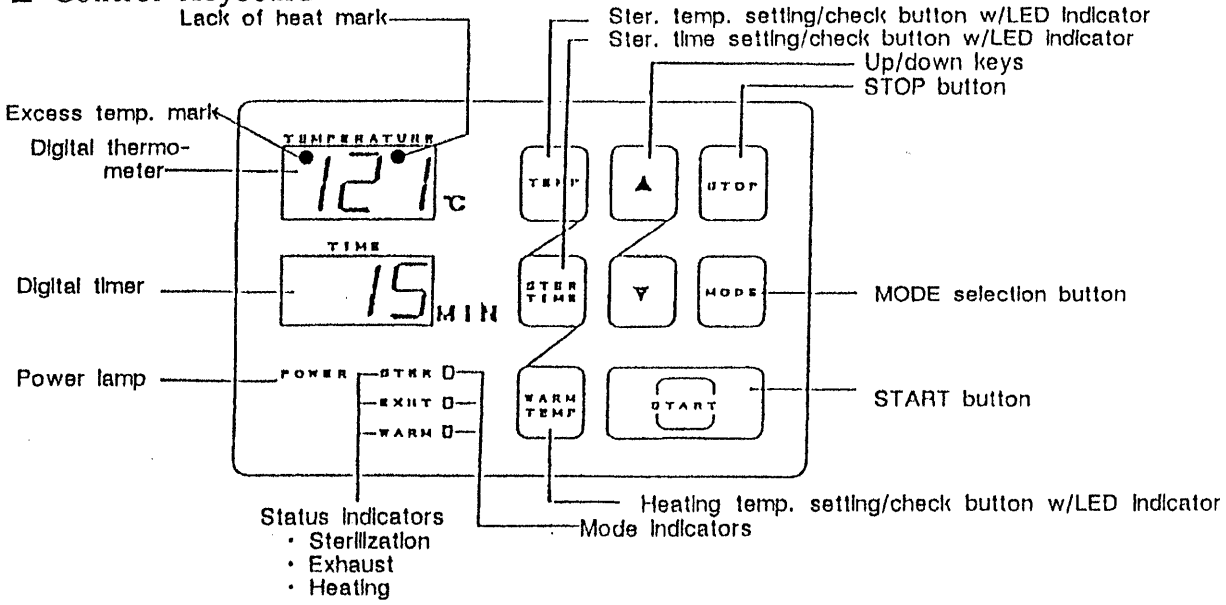
※ Voltage, pressure and temperature may vary depending on the country and user requirement. Please refer to order for voltage/temperature specification.

Nomenclature

■ Overall View

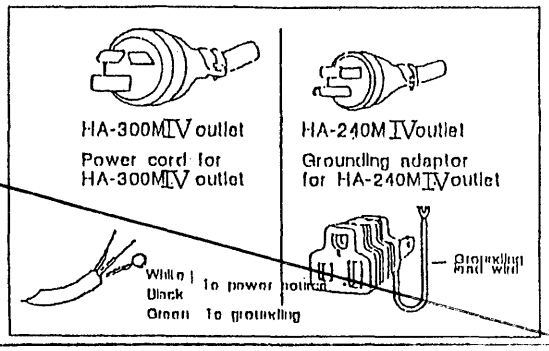


■ Control Keyboard

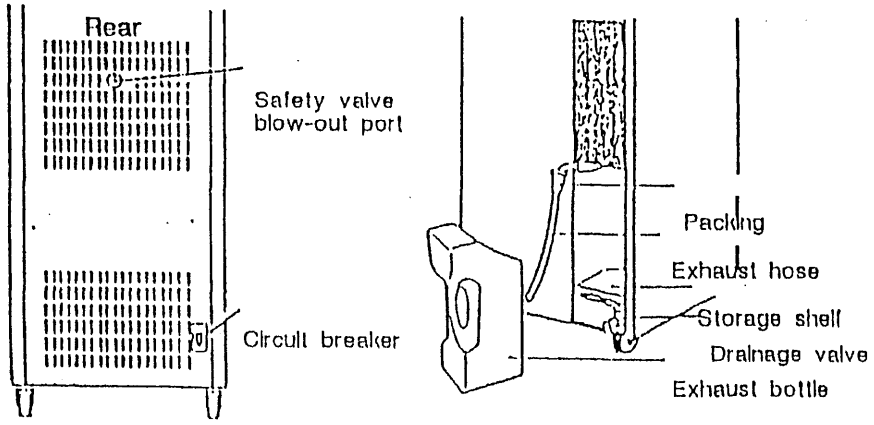


Installation

1. Install your unit on a level and solid floor where water doesn't splash or humidity is not high.
2. Allow enough clearance at the back of the unit to avoid eventual blocking of ventilation holes.
3. Keep sunlight away from directly hitting the key pad panel. It would make lamp indicators difficult to see.
4. Connect the power cord to the outlet of required power rating as follows.
   1) HA-240M Ⅳ : Power cord plug should be connected to the outlet w/grounding terminal (200VAC 20A or over) used only for this purpose.
   2) HA-300M Ⅳ: Connection to the dedicated outlet w/grounding (200VAC 20A or over)
5. Make sure to separately ground if the outlet is not provided with a grounding terminal.
   1) HA-240M Ⅳ : First connect the furnished grounding adaptor to the outlet, and use the grounding lead wire coming from the adaptor for sure grounding.
   2) HA-300M Ⅳ : Detach the power plug, and ground the green wire (for grounding).



