

HIRAYAMA

HICLAVE

HV-25

HV-50

HV-85

HV-110

SERVICE MANUAL

Introduction

- This manual was created to support smooth service of the HV autoclave series (HV-25, 50, 85 and 110). Use the manual as a reference in addition to the operation manual.
- Some tools are required (screw drivers, digital multimeter, and clamp meter) when replacing and making adjustment. Also, required tools are stated for particular works.

- (1) No part of this document may be reproduced without permission.
- (2) The contents of this document are subject to change without notice.
- (3) This document has been carefully compiled. If you have any questions or require information not covered in the manual, please contact :

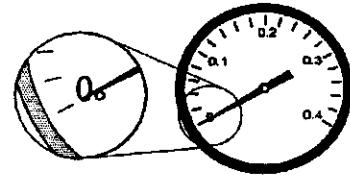
Read Carefully Before Using

- In this manual the following headings are applied to items to which great attention should be given:

- ⚠ **WARNING :** Precaution indicating an imminent dangerous situation which if not avoided may lead to death or serious injury.
- ⚠ **CAUTION:** Precaution indicating a dangerous situation which if not avoided may lead to moderate or slight injury.
- ⓘ **IMPORTANT:** Indicates items you are strongly advised to obey.

⚠ **WARNING:**

- Check that the pressure is below "0Mpa" before opening the lid.



⚠ **CAUTION:**

- Wait until the body has cooled sufficiently to perform maintenance and service work.
- Wait until the water in the bottle has cooled sufficiently to take out the exhaust bottle.
- Do not take out the exhaust bottle or drain the working chamber when the interior of the chamber is under pressure. Otherwise, boiling water and steam will gush out, and you may burn yourself.
- Be careful not to cut fingers when cleaning the bottom of chamber or heater. The heater attaches a temperature sensor and fixing clips that corners may cut your fingers.
- Do not incinerate used batteries. Incineration may cause the batteries to explode.
- Be sure to securely tighten the heater holding nuts when replacing the heater. Water may leak and cause short circuits if the nuts are loose.
- Be sure to securely tighten terminal holding nut A when replacing the heater. Heat may be generated from the terminal and burn damage may result if the nut is loose.

How to Read this Manual

This manual consists of the following sections covering the information required for proper maintenance of the HV-25/50/85/110 autoclaves.

Chapter 1. Maintenance and Adjustment

This section describes the maintenance procedures for the unit as well as the methods for replacing and adjusting the main parts.

Chapter 2. Troubleshooting Chart

This section describes the items to check and measures to take when a problem occurs.

Chapter 3. Product Description

This section describes the operations and internal structural parts of the product.

Chapter 4. Operation Check Procedure

This section describes the method for checking the operation of electrical parts using the check programs.

Chapter 5. Main Parts List

The code numbers for the main parts are listed in the table here.

Contents

Chapter 1. Maintenance and Adjustment	1
1. Draining Water from the Exhaust Bottle	1
2. Draining the Chamber	2
3. Cleaning the Chamber	3
4. Cleaning the Body	3
5. Cleaning the Cooling Unit Filter	4
6. Lid Gasket Replacement	5
7. Backup Battery Replacement	6
8. Solid State Relay (SSR) Replacement	7
9. ROM Replacement	7
10. Heater Replacement	9
11. Temperature Control Sensor Replacement	10
12. Floating Sensor (Option) Replacement	11
13. Motor Replacement	12
14. Exhaust Valve Replacement	13
15. Display Board Replacement	14
16. Exhaust Valve Adjustment	16
17. Alarm Volume Adjustment	17
18. Switchboard Replacement	17
Chapter 2. Troubleshooting Chart	18
1. Error Detection (Alarms)	18
2. Early Trouble Shooting	20
3. Trouble Shooting	23
Chapter 3. Product Description	25
Error Monitoring Charts	26
External Appearance	30
Assembly Diagrams	31
Detailed Display and Operation Switch Diagram	35
Switchboard Diagram	36
Exhaust Valve Area Diagram	36
Solenoid Area Diagram	37
Optional Accessories Diagrams	38
Piping Diagram	39
Wiring Diagram	40
Connector Table	41

Chapter 4. Operation Check Procedure	43
1. Check Program Outline	43
2. Check Program Startup	44
3. Check Programs	45
 Reference Table for Floating Sensor and Temperature Control Sensor	50
Pressure Sensor Reference Table	52

2. Draining the Chamber

Drain water using the following procedure after confirming that the inside of the chamber has cooled sufficiently.

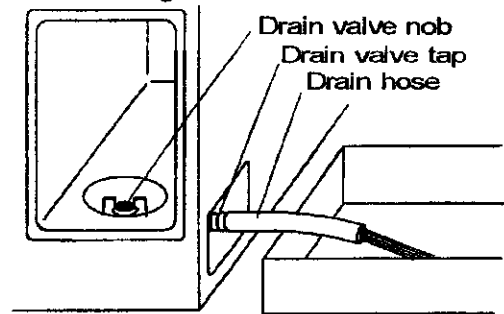
CAUTION:

- Do not unload the exhaust bottle or drain the chamber when the chamber is under pressure. Boiling water or steam may gush out causing burns.

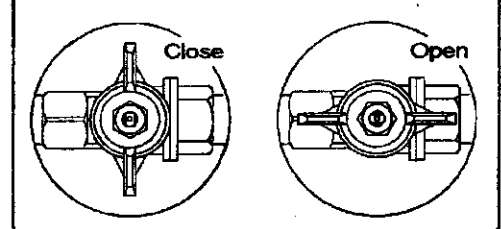
- (1) Open the lid.
- (2) Connect one end of the accessory drain hose to the top of the drain valve located at the lower part of the right side of the body.
- (3) Put the other end of the hose in a container.
- (4) Remove the exhaust bottle from the body.
- (5) Turn the drain valve knob, located at the bottom of the exhaust bottle housing area, counterclockwise to open.
- (6) Check that draining of the working chamber is complete.
- (7) Turn the knob clockwise to close the drain valve.

Be sure the exhaust valve is closed.

Bottle housing area



Drain valve



When drain pipes are clogged

- Connect the drain port and water pipe stopper using a pressure-resistant hose, open the exhaust valve on the body, and gradually open the water pipe stopper. Foreign matter clogging the exhaust piping will then flow into the working chamber. Remove the foreign matter and drain the chamber.
- If the clog is not removed by the above procedure, disassemble the piping and clean.
- If the clog is not removed by the above procedure, disassemble the piping and clean.

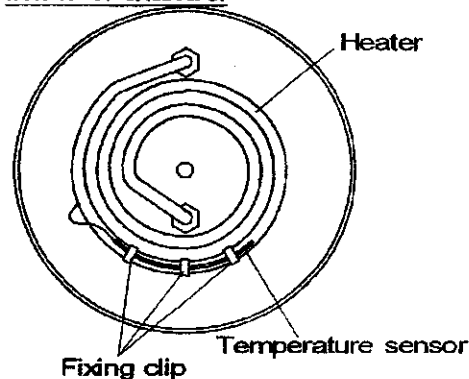
3. Cleaning the Chamber

! CAUTION:

- The heater is provided with a temperature sensor with clips. Be careful not to hurt your fingers when cleaning.

- (1) Remove the heater cover to see if the bottom of the chamber or the surface of the heater is dirty. After draining the chamber, clean these areas with a soft brush or the like while applying water and keeping the drain valve open.
- (2) Reattach the fixing clip of the temperature sensor if it has come off or is loose. Attach the clip so that the temperature sensor comes into close contact with the heater.

