Note: Always have this machine's model and serial number (printed on the first page of this document) ready when calling Consolidated for service or parts.

WARNING

If this sterilizer's chamber is constructed of Stainless Steel, **NEVER** use **CHLORIDE** based cleaners to clean this sterilizer. **NEVER** sterilize items containing **CHLORIDES** or producing **CHLORIDE GASES** in this sterilizer. **CHLORIDES** have proven to damage the Stainless Steel material **causing cracks** and **pin holes**, which will lead to steam leaks.

Service & Installation Manual

"MARK II"
Solid-State Digital Automatic
Controlled Sterilizers

Consolidated Stills & Sterilizers

Rev. 20050914

PLEASE READ CAREFULLY BEFORE ATTEMPTING TO OPERATE YOUR STERILIZER.

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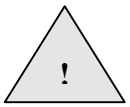
1. Installation Instructions



WARNING: DEGRADATION HAZARD

If you are using a 110-volt supply voltage for the valves and solenoids, make certain that the supply voltage is either 110 volt 50 Hz or 120 volt 60 Hz. Use of any other combination of voltage and frequency (for example 120 volts 50 Hz) will cause degradation of the coils on the solenoids and will lead to failure.

If you are using a 220-volt supply voltage for the valves and solenoids, make certain that the supply voltage is either 220 volt 50 Hz or 240 volt 60 Hz. Use of any other combination of voltage and frequency (for example 240 volts 50 Hz) will cause degradation of the coils on the solenoids and will lead to failure.

1. The room in which this sterilizer is to be installed ***MUST*** be vented and cooled very well. The sterilizer will not perform very well in a hot environment.

2. All ***direct steam*** units should be provided with a 3/4-inch steam line with a pressure of 50-PSI minimum to 80-PSI maximum. This steam line should be equipped with a shut-off valve ***and*** a float type inverted bucket trap to provide dry steam to the sterilizer. Dry steam is essential in obtaining best sterilization results.

3. Installation should be made in accordance with tagging instructions on the sterilizer. Uncrate and place unit in its final position. Adequate space must be allowed at the sides and rear of unit for maintenance and service. As an aid for servicing, shut-off valves should be installed in steam and water service lines adjacent to the sterilizer.

4. Using a spirit level on one vertical side, plumb unit to vertical using the four (4) leveling screws - one in each corner of the steel angle frame of the sterilizer inside the stainless steel outer cabinet. Then place spirit level on front side of sterilizer at one corner and raise the back end of the sterilizer equally with both back leveling feet so that the whole sterilizer has a slight pitch forward. This is to allow a grade for any liquid within the chamber to drain into the drain hole at the front bottom of the

chamber. To check if sufficient grade is provided, slowly pour a glass of water on the back bottom surface of the sterilizer chamber and note if it runs freely to and down the drain hole.

5. All ***electrically heated units*** must have a handy power shut-off switch. While making the necessary wiring connections to the contactor, make sure all the wires are far enough away from the contactor's moving parts to prevent any obstruction. If a wire should become entangled and cause an obstruction, it is very possible that the contacts could get stuck in a closed position, which will result in a melt down in a low water situation.

6. On all electrically heated units the screws on the line and load terminals of the electrical contactor for the generator's elements must be tightened and torque measured to 40 PSI. This is critical to ensure long life for the contactor, wiring and the heating elements.

7. All ***Vacuum equipped*** sterilizers should be supplied with a suitable grade of feed water ***free of calcium deposits***. If water quality is a concern at the installation site, a ***water*** filter must be installed in line with the water ring vacuum pump or the water booster pump depending on the sterilizer vacuum system selected.

1.1 Notes

- If exhaust steam is to be vented to a stack, the ductwork should be at least one pipe size larger than the exhaust line at the sterilizer and must not include any 90 degrees angles.

- Exhaust lines entering the funnel waste must be kept out of the funnel to avoid possible siphoning.

- When piping the generator drain on electrically heated sterilizers, consideration should be given as to the placement of the manual ball valve. This valve should be piped so as to facilitate easy access when draining the generator on a regular basis.

- When waste connection is made to anything other than a floor drain, and piping changes are required, **make sure that chamber steam trap is gravity-fed to open waste - IT MUST NOT BE PIPED UPHILL**.

- When new steam lines are run into the sterilizer, blow out lines before connecting to sterilizer to eliminate thread chips, excess pipe compound and dirt. When new piping is involved it is not uncommon for the steam traps to become fouled causing malfunction of the sterilizer if lines are not pre-cleaned.