6. Supply water in the exhaust bottle until it reaches the LOW level (minimum water level). Put the exhaust hose in it, and surely push in its packing end. Then mount it on the main unit's storage shelf. During this procedure, make sure that the exhaust hose is not bent.
7. Confirm that the exhaust valve in the front, lower portion of the unit, is closed.
8. Set the circuit breaker (CB, located in the back, lower portion of the unit) to upper ON position.



Operations

* Simple procedures (For further details, refer to each related page.)

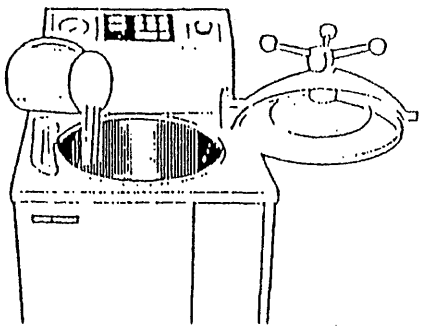
Water supply	· Page 4 ... Supply water in chamber from above until it fills the center of the bottom plate. (2 ℓ for 300MIV & 1.5 ℓ for 240MIV)
↓ ↓	
Placing objects	· Page 5 ... Place objects in chamber for sterilization, and turn the handle to close the lid. (After the handle turning gets tight, further turn 3/4~1 turn.)
↓ ↓	
Power ON	· Page 5 ... Set the circuit breaker and power switch to ON. (Close the drainage valve. Check the exhaust bottle water level.)
↓ ↓	
Mode selection	· Page 5,6 ... Select a desired mode using the mode switch. (Change of preset value) (Three modes are available: "STER + Warming", "STER only" and "Warm only". Make sure of the set mode.)
↓ ↓	
Operation starts	· Page 7 ... Push the "START" button. Lighting of status indicator shows the operation under way. (Confirm "STER", "WARM" indicator.)
↓ ↓	
Auto operation	· Page 7 ... Termination is advised by "END" indication and an electronic sound (beep, beep, beep).
↓ ↓	
Auto stop	· Page 7 ... During warming mode operation, objects may be taken out after pushing the "STOP" button.
↓ ↓	
End	· Page 7 ... Push "STOP" button, and confirm that the pressure has returned to 0MPa. Then remove objects. (Continuously press the "STOP" button for more than 0.5 secs.)

1. Water supply

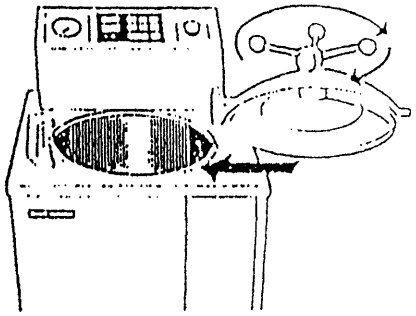
1) Turn the handle counterclockwise until the lid is perfectly loose. Then slide it horizontally to allow for water supply as illustrated.

2) Confirm that the fine exhaust knob in the operation box and the drainage valve in the front lower portion are close.

3) Supply water in the chamber. If water comes up to the metal strip across the center hole, sufficient water has been added.
(It is necessary to supply 2 ℓ of water for HAM-300MIV, and more than 1.5 ℓ for 240MIV.)



2. Object placement



1) Place objects in chamber for sterilization, and turn the lid clockwise until the arm hits the arm stopper.

2) Slowly turn the handle clockwise. As its turning gets tight, additionally give 3/4 ~ 1 turn for firm tightening. Gasket life is two to three years under normal condition. Don't tighten the lid too much, otherwise the life may be shortened.

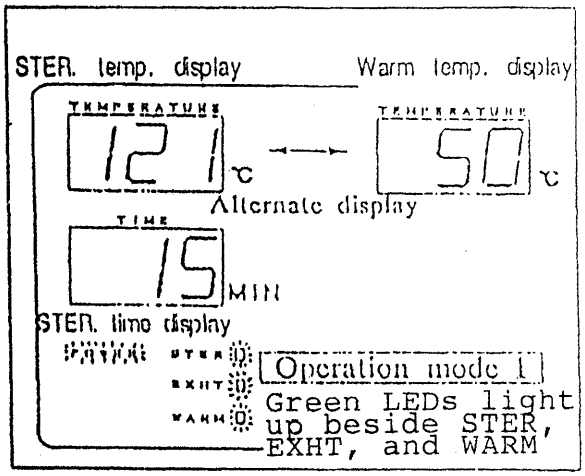
3. Power switch "ON"

1) Turn on the power switch on the right side of the main unit. Power lamp (POWER) and mode indicator are lit, and preset values are digitally shown on the temp./time indicators.

4. Mode (Program) selection

1) Five canned programs (see Table below) indicated by green LED lamps are stored in the built-in microprocessor.
Push the MODE button to select a desired mode.

2) Mode 1 is the default mode. Press the MODE button to select sequentially and cyclically modes 2, 3, 4, 5, 1,....



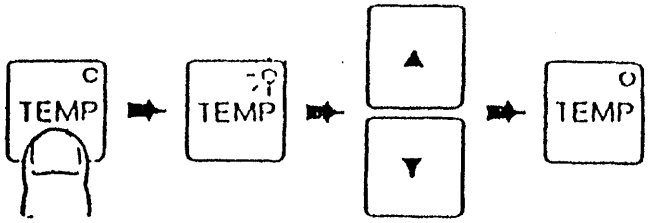
Operation mode	Process	Set value: Sterilizing temperature	Set value: Sterilizing time	Set value: Warming temperature	Mode lamp lighted green
1	Sterilization → Slow pulse exhaust; Warming cycle (Up to max 20 hours)	121 degrees C	15 minutes	50 degrees C	STER, EXHT, WARM
2	Sterilization → Natural cooling; Warming cycle (Up to max 20 hours)	121 degrees C	15 minutes	50 degrees C	STER, EXHT, WARM
3	Sterilization → Slow pulse exhaust	121 degrees C	20 minutes		STER, EXHT, WARM
4	Sterilization → Natural cooling	121 degrees C	20 minutes		STER, EXHT, WARM
5	Warming			50 degrees C	STER, EXHT, WARM

5. Change of preset default parameters

1) Changing temperature (STER. temp., Warm temp.)