Inside of chamber



4. Cleaning the Body

! IMPORTANT:

- Do not use benzine or thinner to clean the body. Also, make sure that volatile substances such as insecticides do not come into contact with the body as these may cause deterioration and stripping of the paint.

- (1) Gently wipe stains with a soft cloth. To remove stubborn stains, wipe with a cloth soaked in solution of neutral detergent. Wipe off any remaining moisture with a dry cloth.

5. Cleaning the Cooling Unit Filter (For Cooling Unit option only)

An air filter is attached within the cooling unit. Clean the fan once a year according to the following procedure.

- (1) Remove the screws holding the fan case and remove the fan case.

The filter is mounted inside the fan case

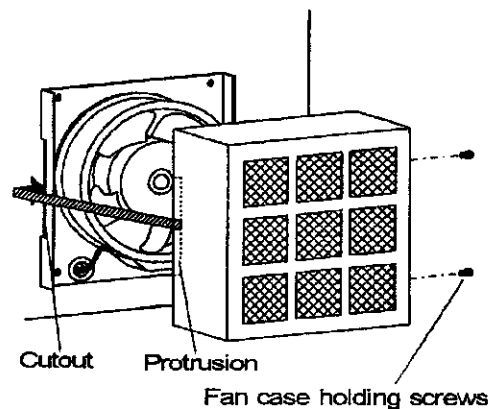
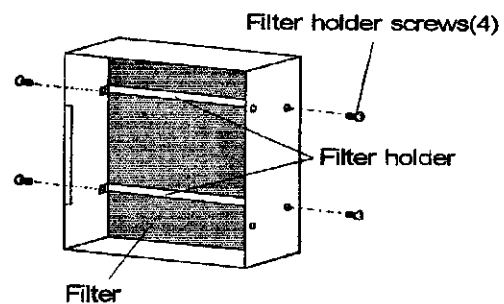
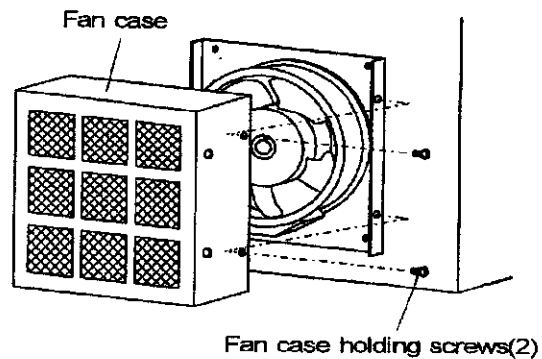
- (2) Remove the filter holder screws and remove the filter.
- (3) Soak and gently wash the filter in neutral detergent diluted in water.

Avoid volatile detergents as these may cause discoloration or deformation.

- (4) Sufficiently dry the filter.
- (5) Reattach the filter in the filter case.

Replace the filter if flawed or broken.

- (6) Match the protruding part of the fan case with the cutout part of the base plate and secure with the holding screws.



6. Lid Gasket Replacement

- Lid gasket with a whitened edge may cause steam leakage. Replace the lid gasket, if moistened with neutral detergent diluted with water, and wipe off the stains with it. Wipe off any moisture with a dry cloth.

- ① Open the lid
- ② Apply the minus (–) screwdriver to the underside of the gasket band, and pry it up. Pull out the old gasket.
- ③ Using a waste cloth wipe any dirt off the portion of the chamber with which the lid gasket was in contact.
- ④ Remove the gasket band from the old gasket, and using a waste cloth wipe any dirt off the gasket band.

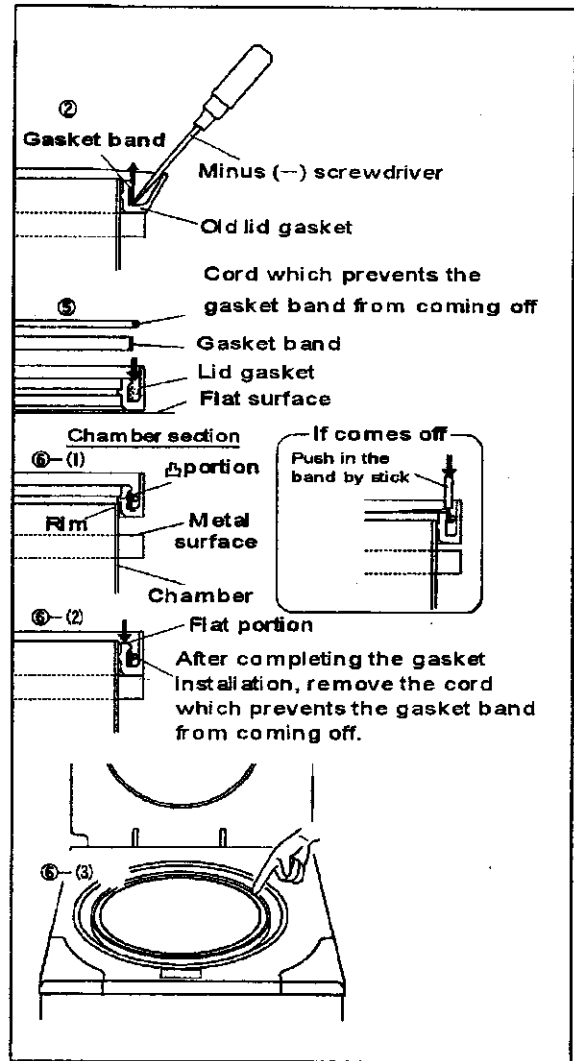
- ⑤ Attach the gasket band to the new gasket:
 - (1) Place the new gasket on a flat surface, and push in the gasket band until it hits against the bottom of the groove.
 - (2) Insert the cord which prevents the gasket band from coming off.

- ⑥ Install the new gasket in the chamber:
 - (1) Push in the gasket until the entire projected portion of the gasket hits against the rim of the chamber. Gradually and evenly insert the entire gasket while pressing your palm on the gasket.
If the gasket band starts to come off, press the wooden stick against it to shove the band into the groove in the gasket while taking care not to damage to the gasket.

- (2) Push in the gasket until it hits against the metal surface.
When the gasket is completely pushed in, the flat portion is positioned at a level slightly lower than the rim of the chamber.
- (3) In addition, run your finger along the flat portion of the gasket to eliminate any irregularities on the gasket surface.

An uneven gasket surface makes the lid difficult to close.

- ⑦ Pull out the cord. [Ref. ⑤ (2)]
- ⑧ Follow the ordinary operating procedure to start operation and make sure of no leakage through the lid gasket.



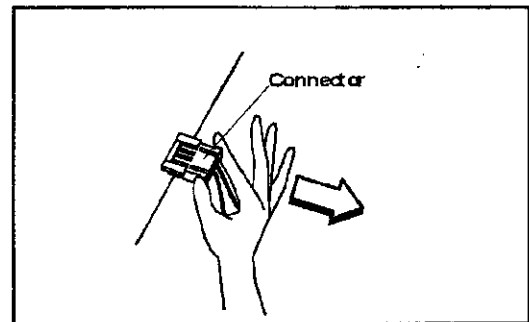
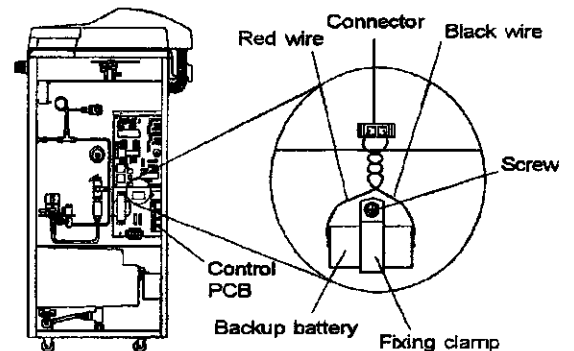
7. Backup Battery Replacement

- When the **CLOCK** display flickers, replace the backup battery in accordance with the following procedure.