- Steam, water, and power service are always clearly labeled for the sub-trades responsible for their connection.

- As per our tagging instructions, water supply pressure to sterilizer should be a minimum of 45 PSI and a maximum of 65 PSI.

1.2 Waste water cooling system

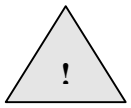
Some machines are supplied with a wastewater cooling system at the customer's request. This system is controlled by a temperature-actuated valve, which supplies an additional volume of water to prevent wastewater temperatures exceeding preset limits. A 1/4" valve is also supplied for the purpose of regulating the flow of water passing by the temperature probe, thus resulting in how long the valve remains open. The more the needle valve is opened, the shorter the period in which the water valve stays open resulting in less usage of water.

If your machine is equipped with a Steam Generator, please be warned that the drain valves for the generator and the low water cut off are NOT piped into this cooling system. Before blowing down the generator, you must wait long enough for the generator water to cool off.

2. Safety Instructions

The following safety instructions appear in this manual. Please read them carefully before operating the sterilizer.

2.1 Aborting a cycle

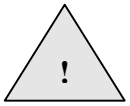


WARNING: RISK OF NON-STERILE DEVICE

Please note that if a cycle is aborted prior to successful termination, it must be considered incomplete and the load must be reprocessed (unwrapped goods or liquids) or repacked and reprocessed (wrapped goods).

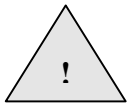
To abort a cycle in progress, press the red POWER key on the keypad assembly. This will shut off power to the unit. You will then need to open the green–handled manual exhaust valve below the chamber (labeled Manual Steam Exhaust Valve) by removing the access panel below the chamber door. Wait for the pressure inside the chamber to reach atmosphere before carefully opening the door.

2.2 Starting a cycle

 **WARNING: BURN HAZARD**
The operator MUST wear protective clothing including face shield, thermal gloves, and proper lab attire, when attempting to load and unload the chamber materials.
Steam released from the sterilizer chamber can cause serious burns. Stand away while opening the door.
If water leaks from the front of the sterilizer, **DO NOT open the door**. Contact service personnel.

To start a cycle, make sure the door is hand-tight. Press the appropriate selector switch for the type of cycle you are running (Fast, Dry, or Fluids), then press the red power button on the selector switch to start the cycle. See section 6 for a complete tutorial before you start operating the machine.

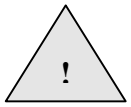
2.3 Preparing the load

 **WARNING: RISK OF INFECTION**
Please note that airborne microbial and particulate contamination is likely to be high in the decontamination area of the sterile processing department. Users MUST wear protective clothing and equipment when preparing goods for sterilization or when in the decontamination area.

Please see section 7.2 on load preparation before you start operating the machine.

2.4 Sterilizing Fluids

(See Section 3.3 on Sterilizing Fluids)
INJURY HAZARD: If the wrong cycle is selected to sterilize liquids, the containers may burst or crack during the processing. After completion of a FLUIDS cycle, take care that you do not agitate the fluids during removal from the chamber. Otherwise the containers may burst or crack.

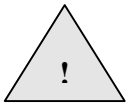


WARNING!

Sterilized liquids are not intended for direct patient contact.

2.5 Chart Recorder Care

See section 5 of the Operator's Manual about setting your sterilization temperature and changing the chart paper on the chart recorder controller.



WARNING: Damage to the Chart Recorder

The Chart Recorder/Controller's Green Indicating Pointer and Orange Set Pointer (see Figure 5.1) must not be manipulated by hand or any tools in an attempt to swing them up or down the scale. This can result in serious damage to the recorder's linkage. This damage is **not** covered under your sterilizer's warranty.