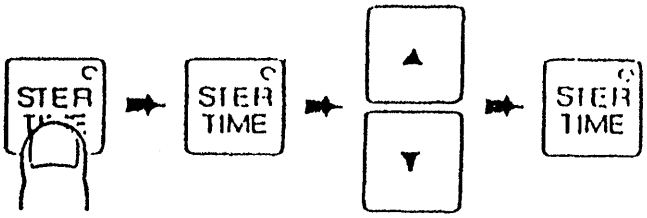
① Push Ster. temp. setting/check (TEMP) or (WARM TEMP) button. Red LED at the above right of each button lights up while the temperature indication blinks, advising that parameter change is now available.
② Change the value by Up/down keys (▲▼). Each single push permits to raise or lower STER. temp. (TEMP) in the range of 105~126℃, and Warming temperature (WARM TEMP) in 45~80℃, respectively in 1℃ increments.

Continued pressing raises or lowers the temperature value in 10℃ increments, and if it reaches upper (or lower) limit, the indication returns to the lower (or upper) limit.
③ After changing to a desired value, push TEMP or WARM TEMP button once again. The new value is entered, red LED goes off, and the temperature indication ceases blinking to light. Renewed presetting thus is over.



2) Changing time (sterilization time - STER. TIME)

① Push Ster. time setting/check (STER TIME) button. Red LED at the above right of the button lights up while the time indication blinks, advising that parameter change is now available.
② Change the value by Up/down keys (▲▼). Each single push permits to increase or decrease the time in the range of 1~999 min. and 'con' (continuous operation) in 1 min. increments. Continued pressing increases or decreases it in units of 10 min., and if it reaches upper (or lower) limit, the indication returns to the lower (or upper) limit.
③ After changing to a desired value, push STER TIME button once again. The new value is entered, red LED goes off, and the time indication ceases blinking to light.



④ Maximum warm time is fixed at 20hrs. During this period, however, sterilized objects can be taken out whenever necessary.

Note

① **Any change in temperature and time from the default values is stored in the memory module of the microprocessor, even when the power switch is turned off. However, the new values will be lost if there is a power failure or if the power cord is disconnected. In these cases, just reprogram from the default values again.**

6. Operation start

1) Reconfirm that the fine exhaust knob and the drainage valve in the lower portion of main unit are firmly close, and then push START button to commence operation.
2) STER indicator blinks, the temperature digital indicator is switched to chamber temperature indication (starting 15℃, and Lo indication if it goes below 14℃). Time indicator goes off. It is the sign of operation start.

3) Hereafter the unit is automatically operated.

Note

① Where it is required to check the preset temperature/time during operation, push TEMP, STER TIME or WARM TEMP button.
② Red LED (right above of each button) lights, and the preset value indication blinks for approx. 5 secs.
* Change of preset value unavailable

7. End of automatic operation

· When the entire cycle of each operation mode is finished, an electronic beep alarm sounds three times, informing that all the steps are over.

Note

① Objects can be taken out from the chamber during automatic operation, but before removal, make sure that the chamber pressure is lowered to 0MPa.

· After confirming that the chamber pressure is lowered to 0MPa, loosen the handle to open the lid. Then take out sterilized objects.
· After operation, turn off the power switch (POWER), and disconnect power cord.

Note

① For continued operation, check the water level in the chamber.
② After the day's use, make sure to switch main unit to OFF, if applicable. If the unit is not to be used for an extended period, set the circuit breaker (CB) in the lower portion on the rear of main unit to OFF. Chamber water should also be drained.
③ If the circuit breaker is turned off, the operation mode, temperature and time pre-registered by you are deleted.

Precautionary Notes during Usage

1. Power switch OFF

① After the day's use, be sure to switch power off. If the unit is not to be used for an extended period, set the circuit breaker (CB) (lower, rear of main unit) to OFF.
② If the displays differ from the expected one in each process, turn the circuit breaker to OFF, and restart the operations. Should some condition persist, switch power off, and contact the dealer or service station for repair.

2. Sudden power interruption during a cycle

① If the power is turned off due to power failure or cord breakage, the cycle is interrupted, and the temperature time indication returns to the initial value (Operation Mode 1), that is, the state prior to pushing the START button. To continue, you have to start from the beginning again.
② Should a stand-by condition occur due to power failure or cord disconnection, the reset values of temperature and time returns to the initial ones (the values preset in factory with the circuit breaker turned on; state of Operation Mode 1).

3. When sterilizing liquids

① In sterilizing liquids including medicines, set the timer for a longer period, depending on volume of liquid sterilized. (Refer to the temperature · time curves shown in the graph below.)