⚠ **CAUTION:**

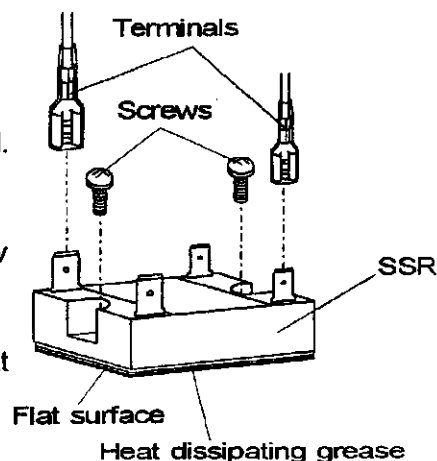
- Connecting the battery with its polarities reversed may cause heating, explosion or ignition.
- Do not dispose of used batteries in fire; they may explode.

- ① Hold both the ends of the connector for the backup battery between your fingers, and pull the connector out of the switch board.
- ② Remove the screw from the clamp.
- ③ Attach the clamp to a new battery, and screw the clamp on the switch board.
- ④ Insert the battery connector to the control PCB, with twist wires several times, with care of its correct direction.
- ⑤ Correct the clock following the operation manual.
 - When the correction of the clock is complete, the **CLOCK** display goes out.



8. Solid State Relay (SSR) Replacement

- (1) Pull out the terminals from the solid state relay (SSR).
- (2) Remove the SSR by unscrewing from the switchboard.
- (3) Wipe off the trace of heat dissipating grease and dust adhering to the switchboard in the vicinity of the screw holes.
- (4) Clean the flat surface of the new SSR, then apply heat dissipating grease evenly on it.
- (5) Fit the SSR to the switchboard and plug in the terminals.

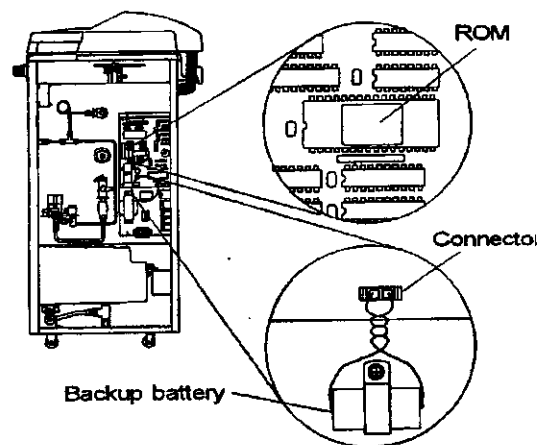


Since the IN side of the SSR has +/- polarity, be sure to connect in the original position.

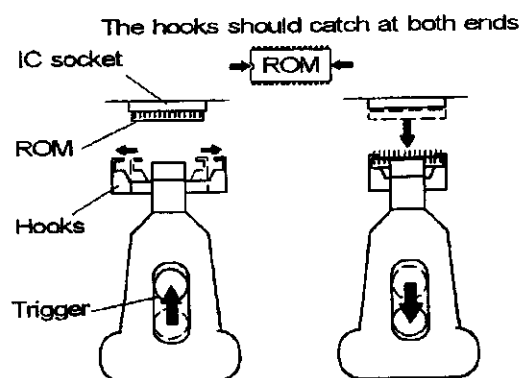
9. ROM Replacement

! IMPORTANT:

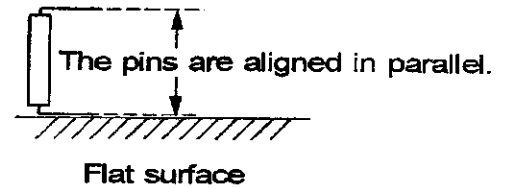
- When replacing the ROM, use a special tool to avoid damaging the control PCB or the new ROM.
- The PCB or ROM can be damaged if touched or brought into contact with people or clothing having a static electricity charge. Touch a metal object or take other measures to discharge static electricity before performing these operations.



- (1) Follow the procedure below to remove the ROM from the IC socket using a ROM puller
 - Push the trigger on the puller to open the hooks.
 - Set the ends of the hooks to catch on the bottom of the ROM.
 - Pull the trigger to remove the ROM.

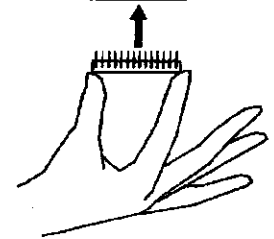


- (2) Make sure that the pins on the new ROM are aligned in parallel. If pins are bent outward, use a flat surface to realign them.

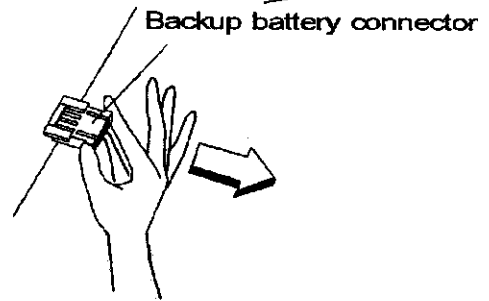


- (3) Insert the new ROM into the IC socket to the correct direction. (The notch to the left).

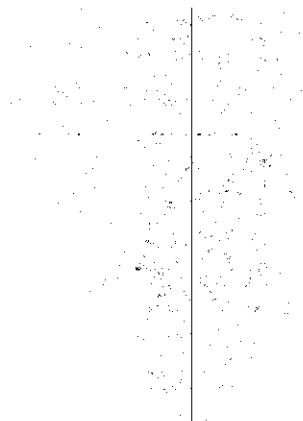
Insert with the notch to the left.



- (4) Grasp both ends of the backup battery connector to pull out and disconnect, and after a few seconds, reinsert the connector.



- By disconnecting the backup battery, the data on the old ROM will be erased. Reset the time in accordance with Operation Manual.



10. Heater Replacement

CAUTION:

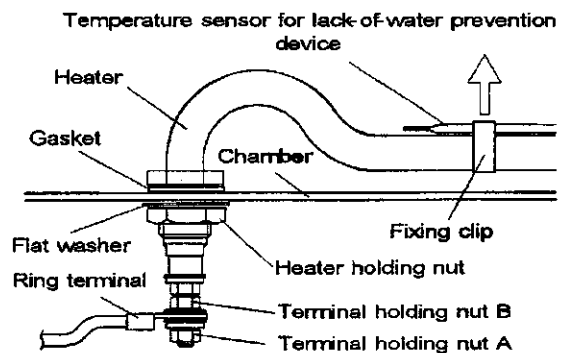
- Be sure to securely tighten the heater holding nuts when replacing the heater. Water may leak and cause short circuits if the nuts are loose.
- Be sure to securely tighten terminal holding nut A when replacing the heater. Heat may be generated from the terminal and burn damage may result if the nut is loose.