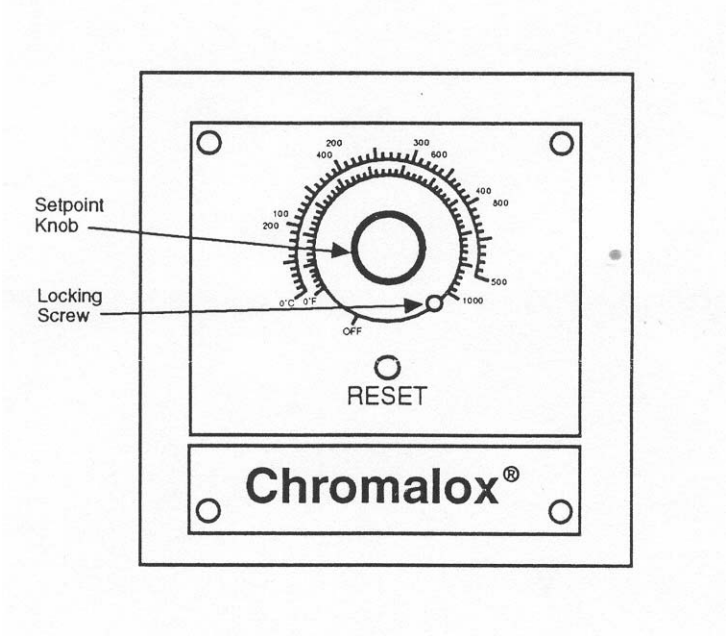
3. Maintenance Recommendations

1. ***EVERY MORNING***, run a short 5-minute sterilization cycle with an empty chamber. This helps the machine run better throughout the day.
2. ***BEFORE EVERY CYCLE***, make sure the mesh screen from the front drain hole inside the sterilizer is totally free of debris. A clogged chamber drain strainer will prevent sterilizer from coming up to temperature.
3. ***ONCE A WEEK***, flush Chamber with clean water. This is particularly necessary if saline solutions are being sterilized. Depending on the type of goods being sterilized, the chamber may also require wire brush cleaning (or other type) on a regular basis.
4. ***ONCE A WEEK***, on units equipped with a steam generator, drain the generator immediately after the sterilizer has been shut down and while the water in the generator is still hot. This will aid in drawing off the sediments and impurities in the water and keep the generator clean.
5. ***ONCE A WEEK,*** Clean the head ring and the door gasket. The head ring is where the door gasket meets the sterilizer chamber when door is shut. Clean the gasket and apply some graphite to prevent sticking of the gasket to the head ring. Always have a spare door gasket in stock. If you have trouble sealing the door, it may be time to replace the door gasket.
6. ***ONCE A MONTH***, check all hand valve spindles for leaks around packing nuts.
7. ***ONCE A MONTH***, Calibrate the UE chart recorder's temperature sensor.
8. ***ONCE A MONTH***, oil the door hinge pins, and lubricate the door hub. See section on door hub maintenance for instructions on lubricating the door hub.
9. ***ONCE EVERY THREE MONTHS***, clean all steam traps. This should also be done when indications point to trap malfunctioning.
10. ***ONCE EVERY THREE MONTHS***, on units equipped with a steam generator, clean and service the generator. See section on servicing the generator and low water cut off later in this manual.

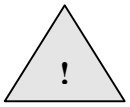
4. Sterilizers equipped with a Steam Generator

Some sterilizers with a steam generator are equipped with an optional Chromalox thermal protection device for the heating elements. This thermal protection device cuts the power to the coil of the contactor if the temperature of the heating elements rises above 350 degrees Fahrenheit. Usually this temperature rise is caused by insufficient flow of water into the generator. If you are unable to pressurize the jacket of your sterilizer, the thermal protection device may be the cause. Remove the front panel of the sterilizer under the chamber. You will see the optional Chromalox thermal protection device mounted adjacent to the steam generator. If the red light on the Chromalox box is ON, then the thermal protection has cut the power to the coil of the contactor.

In this case, you must check the low water cut off assembly and switch for signs of failure. See the following section for instructions. Once you have corrected the source of the problem, you may press the reset button on the optional Chromalox thermal protector to reset the system and continue operation. The reset button will not operate if the elements are hotter than the threshold temperature of 350.



5. Generator and Low water cut off assembly



WARNING: RISK OF SEVERE INJURY OR DEATH

Make sure that all power is shut off to the sterilizer, the controls, and the generator and that there is no water in the generator before attempting to service the sterilizer, the generator, and associated parts and accessories. Be mindful of hot water and steam still present in pipes even after shut down of sterilizer power and utilities.

5.1 Identifying generator and Low water cut off parts

The following descriptions refer to the parts marked on figure 5.1 drawing on the next page.