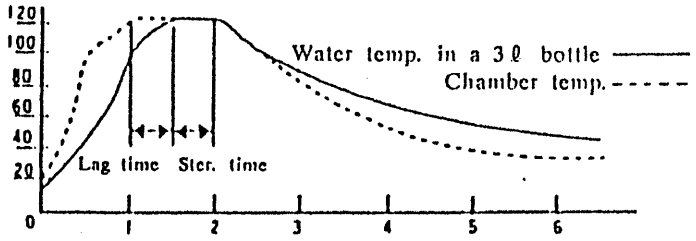
Time set on the timer = Required sterilization time + Lag time

For instance: If 3 liters of water is put in a flask, take notice that a lag time of 30 min. takes place between the time when the chamber temperature reaches the sterilization temperature and when the temperature of water (in the flask) gets to the same temperature. The lag time for a given volume of liquid also depends on the vessel(s) holding it. The lag time for 3 liters in a flask is longer than for 3 liters in 10 smaller flasks. This is because of the larger exposed surface area of the 10 smaller flasks. If prolonged exposure causes deterioration of the liquid, please determine the shortest time necessary to affect complete sterilization by testing the sample after sterilization. Sterilization at a higher temperature may also be considered for reducing sterilization time.

② It is best to use the program with auto steam exhaust.

③ Where a liquid object is taken out after sterilization, it takes a fairly long time before the liquid temperature in the container is lowered. Remember it to avoid being scalded.

4. Lag times here are approximate, depending on nature of container(s). They can be shortened by operating at 123 or 126°C.



Temp.·time curve in liquid sterilization
(Reference example: Room temp. 13°C)

Lag time reference value
(per container)

Liquid vol.	Lag time
3 liters	30 min.
2 "	25 "
1 "	20 "
500cc	15 "

4. Interruption of operation

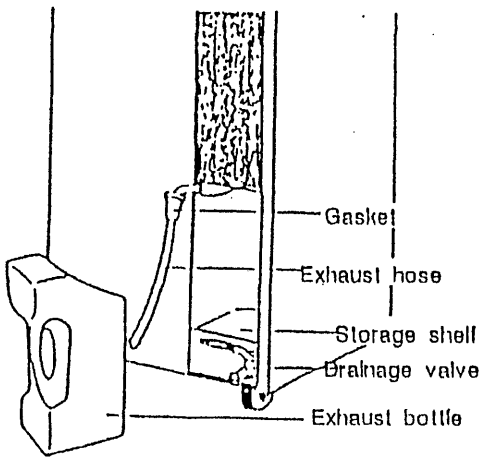
① To intentionally stop operation (that is under way in each operation mode), push the STOP button. The cycle is interrupted to be in the state of stand-by.
* For prevention of erroneous operation, the STOP button is designed so that it activates only when continuously pushed for more than 0.5 secs.
② When opening the lid after interrupting operation, first make sure that the chamber pressure is lowered to 0MPa observing the pressure gauge. Meanwhile, if pressure is still high, turn the fine exhaust knob to release the chamber pressure until it goes down to 0MPa , and then manipulate the handle.

5. Cautions against high temperature/pressure

① The lid and arm are very hot during operation and immediately after. Don't touch them directly with your hand to avoid being scalded.
② During the process of sterilization when the chamber is pressurized, never open the lid and the drainage valve (front in the lower portion). Hot water and steam would be expelled, leading to extreme danger. Where pressure is still high, always confirm 0 reading of pressure gauge before proceeding to next step. Especially when opening the drainage valve, the chamber should be sufficiently cooled.

6. Drainage

① Never turn the drainage valve while sterilization is under way or chamber pressure is high. Eventual gushing of hot water is very dangerous.
② After the chamber being sufficiently cooled, drain according to the following steps:
• First open the lid to make chamber pressure return to atmospheric pressure.
• Attach the furnished drainage hose to the end of drainage valve.
• Put the end of hose in a receptacle, and drain by turning the lever of drainage valve in the direction of OPEN.
③ After completing the day's job, be sure to drain the chamber so that longer life of chamber and heater is assured.



7. Draining the exhaust bottle

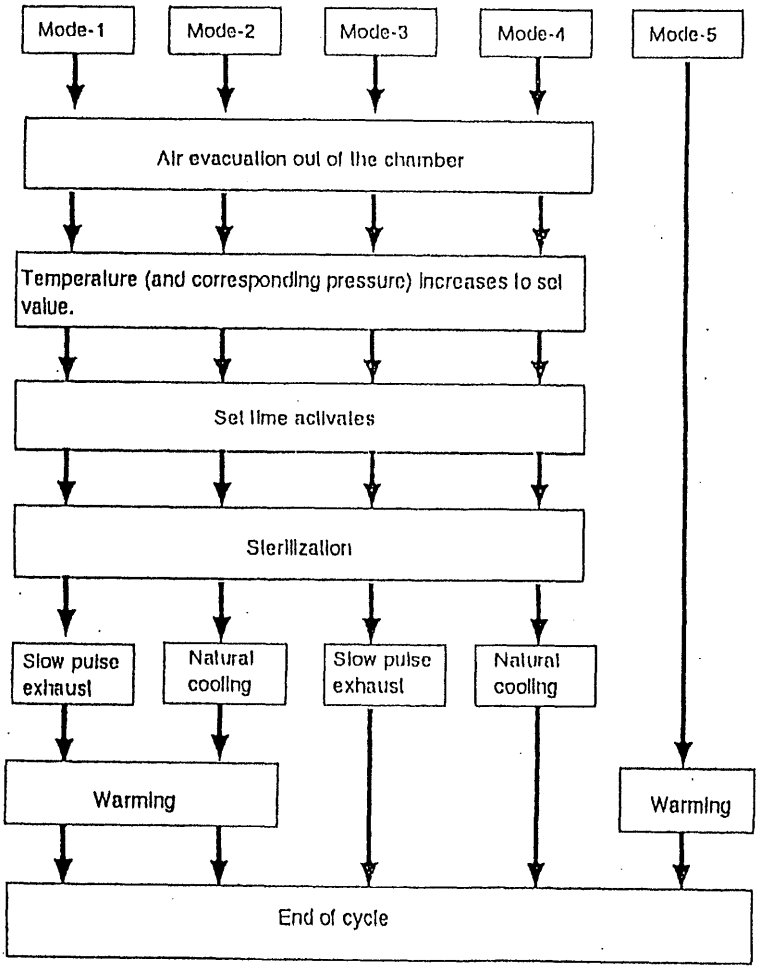
① The water level of exhaust bottle is raised by drainage. If it reaches HIGH level (maximum water level), empty the bottle and supply new water up to LOW level (minimum level). A due care should be taken when detaching the bottle because an exhaust hose is connected to it.
② Water should be first supplied up to the LOW level (minimum water level) of exhaust bottle, that serves to cool hot steam. Connect an exhaust hose to the bottle, and put the exhaust port (main unit) into the gasket section (of hose). And then set the bottle on the storage shelf. While storing it, pay attention to the exhaust hose not being bent. Should the packing section be detached, steam would enter the main unit, causing malfunction.