■ Required tools

- Monkey wrench (with maximum opening width of 23mm or more)
- Spanner (7mm span for the heaters of HV-25/50; and 8mm for HV-85/110)

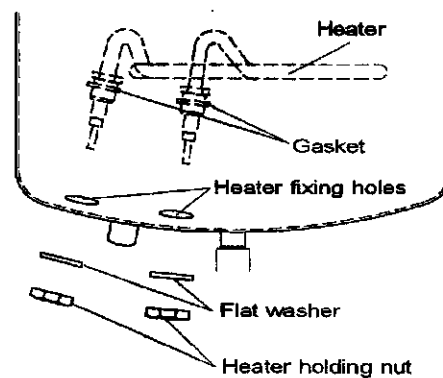
Removing the old heater

- (1) Open the lid and turn the power switch off.
- (2) Drain water from the chamber.
- (3) Remove the blank plate (or the optional cooling unit) fitted on the rear panel.
- (4) Remove the temperature sensor (for lack-of-water prevention) from the fixing clips on the heater. (The fixing clips for HV-25L/50L are small pipes welded to the heater, and those for HV-85L/110L are of flexible spring.)
- (5) Loosen the terminal holding nut A and remove the ring terminal.
- (6) Remove the heater holding nuts.
- (7) Remove the heater from the chamber.
- (8) Remove any scale or stains from the area around the heater fixing holes.

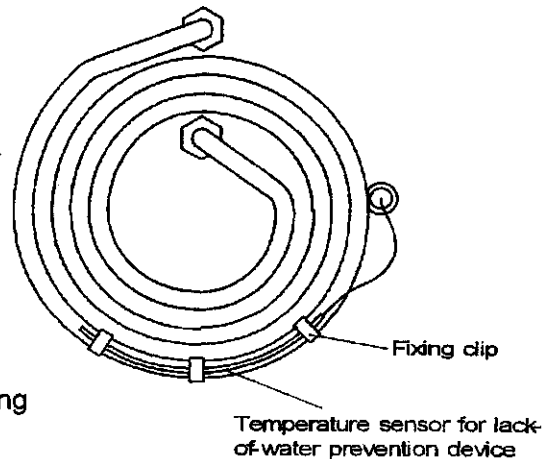


Fixing the new heater

- (9) Remove the heater holding nuts and flat washers attached to the new heater.

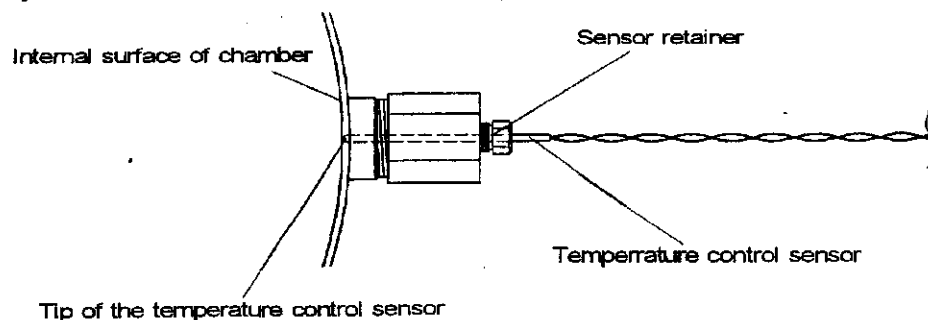


- (10) Pass both ends of the heater through the fixing holes at the bottom of the chamber, with care so that the gaskets do not drop.
- (11) Attach the flat washers, then tighten the heater holding nuts.
- (12) Remove terminal holding nut A from the newly attached heater.
- (13) Fit the ring terminal and tighten the terminal holding nut A, while securing the terminal holding nut B with a wrench.
- (14) Affix the temperature sensor to the heater with or through the fixing clips.
- (15) Pour water in the chamber and make sure of no leakage from the area around the heater.
- (16) Turn the power switch on, start normal operations, and make sure of no leakage of water from the area around the heater while the pressure rises.
- (17) Turn the power switch off and fix the blank plate (or the optional cooling unit) on the rear panel.



11. Temperature Control Sensor Replacement

- (1) Loosen the temperature sensor retainer.
- (2) Pull the temperature sensor from the sensor port.
- (3) Insert the new sensor through the sensor port, until the tip of the sensor comes to the same level of the internal surface of the chamber, and firmly tighten the sensor retainer using the fingers only. Never use a tool such as a monkey wrench.



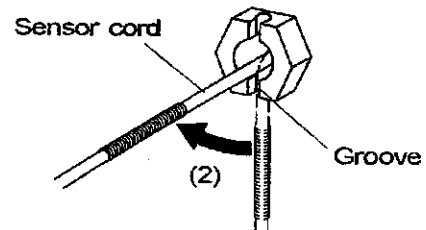
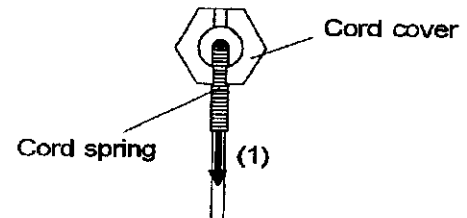
12. Floating Sensor (Option) Replacement

■ Required tools

- Monkey wrench (with maximum opening width of 24mm or more)

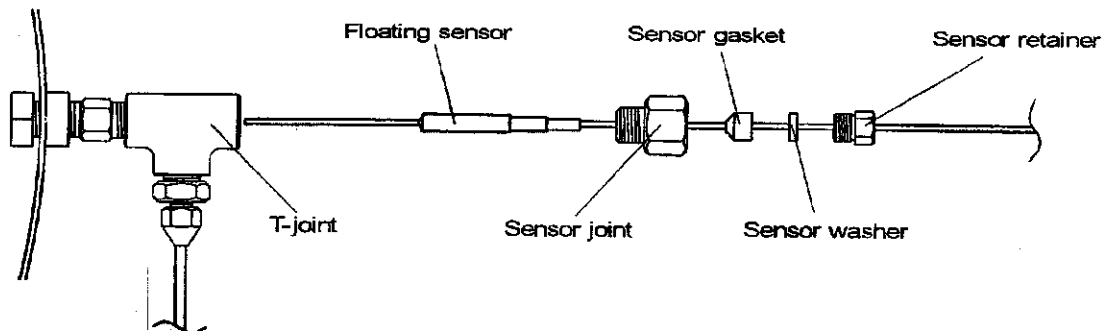
- (1) Pull the cord spring down and remove from the cord cover.
- (2) Remove the cord from the cord cover groove.
- (3) Loosen the sensor retainer and remove the sensor from the joint.
- (4) Remove the sensor joint from the T-joint.
- (5) Pull the sensor out from the T-joint hole.
- (6) Insert the new floating sensor into the chamber through the T-joint hole and pull inward to the length shown below.

Inside of the chamber



HV-25L: $\geq 450\text{mm}$, HV-50L & HL-85L: $\geq 600\text{mm}$, HV-110L: $\geq 780\text{mm}$

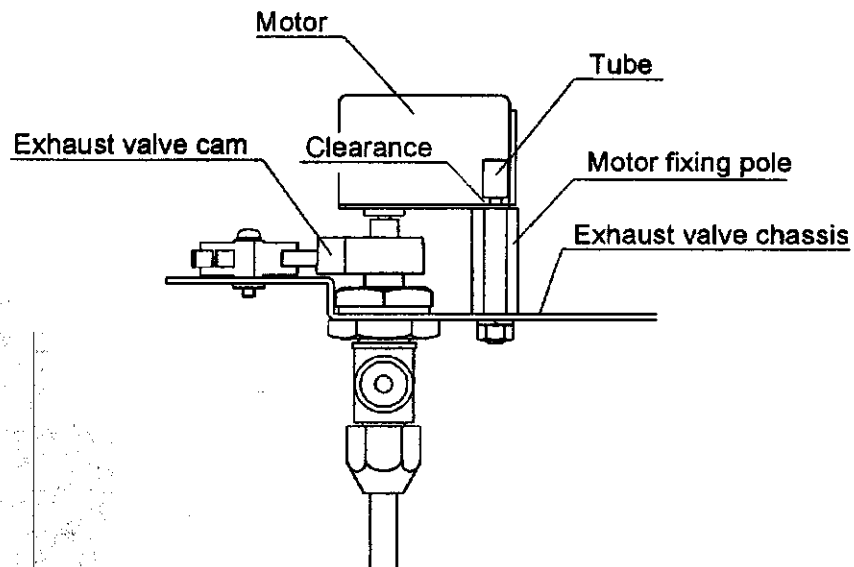
- (7) Attach the sensor joint to the T-joint.
- (8) Attach the sensor gasket, sensor washer, and sensor retainer to the sensor joint. (firmly tighten the sensor retainer using the fingers only. Never use a tool such as a monkey wrench.)