A) Generator safety valve (50 PSI)
B) Generator supports
C) Manual shut off valves for sight glass (MUST BE OPEN when generator in use)
D) Low water cut off assembly
E) Check valve
F) Water inlet solenoid valve
G) Air Breaker
H) Water strainer
J) Manual shut off for water inlet
L) Sight glass
M) Eight (8) 1/2x13 studs
N) Heating elements electrical connection studs
P) Generator clean out plug
Q) Low water cut off clean out plug
R) Generator drain manual shut off valve
S) Steam line to sterilizer jacket
T) Water inlet to generator
U) Screw jacks
V) Chromalox Temperature probe mount (optional)
W) Generator & low water cut off drain

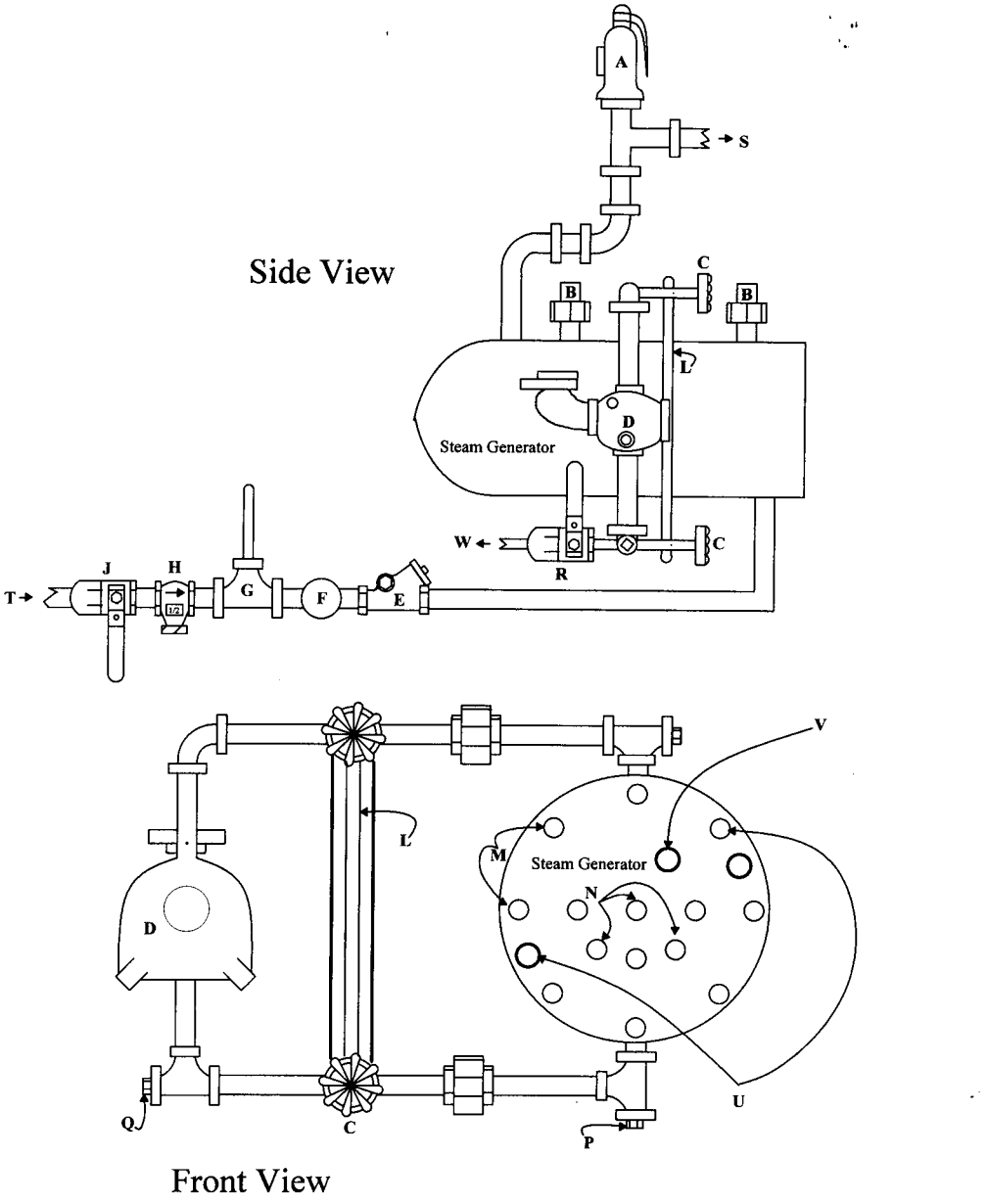
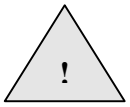

Side View
A
S
C
B
B
L
D
Steam Generator
W
C
R
J
H
G
F
E
T
L
V
M
Steam Generator
N
D
U
Q
C
P
Front View

Figure 5.1

5.2 Cleaning the generator & Low water cut off



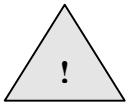
WARNING: RISK OF SEVERE INJURY OR DEATH

Make sure that all power is shut off to the sterilizer, the controls, and the generator and that there is no water in the generator before attempting to service the sterilizer, the generator, and associated parts and accessories. Be mindful of hot water and steam still present in pipes even after shut down of sterilizer power and utilities.