8. Lid gasket (PAT) and Lid tightening

① When opening or closing the lid, turn the handle counterclockwise, and fully lift it as far as it goes. Care should be taken so that the lid gasket doesn't touch the chamber to avoid scratches on it.
② The gasket attached to the lid is of a pressure adaptive closure type (patented construction), being moded of silicone rubber. As chamber pressure increases, the gasket adheres more tightly. According if the lid is too much tightened, it can adversely affect the gasket's adhering effect, further, facilitating earlier deterioration. Make sure not to tighten the handle excessively.
③ As this is a rubber product, should it deteriorate with age or be broken, replace it with a new one. (For gasket replacement, refer to the page of maintenance.)

Operation mode

The following automatic cycles will proceed according to your selection of each operation mode.

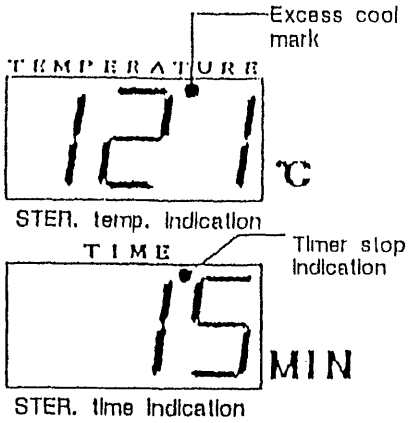


Note

① Presetting of warming time is not available. (Fixed at 20 hrs.)
② To preset warming temperature in modes 1 and 3, refer to ⟨5. Change of preset value⟩ on p.5.
③ In Operation mode 3 as well, sterilization water is required. Never warm without water.

1. Sterilization cycle ... Common to Operation Mode 1 and 2

· If air is left in chamber, uniformity of chamber temperature distribution is lost, putting obstacles in proper temperature increase (sterilization). Microprocessor-controlled air evacuation solenoid valve serves to eliminate air almost 100%.
· Increase sterilization temperature/pressure until they reach preset values.
· If the desired temperature/pressure are reached, the preset sterilization time is digitally indicated, simultaneously activating the timer.
· Sterilization indicator lights up from blinking.
· During the preset sterilization period, temperature and pressure are kept constant.
· If the chamber temperature lowers 1℃ or more than the preset value due to some abnormal condition, the excess cool mark of digital thermometer lights, stopping the activation of digital timer. When the preset temperature is regained, the timer starts counting.
· During the cycle of sterilization, the digital timer indicates the remaining time. To confirm the preset time, refer to the note of ⟨6. Operation start⟩.
· When the predetermined sterilization time passes, the built-in electronic alarm sounds "beep", and the time indicator shows "0". STER indicator goes off, telling the end of sterilization.

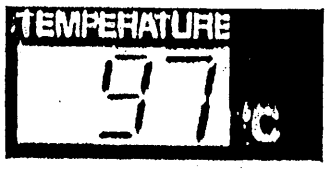


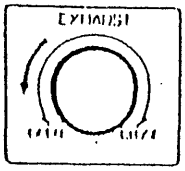
2. Warming cycle ... Operation mode 1

· When the auto STER. cycle comes to end, WARM indicator blinks. The chamber is cooled in a natural manner.
· Reaching the present temperature is advised by an electronic alarm "beep, beep" sound. WARM indicator lights up from blinking, and the warming process starts.
· When the warming period (fixed at 20 hrs.) is over, "END" is indicated on the digital thermometer.
* While in warming, sterilized objects can be taken out at any time.

3. Natural cooling cycle ... Operation mode 2

· Wait for natural cooling until the chamber temperature lowers to 97℃ (chamber pressure 0MPa).
· At 97℃, the digital thermometer shows "END".





Note

If you feel anxious about breakage or spilling over of medical fluid or objects placed in a sealed bag when sterilizing them and decreasing pressure immediately after sterilization, use the fine exhaust knob for gradual pressure decreasing. Minutely turn the knob for this purpose.

4. Warming cycle ... Operation mode 3

· WARM indicator blinks. Chamber is heated or cooled in a natural way until the preset temperature is reached.

· At the preset temperature, WARM indicator lights up from blinking.

· At the termination of warming period (fixed at 20 hrs.), "END" is indicated on the temperature display.

5. End cycle ... Common to Operation modes 1, 2 and 3

· When all the steps of each operation mode come to end, three times of beep sound is given by the electronic alarm. It means the completion of all the steps.