- (9) Pass the cord downward into the cord cover groove, and then, insert the cord spring into the cord cover groove.

13. Motor Replacement

- (1) Disconnect the wires attached to the motor.
- (2) Remove the tube.
- (3) Pull the motor out from the exhaust valve cam.
- (4) Mount new motor on the motor fixing pole.
- (5) Turn in and insert the shaft of the new motor into the hole of the exhaust valve cam.
- (6) Insert the tube into the motor fixing pole until it reaches the gap of motor fixing pole.
[Confirm there is a clearance for the motor movable up and down.]
- (7) Rewire the motor.
- (8) Power on the autoclave and confirm the performance.



14. Exhaust Valve Replacement

■ Required tools

- Monkey wrench (maximum opening width of 24mm or more) X 1
- Plus (+) screwdrivers (for M3 screw) X 1

(1) Refer to steps (2) ~ (3) of "13. Motor Replacement" and remove the motor from the exhaust valve cam.

(2) Remove the piping attached to the exhaust valve.

(3) Loosen the fixing screws of limit switch.

(4) Remove the exhaust valve cam from the exhaust valve.

(5) Loosen the exhaust valve fixing nut, and remove the exhaust valve from the exhaust valve chassis by turning the valve.

(6) Remove the retaining nut from the new valve and tighten the exhaust valve fixing nut all the way to the end.

[The new exhaust valve should be tightened by a torque wrench before used.]

(7) Attach the toothed washer to the retaining nut and place them on exhaust valve chassis and exhaust valve. [The exhaust valve chassis is in between the retaining nut and the exhaust valve.] Tighten firmly the retaining nut.

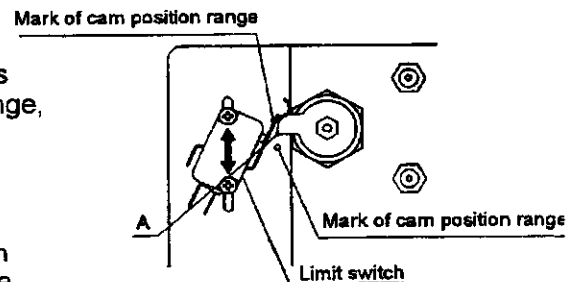
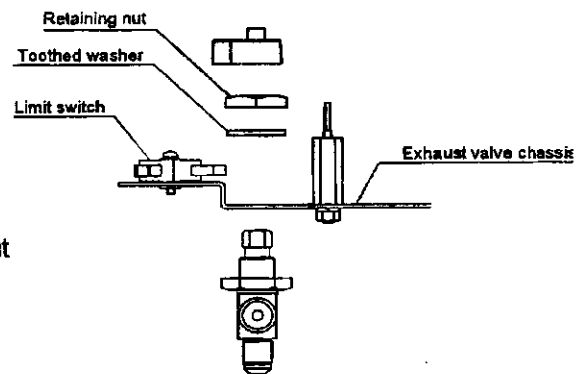
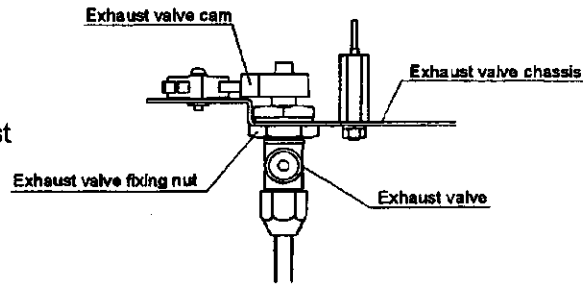
(8) Tighten the exhaust valve fixing nut firmly with steadying the exhaust valve chassis.

(9) Place exhaust valve onto the exhaust valve tentatively.

(10) Turn the exhaust valve cam to the right until the exhaust valve is completely closed.

(11) If the position "A" of the exhaust valve cam is out of the range of marks of cam position range, refix the exhaust valve cam "A" comes in between marks of cam position range.

(12) Turn the exhaust valve cam to the exhaust valve close (clockwise,) and slide limit switch with pressing lever of the limit switch until the limit switch clicks.



(13) Refer to steps (4) ~ (6) of "13. Motor Replacement" and fix the motor.

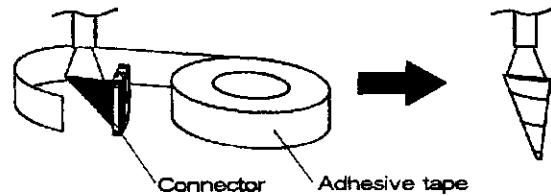
(14) Start operating with the normal procedure and make sure that steam does not come out from the exhaust valve hose port while the chamber is pressurized. If steam comes out too much, adjust the exhaust valve with reference to "16. Exhaust Valve Adjustment."

15. Display Board Replacement

■ Required tools

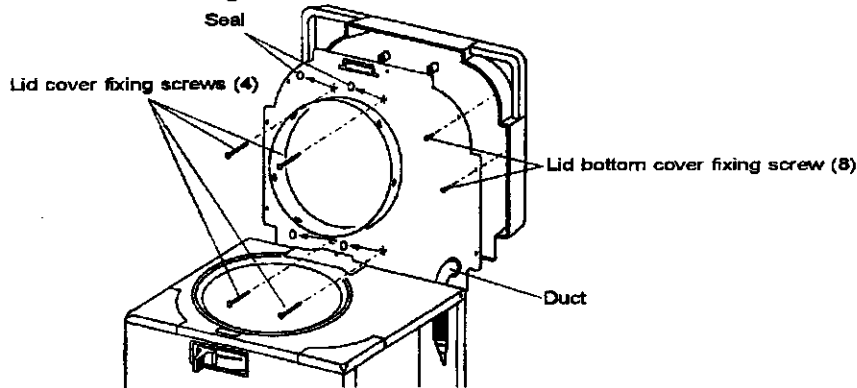
- Plus (+) screwdrivers 2 (1 each for M5 and M3 screws)
- Vinyl adhesive tape
- Sealing tape (glass cloth impregnated with P.T.F.E.)