1. Make sure you have a gasket (o-ring) for the generator and a gasket for the low water cut off before attempting to service them. If you need to clean the sight glass, you will also need the o-rings for the sight glass.
2. Refer to figure 5.1 on the previous page for the descriptions contained here.
3. Disconnect the wires to the heating elements (N). Be careful not to break the screw terminals that attach the wires to the heating elements. Mark wires for proper reattachment. Unplug the (optional) Chromalox temperature probe connector (V).
4. Remove the eight nuts (M).
5. Pull the flange and the heating elements out of the generator. If needed, you can screw two 1/2x13 thread bolts into the screw jacks (U) to push the flange out.
6. Clean the heating elements, the temp probe, and their points of contact using warm water, soap, and a wire brush. Be careful to brush lightly so that you do not puncture the sheath on the elements. Also be very careful not to wet the electrical terminals (N). If the elements have a heavy cover of sediments, you should increase your cleaning intervals.
7. Use warm water, soap, and wire brush to clean the inside of the generator from any mineral build up.
8. Remove plug (P) and make sure the drain line is clean.
9. Put plug (P) back in and remove (Q) to make sure the line running between (P) and (Q) is clean and free of obstructions.

10. Put (Q) back in.
11. Put the steam generator flange back in using a new o-ring gasket for the flange. Torque the nuts (M) down to 40 ft.lbs.
12. Reconnect the electrical connections to the heating element terminals (N). When tightening the screw terminals make sure you hold the back nut while you tighten the outside nut to avoid breaking the terminal. Reconnect the (optional) Chromalox temperature probe (V).
13. Double-check the wires on the contactors for the heating elements to ensure they have not loosened up during the cleaning procedure.

5.3 Cleaning the low water cut off assembly



WARNING: RISK OF SEVERE INJURY OR DEATH

Make sure that all power is shut off to the sterilizer, the controls, and the generator and that there is no water in the generator before attempting to service the sterilizer, the generator, and associated parts and accessories. Be mindful of hot water and steam still present in pipes even after shut down of sterilizer power and utilities.

MAINTENANCE

SCHEDULE:

- Blow down control as follows when boiler is in operation.
  - Daily if operating pressure is above 15 psi.
  - Weekly if operating pressure is below 15 psi.

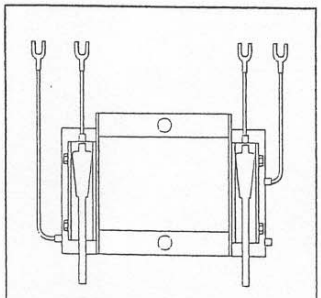
NOTE
More frequent blow-down may be necessary due to unusual water or system conditions, including dirt and minerals and/or local codes.

- **Disassemble and inspect the low water cut-off/pump controller annually. Replace if it is worn, corroded, or if components no longer operate properly.**
- **Inspect the float chamber and equalizing piping annually. Remove all sediment and debris.**
- **Replace head mechanism every 5 years.** More frequent replacement may be required when severe conditions exist such as rapid switch cycling, surging water levels, and use of water treatment chemicals.
- **We recommend head mechanism replacement when the switch(es) no longer operate properly.** If you choose to replace the switch(es), order the proper McDonnell & Miller replacement switch or switch assembly and follow the Repair Procedure provided.

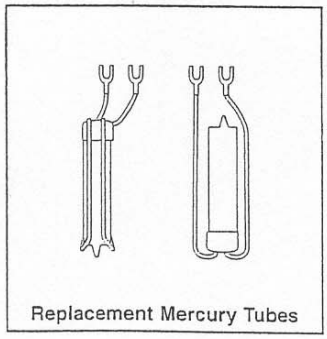
PROCEDURE:

⚠ CAUTION
To prevent serious personal injury from steam and hot water during blow down, connect piping to the discharge side of the blow down valve to avoid exposure to steam discharge. Failure to follow this caution could cause personal injury.