Note

Removal of sterilized objects is possible. Take them out after confirming that the chamber pressure has lowered to 0MPa.

Maintenance

1. Error detection/alarm

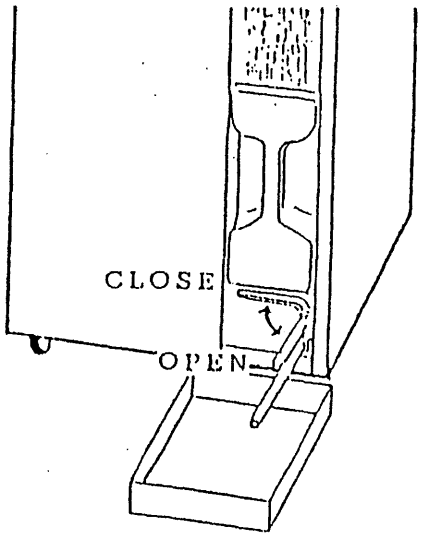
Should any abnormality be caused in this unit, the error detection circuit activates to automatically take appropriate measures for safety. The error is indicated on the digital thermometer, simultaneously informing you of abnormality by electronic alarm sounding.

Error display	Details of abnormality	Measures
ER 1 (Insuff. water heating)	Heating with insufficient sterilization water	Stop of electricity to heater circuit; Informed by electronic alarm
ER 2 (Sensor disconnection)	Wire disconnection in sensor sterilization water	Stop of electric to heater circuit Informed by electronic alarm
ER 3 (Excess heat alarm)	If chamber temperature rises over 128℃; If preset temp. + 5℃ or over continues for 10 secs. during ster. cycle; If preset temp. + 10℃ or over continues for 5 secs. during warming cycle;	Stop of electric to heater circuit Informed by electronic alarm
ER 4 (Excess cool alarm)	102℃ or over continues for 10 secs. during ster. process	Stop of electric to heater circuit Informed by electronic alarm
ER 5 (Excess pressure alarm)	0.16MPa continues in chamber pressure for 15 secs.	Stop of electric to heater circuit Informed by electronic alarm
ER 9 (Defective ster. heater alarm)	If chamber temperature doesn't rise more than 2℃ in 15 min. after start; If ster. temp. is not reached in the chamber in 1.5 hrs. after start	Stop of electric to heater circuit Informed by electronic alarm

1) Where advised of error, check the error number and turn power off.
2) If pressure still remains in chamber in the event of Er 1 (insufficient water heating), open the fine exhaust knob (EXHAUST) for air evacuation. When the pressure lowers completely to 0MPa, open the lid. Wait for the heater being cooled, and supply water. Then start operation from the beginning.
3) In case of other errors, contact the dealer from whom your unit was purchased, or Hirayama Manufacturing Corp.
When asking for repair, make sure to provide the following information: ① Model/manufacturing No., ② Problem part and symptom, ③ Number of days in use (since purchase date) and ④ Condition of operation.

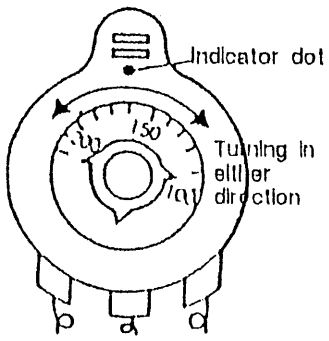
2. Chamber drainage/cleaning

① Always keep the chamber clean. When the day's assignment is over, make sure to drain the chamber, that helps avoiding clogging in the pipings. As it is still very hot immediately after usage, wait for sufficient cooling and drain it.
② Connect the furnished hose to the end of the drainage valve (in the lower portion of main unit - under the drainage bottle), and put the other end of hose in a receptacle. Turn the lever of drainage valve in the direction of "OPEN" for drainage.
* Drainage should be done after confirming that the chamber pressure decreased to 0MPa and with the lid open.
③ After drainage, turn the lever of drainage valve to "CLOSE" (to the machine) and tightly close it. If it is not completely closed, hot water may gush out; it's dangerous. In this case, the alarm sound of insufficient water heating is issued.
④ Where the chamber bottom or heater surface is stained, clean it with a soft brush while flushing water. (A dedicated chamber cleaning solution is available from Hirayama Manufacturing Corp. Contact your dealer.)
A delicate thermo sensor is attached to the heater. Due care should be taken not to damage it.



3. Insufficient water heating prevention device

① Should the chamber be heated with insufficient water, the electronic alarm sounds continuously and "Er 1" is indicated on the digital thermometer. Turn off the power switch, and open the lid. Prior to next use, supply water after the chamber (heater) being cooled.
② The thermal sensor unit of insufficient water prevention device is directly connected to the surface of heater. Maximum usable temperature of this autoclave is 126℃. If chamber temperature gets abnormally high due to heating with insufficient water, this device triggers to interrupt the heater circuit.