- (1) Disconnect the connector from CN1 on the control PCB.
Bind the connector and the ribbon cable together with vinyl adhesive tape so as to facilitate passing through the duct



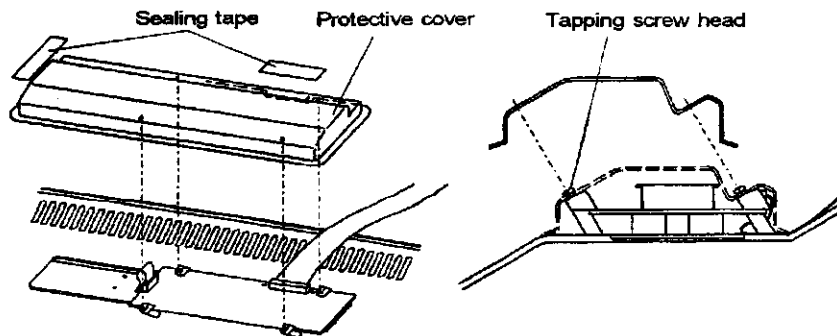
- (2) Open the lid and unscrew the lid bottom cover fixing screws.

- (3) Peel the seals covering the holes for the lid cover fixing screws and unscrew them.

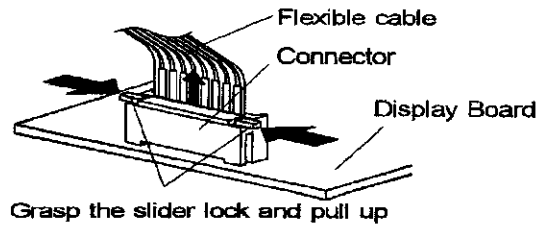


- (4) Pass the ribbon cable of the display board through the duct and remove the lid cover.

- (5) Peel the sealing tapes (PTFE impregnated glass cloth) of the protective plastic cover, and remove the cover by unhooking from tapping screws.



(6) Remove the flexible cable (printed film) connected to the display board.

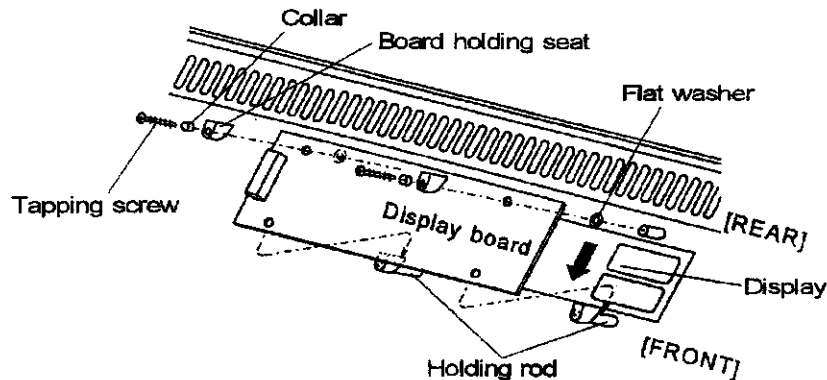


(7) Unscrew the 2 [REAR]-side tapping screws, and remove the display board.

(8) Loosen slightly (1 turn or 2) the 2 [FRONT]-side tapping screws.

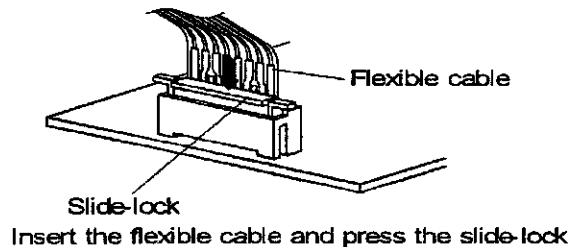
(9) Push the display to [FRONT]-side. Put the new display board in contact with the holding rods. Pass each of the 2 tapping screws on [REAR]-side, through a collar, a board holding seat, a display board fixing hole and a flat washer (M4), and fix to the lid cover.

(10) Tighten the [FRONT]-side tapping screws.



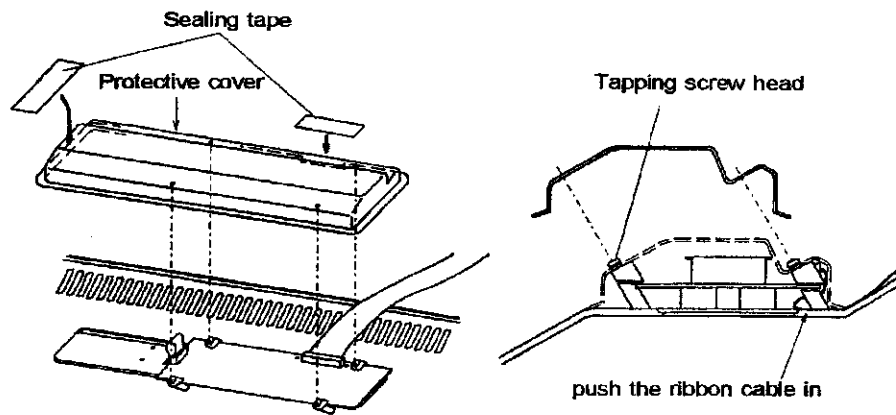
(11) Look at the display from outside of the lid cover and make sure that the character window is aligned with the LED. If not aligned, loosen the tapping screws and realign.

(12) Connect the flexible cable to the connector of the display board.



(13) Push the other end of the ribbon cable in between the display board and the lid cover.

(14) Put the tapping screw heads in the holes of the protective cover, and seal the two places of the protective cover with the sealing tape, i.e. the ribbon cable outlet and the end on the membrane switch side.



- (15) Bind the connector and ribbon cable together with vinyl adhesive tape, and pass them through the duct.
- (16) Fix the lid cover with the corresponding screws.
- (17) Fix the lid bottom cover with the corresponding screws and seal the screw holes.
- (18) Remove the vinyl adhesive tape [ref. the above (15)], and connect the connector to CN1 on the control PCB.

16. Exhaust Valve Adjustment

■ Required tools

- Plus (+) screwdriver (for M3 screws)

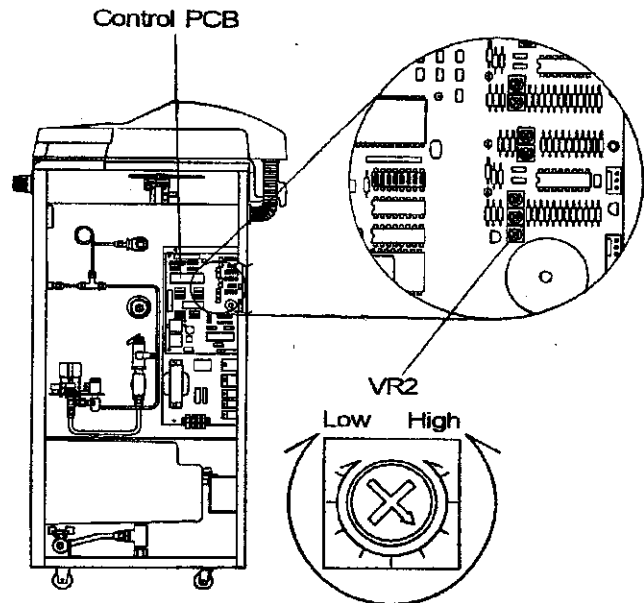
- (1) Refer to steps (2) ~ (3) of "13. Motor Replacement" and remove the motor from the exhaust valve cam.
- (2) Loosen the fixing screws of limit switch, and slide the limit switch to side "B".
- (3) Turn the exhaust valve cam to the right by hand, and make the valve completely closed.
- (4) If the position "A" of the exhaust valve cam is out of the range of marks of cam position range, refix the exhaust valve cam "A" comes in between marks of cam position range.
- (5) Turn the exhaust valve cam to the exhaust valve close (clockwise,) and slide limit switch with pressing lever of the limit switch until the limit switch clicks.
- (6) Refer to steps (4) ~ (6) of "13. Motor Replacement" and fix the motor.
- (7) Power on the autoclave and confirm the performance.