1. Blow down the low water cut-off when the water level is at its normal level and the burner is on. **Slowly** open the blow down valve until it is fully open and observe the water level fall in the gauge glass. Close the valve after verifying that the pump contacts have closed and the burner shuts off. If this does not happen, immediately shut off the boiler and correct the problem.



Replacement Switch Assembly



Replacement Mercury Tubes

⚠ CAUTION
Snap switches must be replaced as an assembly.

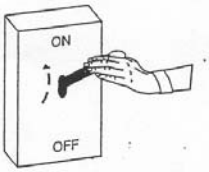
Testing

This control is factory calibrated for specific applications. The following testing procedure is only meant to serve as a verification of proper operating sequence.

Dimensions provided are typical for a boiler not being fired and/or not at pressure. Actual operating ranges are shown on page 2 in the "Operation" section.

IMPORTANT: Follow the boiler manufacturer's start-up and operating instructions along with all applicable codes and ordinances.

a. Turn on the electric power to the boiler. With the boiler empty the pump should go on and the burner must remain off.



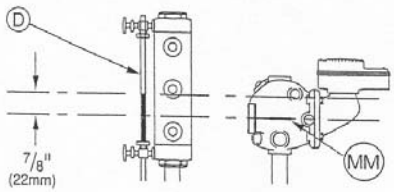
⚠ WARNING

If the burner comes on, immediately turn the boiler off and make the necessary corrections.

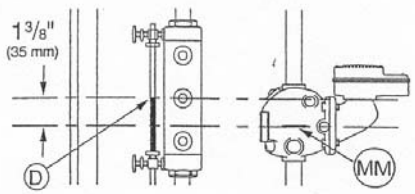
Failure to follow this warning could cause an explosion or fire and result in property damage, personal injury or death.

b. The boiler should begin to fill with water. Watch the gauge glass (D) until the water level reaches approximately ⅞" (22mm) above the horizontal cast line (MM) on the low water cut-off. When the water level reaches approximately ⅞" (22mm) the burner should come on.

IMPORTANT: If water does not start filling the boiler, immediately turn off the the boiler and make the necessary corrections.



c. Continue watching the gauge glass (D) to see that the water continues to rise to approximately 1⅜" (35mm) above the horizontal cast line (MM). The pump should shut off.



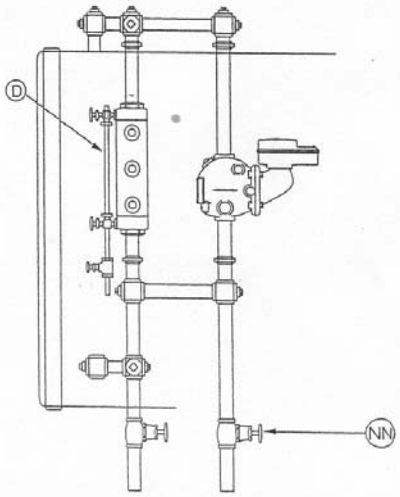
d.

⚠ CAUTION

To prevent serious personal injury from steam and hot water during blow-down, connect piping to the discharge side of the blow-down valve to avoid exposure to steam discharge.

Failure to follow this caution could cause personal injury.

When the water level is at its normal level and the burner is on, **slowly** open the blow down valve (NN) until it is fully open. Watch the gauge glass (D) to see that the water level drops. Close the valve after verifying that the pump comes on and the burner shuts off. If this does not occur, immediately shut off the boiler and correct the problem and retest.



5.4 Cleaning the sight glass

WARNING: RISK OF SEVERE INJURY OR DEATH

Make sure that all power is shut off to the sterilizer, the controls, and the generator and that there is no water in the generator before attempting to service the sterilizer, the generator, and associated parts and accessories. Be mindful of hot water and steam still present in pipes even after shut down of sterilizer power and utilities.

Figure 5.5 below shows the front view of the sight glass. Refer to this figure when following the directions to disassemble the sight glass and clean it.