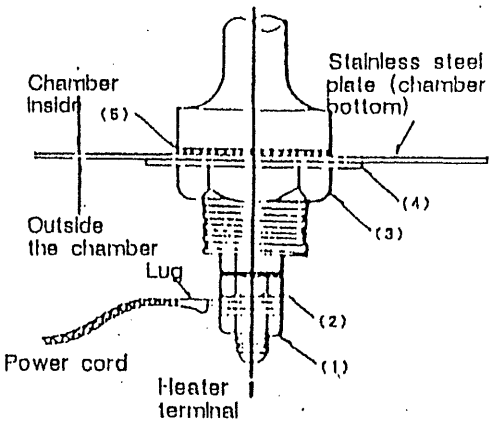


* Insufficient water heating prevention device attached on the distributor panel

③ Before being shipped from the factory, this device is adjusted so that it activates at 160℃. If any external factor altered its trigger temperature to below 160℃ (110℃, for instance), the prevention device results in activating at the maladjusted temperature (that is, when the heater surface reaches 110 ℃), thereby interrupting the heater circuit together with continued electronic alarm sound.
④ If the insufficient water prevention device operates at the preset sterilizing temperature or below, open the rear panel. And the device is accessible for adjustment. Turn the adjustment knob slightly clockwise so that the 160℃ indication is aligned with the indicator dot.

4. Heater replacement

① Drain the chamber, and detach the exhaust bottle from the main unit. Lay the unit on one side.
② Loosen nut (1) to disconnect the power cord lug (2), then screw out the larger diameter nut (3).
③ Take the heater assembly out of the inside of the chamber while pushing the heater terminal into the chamber.
④ After removing heater, clean the area around the attachment hole. Wipe off dirt such as fur and scale if any.
⑤ Remove nut (3) and metal washer (4) attached to a new heater, and put its terminal through the opening (from the chamber side). Be sure to check that washer (5) is in place and not defective.
⑥ Put metal washer (4) and tighten nut (3) securely.