17. Alarm Volume Adjustment

■ Required tools

- Minus (-) screwdriver (2~2.5mm blade width)

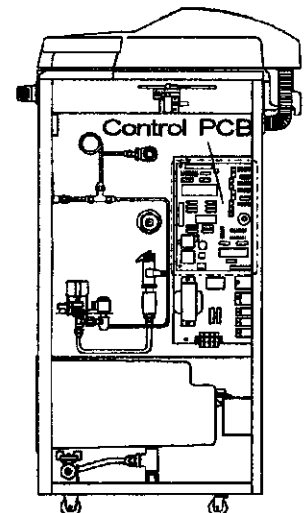
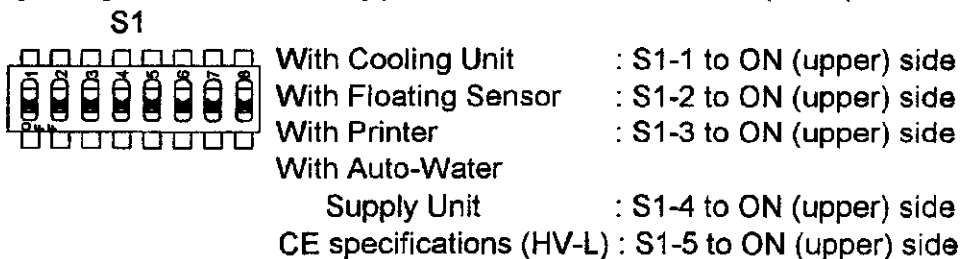
- (1) Turn the VR2 adjusting screw on the control PCB with a minus screwdriver. Turn to the right to lower the volume and to the left to raise the volume.



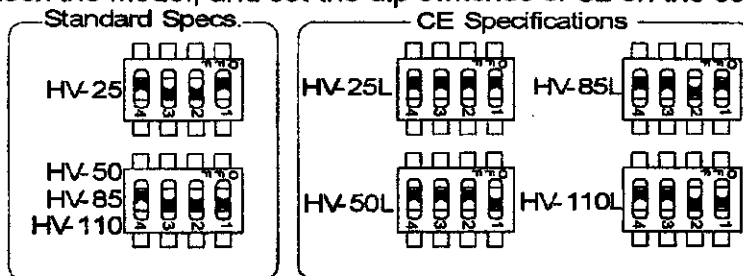
18. Switchboard Replacement

- Check the items below before turning the power on after replacing the switchboard.

- (1) Check whether or not the unit is equipped with the option i.e. Cooling Unit, Floating Sensor, Printer or Automatic Water Supply Unit, then set the dip switches S1 on the control PCB. [Change S1-1-4 accordingly, and S1-6~8 must be OFF (lower) side all the time.]



- (2) Check the model, and set the dip switches of S2 on the control PCB.



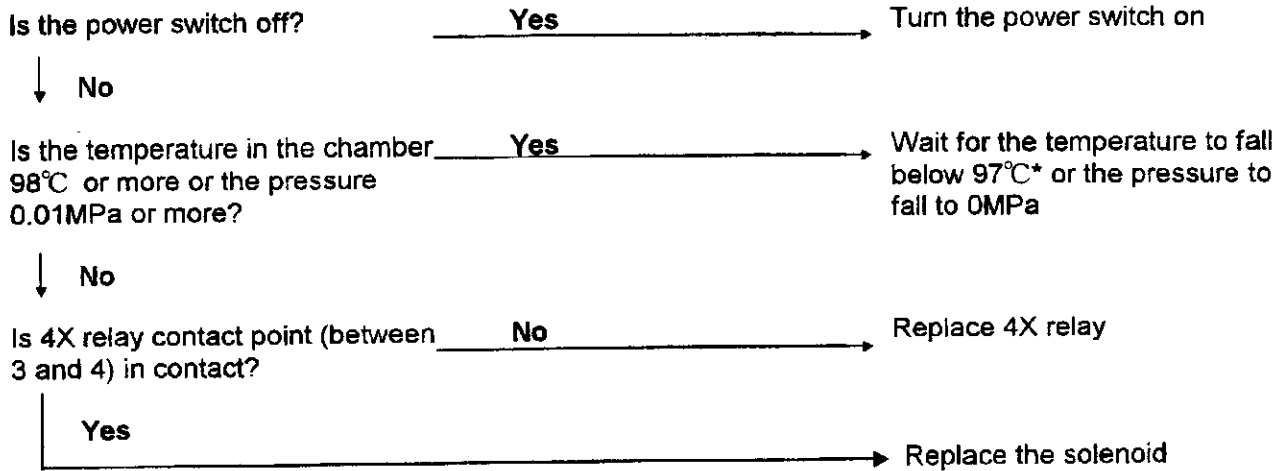
- (2) Remove the ROM from the control board to be replaced and mount it on the new board.
 - Unless otherwise specified, replace the ROM in accordance with [9. ROM Replacement].

Condition	Cause	Items to check	Remedy
One digit on the LED display does not light	(1) Circuit failure	Soldered part of LED	Repair by soldering again
	(2) LED failure	LED breakage	Replace LED
Displays do not light when the power switch (breaker) is turned on.	(1) Poor connection or contact malfunction of terminals and connectors	Power plug connection Breaker (power switch) connection Tab terminal connection Connection of CN9 connector on the control PCB Connection of CN1 connector on the control PCB	Repair or replace the failed parts
	(2) No power	Power socket (rated voltage)	Rectify the power supply facilities
	(3) Power cord breakage	Power input to the breaker (rated voltage)	Replace the power cord
	(4) Breaker failure	Power output from the breaker (rated voltage)	Replace the breaker
	(5) Transformer failure	Between terminals 1 and 2 on connector CN9 of the control PCB (AC14V)	Replace the transformer
	(6) Failure of parts on the control PCB	Between terminals TP7 and TP9 on the control PCB (DC+12V)	Check the short-circuit parts, and repair or replace the failed parts
	(7) Failure of parts on the control PCB	Between terminals TP7 and TP8 on the control PCB (DC+5V)	Replace the control PCB
	(8) Blown fuse F1 on the control PCB	Check visually	Remove the cause for the blown fuse, and replace the fuse
	(9) Blown fuse F3 on the control PCB	Check visually	Remove the cause for the blown fuse, and replace the failed parts
No response to the membrane switch	(1) Dew formation inside the switch	Check leakage from the lid gasket	Replace the membrane switch and the lid gasket
Steam leak from the lid gasket	(1) Aging or damage of the gasket	Check visually deterioration and damage of the gasket	Replace the lid gasket
	(2) Improper installation of the gasket	Check visually installation of the gasket	Install the gasket evenly
	(3) Foreign matter adhering	Check visually foreign matter adhering to the lid or lid gasket	Remove contaminants
Open/Close lever does not slide	(1) Refer to Section 3. Troubleshooting		
Lid cannot be lifted / lowered	(1) Open / Close lever does not slide smoothly Check the lever position (right end)		Slide the lever up to the right end