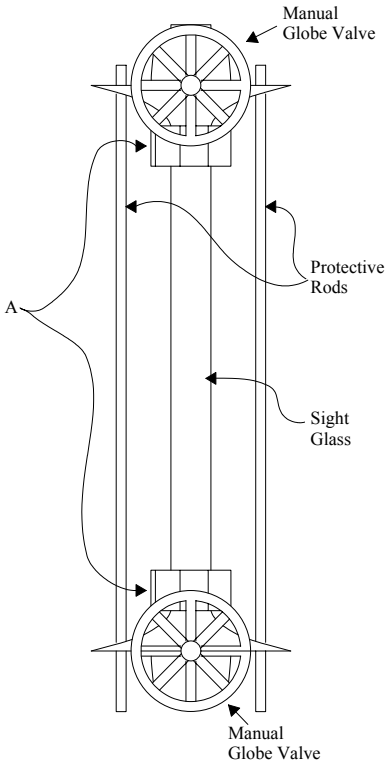


Figure 5.5
Front view of sight glass

1. Before you start, make sure you have two replacement o-rings for the sight glass available. (Part number D-1600-00)

2. Pull protection rods up and out of the bottom holders.

3. Remove the two nuts "A" in Figure 5.5 and pull them over the sight glass.

4. The o-rings are now exposed. Roll the o-rings over the sight glass.

5. Slide the sight glass up to clear the bottom holder. Once it clears the bottom holder, lean the sight glass towards the front and pull it out of the assembly.

6. Clean the inside of the sight glass thoroughly with a bottle washer brush.

7. Replace the o-rings with new ones and put the assembly back together.

Make sure that the two Manual Globe Valves (see figure 5.5) are always OPEN during normal operation of the machine.

6. Door hub assembly

The nomenclature for the door hub assembly shown in figure 6.1 is as below:

A) Internal door lock rod
B) Hub center section - acme thread
C) Hub center section oil port
D) Hub internal interlocks - 2 per unit
E) Thrust bearing
F) Hub pivot pins - 2 per unit
G) Hub pin retaining plate
H) Center door stud - acme threaded with pivot slots
I) Bakelite door handle - 3 per unit
J) Hub body casing
K) Door to ring locking arm
L) Type 304 stainless steel door
M) Internal door lock gasket
N) Internal door lock cover
O) Internal door lock diaphragm
P) Internal door lock spring