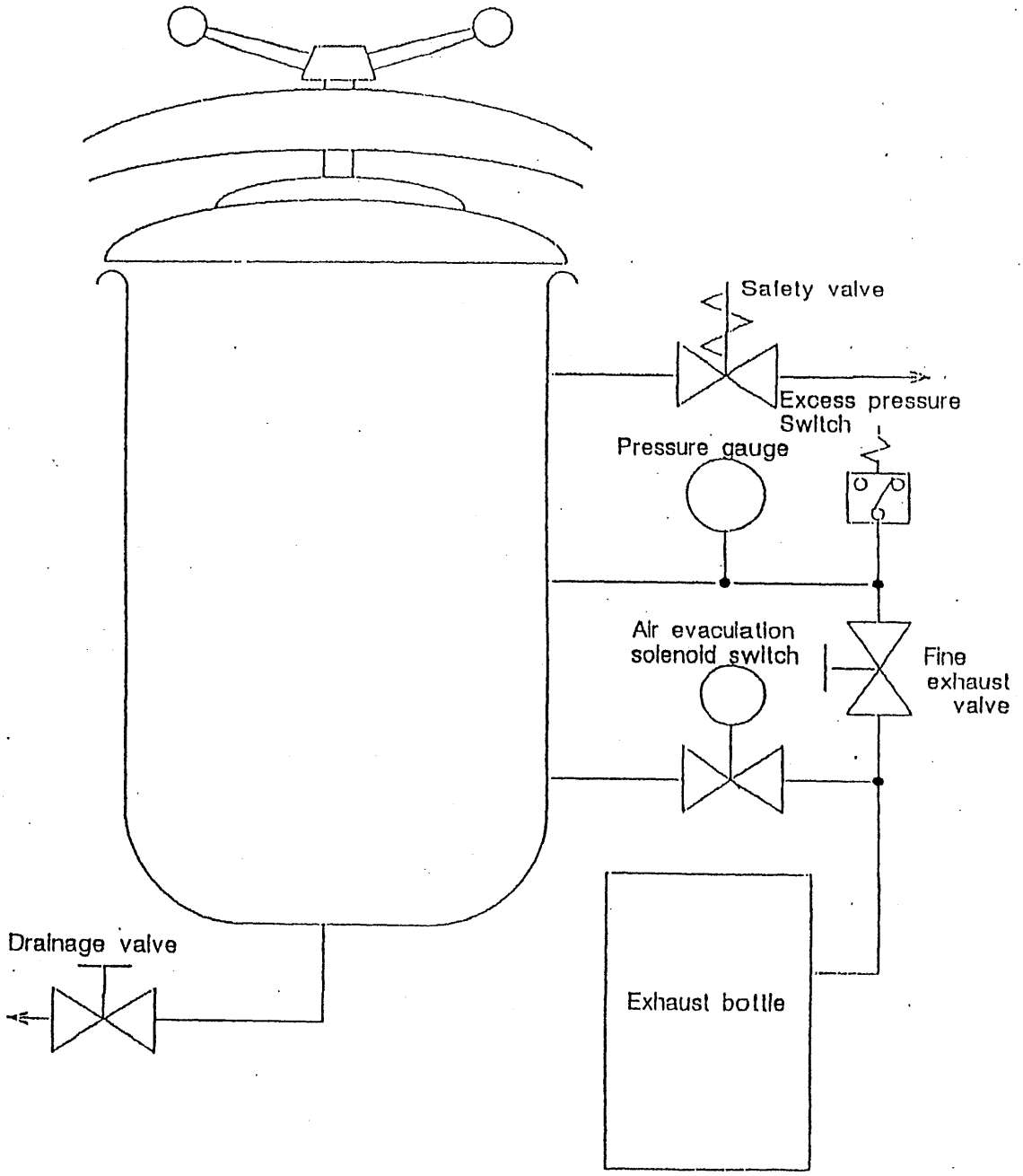


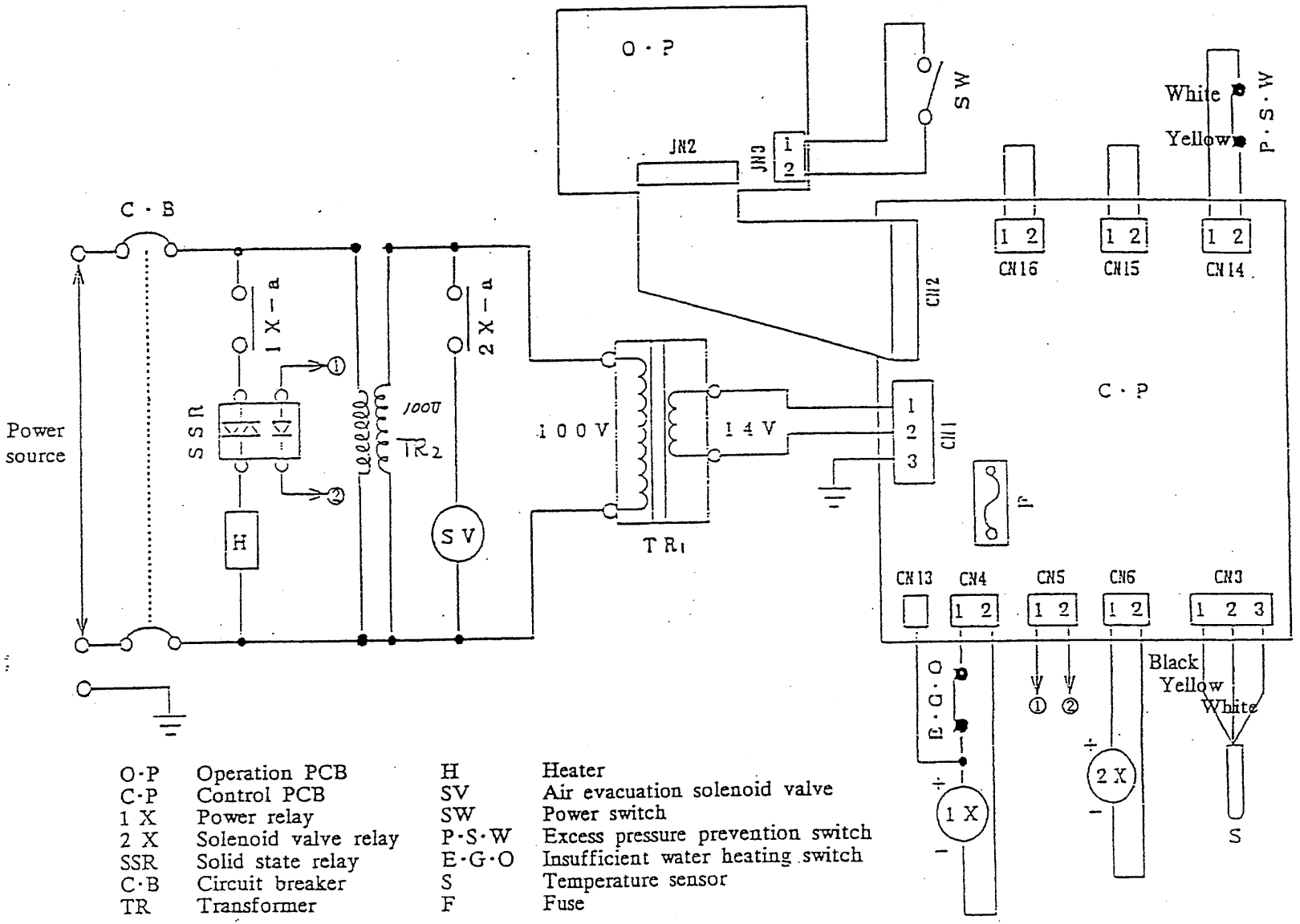
⑦ Remove nut (1), insert the lug, then tighten the nut (1).
⑧ Precautions when changing the heater:
· When replacing the heater, handle new heater with great care not to damage it because the heater incorporates a sensor for insufficient water prevention device (rod-shape material curled around the heater element).
· Tighten nut (3) securely. Insufficient tightening will cause water and/or electricity leakage.
· If the lug of power cord is stained, clean it with sand paper.
· Be sure to attach washers (4) and (5). Also handle them with care to avoid damage during replacement.
· When attaching the lug and tightening nut (1), be careful to tighten it to such an extent that the lug is not broken. However, if it stays too loose, heat generating from the contact will damage the lug.

5. Gasket replacement

① Screw out the lid screw on the nut and remove the cap nut (for arm fixing). Then remove the lid arm combination from the main body.
② Turn the removed lid assembly upside down and remove the cap nut, spring washer and inner lid.
③ Take out the old gasket and fit a new one around the outer rim of the inner lid.
④ Tightly put the inner lid with the new gasket to the outer lid as before.
⑤ Put the washer back and tighten the cap nut.
⑥ Replace the arm onto the main unit and secure it. (Make sure to secure the arm fixing cap nut with the lid screw.)

Piping Diagram





O·P	Operation PCB	H	Heater
C·P	Control PCB	SV	Air evacuation solenoid valve
1 X	Power relay	SW	Power switch
2 X	Solenoid valve relay	P·S·W	Excess pressure prevention switch
SSR	Solid state relay	E·G·O	Insufficient water heating switch
C·B	Circuit breaker	S	Temperature sensor
TR	Transformer	F	Fuse

Appendix

● **Temperature-to-Pressure Conversion Table for Saturated Steam in Autoclave**

The following data are approximate values for practical use in all autoclaves:

Temperature		Pressure gauge reading	
(° C)	(° F)	kg/cm	lb/inch
100	212	0.0	0.0
110	230	0.5	7.1
120	248	1.0	14.2
121	250	1.1	15.6
126	260	1.5	22.0
132	270	1.9	27.0