Condition	Cause	Items to check	Remedy
Alarm sounds after pressing start switch.	(1) Unconfirmed of Door locking	Confirm Open / Close lever to close	Slide the lever up to the left end
Leakage of water from the bottom of the body	(1) Leak from the area of the heater fixing nuts	Looseness of the heater fixing nuts Gasket deterioration	Tighten the nuts Replace the gasket
	(2) Leak from the area of the lack-of-water sensor fixing nut	Looseness of the lack-of-water sensor fixing nuts	Tighten the nuts
	(3) Leak from piping	Piping loose connection	Tighten piping
	(4) Leak from the exhaust bottle	Breakage of the exhaust bottle Gasket improperly fitted or deteriorated	Replace the exhaust bottle Refit or replace the gasket
	(5) Leak from exhaust hose	Cracks in exhaust hose	Replace exhaust hose
	(6) Leak from the drain port as the drain valve was not closed by mistake	State of the drain valve	Close the drain valve
Exhaust is too busy during sterilization cycle (1) Under the display temp. higher than the set temp. (2) Under the set temp.	(1) SSR failure (2) Overpressure exhaust due to remaining air in the chamber	(1) State of ON/OFF of the heater circuit (2) State of containing of the substance Check visually	(1) Replace SSR (2) User instruction
No action of both the solenoid and the exhaust valve	F2 fuse on the switch board is broken		Replace the fuse after removing the cause of breakage

3. Troubleshooting

Open/close lever does not slide



Pressure in the chamber does not rise

Turn the power switch on



Refer to Operation Manual and start operation



Does the temperature in the chamber rise? No → Refer to **Temperature in the chamber does not rise** below



3 min. (HV-25/50) or 6 min. (HV-85/110) after 97°C is displayed, the exhaust valve cam rotates toward "close" direction and stops

No → 2X relay activates → No → Replace 2X relay



Yes → Replace the motor

Cam fixing nut is loose Yes → Refer to Chapter 1 16. Exhaust Valve Adjustment



Cam position adjustment is wrong Yes → Refer to Chapter 1 16. Exhaust Valve Adjustment

Temperature in the chamber does not rise

Turn the power switch off



Remove the heater wiring and measure the resistance. Is the value $\infty \Omega$?

Yes



Replace the heater



No

Restore the heater wiring



Remove the wiring on connection point side (NO, COM) of 1X relay, and start operation according to Operation Manual



Measure the resistance of 1X relay connection point (between NO and COM). Is the value $\infty \Omega$?

Yes



Replace 1X relay



No



Replace the solid state relay (SSR)

Air in the chamber is not purged

Turn the power switch on



The exhaust valve cam rotates toward "open" direction and stops

No



3X relay activates

No



Replace 3X relay



Yes



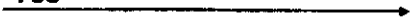
Yes



Replace the motor

Cam fixing nut is loose

Yes



Refer to Chapter 1 16. Exhaust Valve Adjustment



No

Piping is clogged

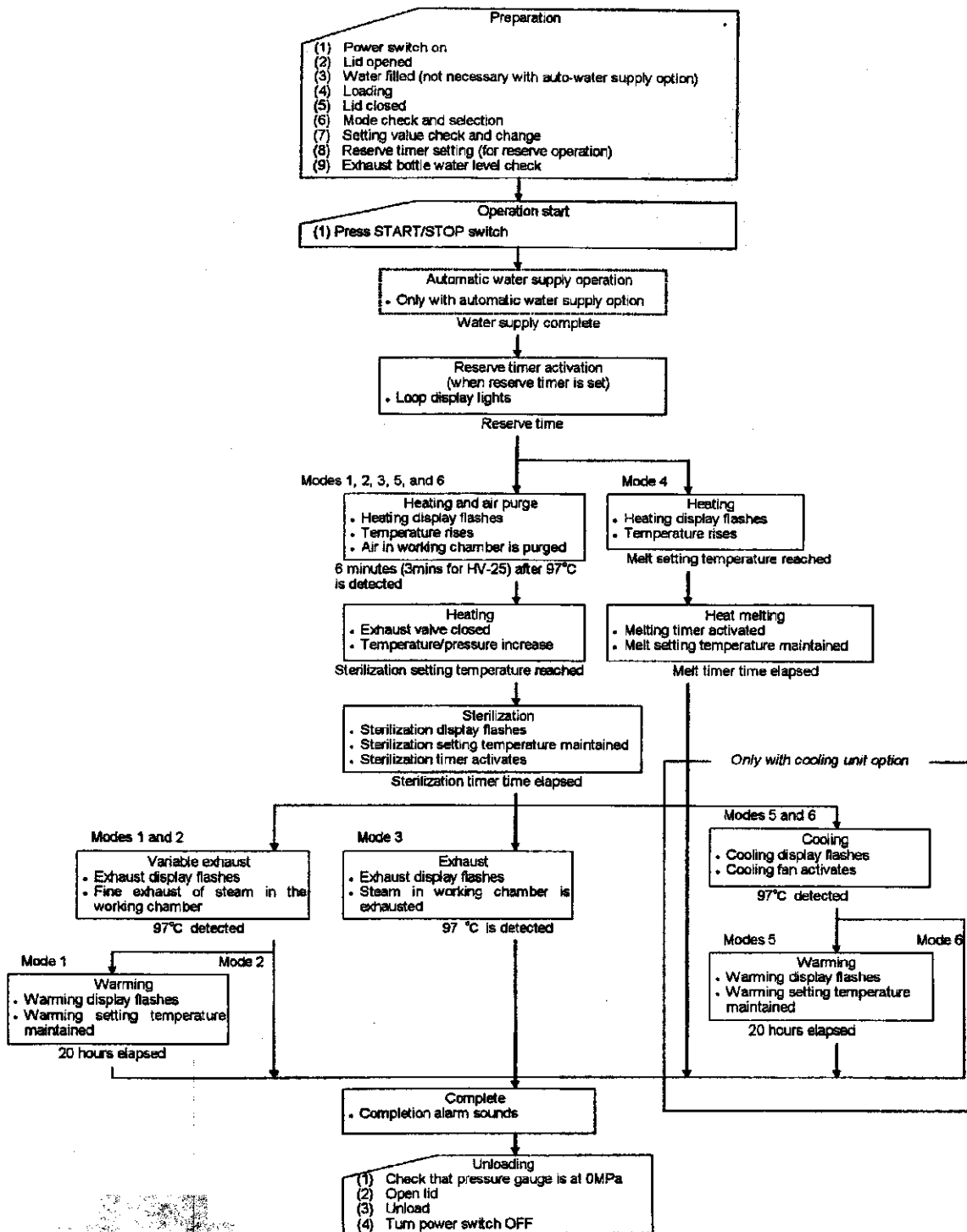
Yes



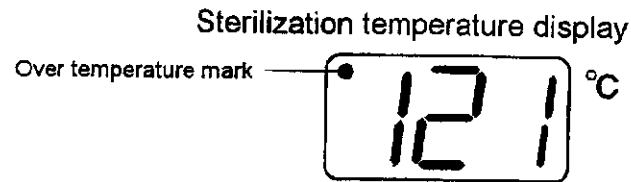
Remove the clog

Chapter 3. Product Description

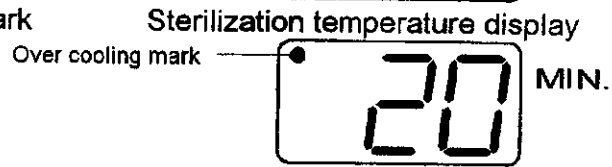
Operation Sequence/Procedure Flow Chart



*1: Over temperature mark



*2: Over cooling mark



*3: Detected when the pressure in the chamber is 0.01MPa or more or the temperature is 98°C or more.

■ Other

- Modes 5 and 6 can only be used with units having the cooling unit option.
- "ErF" monitoring is only for units having the floating sensor option.
- "The automatic water supply cycle" and "Er8" monitoring are only for units having the automatic water supply unit option.