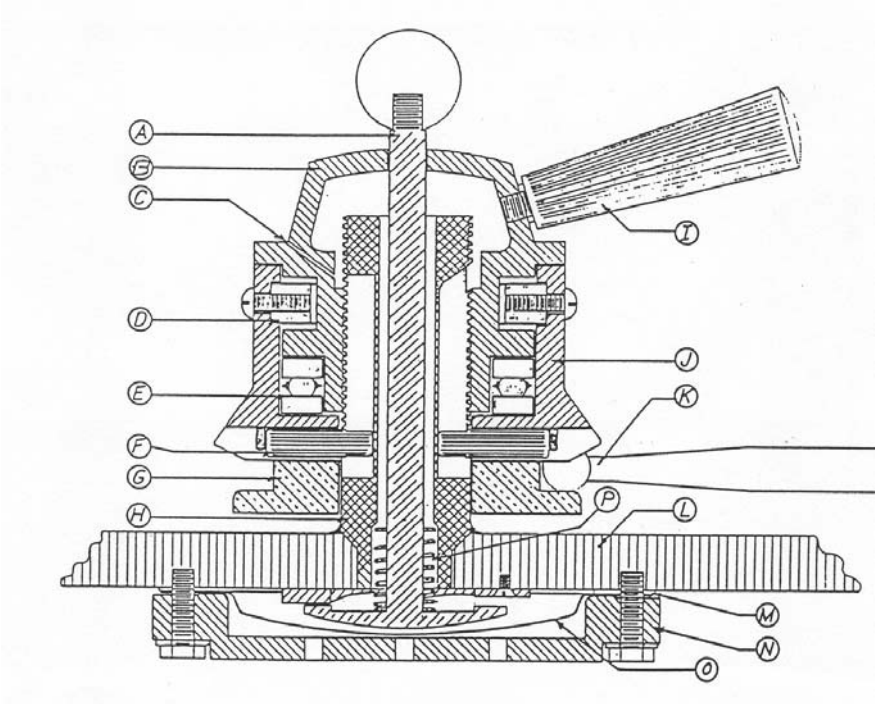


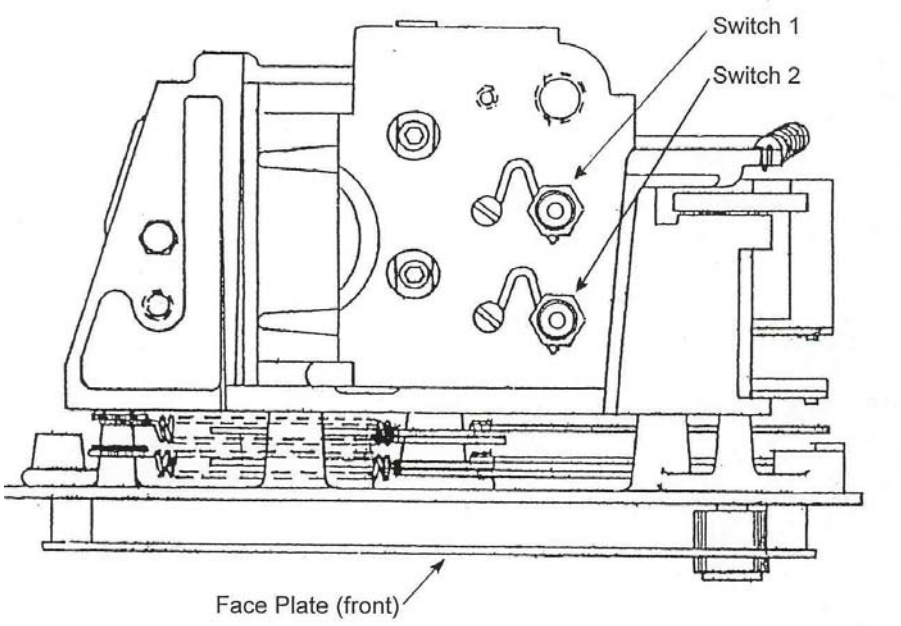
Figure 6.1

6.1 Lubricating the door hub

1. Open the sterilizer door but and tighten the hub handles all the way.
2. Spin the door handles less than a turn so that the oil hole, “C” in figure 6.1 is facing the top.
3. Pump three shots of oil (recommended MOBIL EXTRA HEAVY DTE LUBRICATING oil ISO VG150) into the oil hole using an oiler.
4. Now take two of the handles and move them back and forth. If there is more than 1/16-inch play in the handles, the hub needs to be inspected for possible damage to the threads.

7. Recorder Adjustment

If the recorder is recycling (resetting the sterilization time elapsed to zero), you should measure the "actual" temperature inside the chamber of the sterilizer using a secondary device and compare it to the recorder's temperature reading. If the recorder temperature reading matches the secondary device, then you should follow the following steps.



The above diagram shows a view from the UNDERSIDE of the recorder. You should open the recorder door, then open the faceplate and look under the recorder.

Switch 1) The micro switch set screw for the steam solenoid
Switch 2) The micro switch set screw for the timer light

If the recorder is recycling often, using a 3/8 open-end wrench, you may adjust the timer micro switch (Switch 2) by turning it 1/8 of a turn clockwise. If the recycling problem continues, you should repeat this procedure.

8. Valves & Solenoids

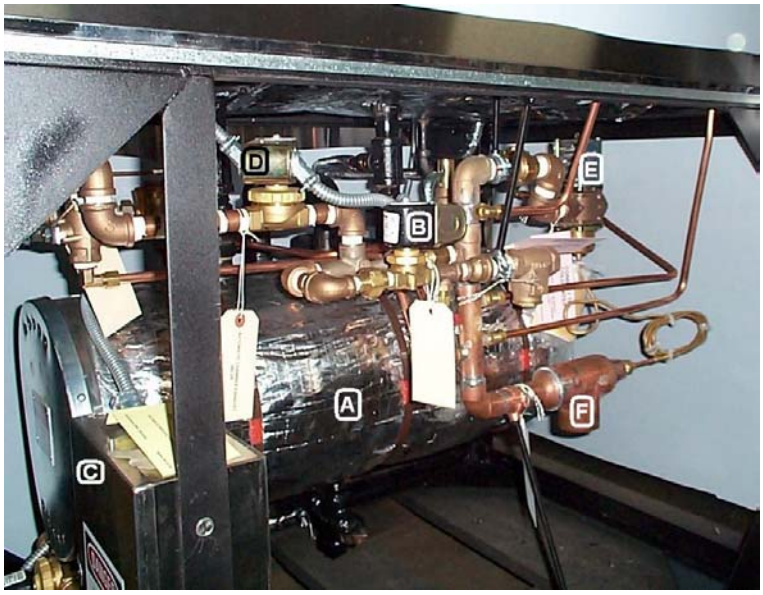
In the picture to the left:

A) Low Water Cut Off

B) Chamber Steam Trap

C) Water Level Sight Glass

D) Steam Generator



In the picture to the left:

A) Steam Generator

B) Water Solenoid

C) Contactor & Electrical Box for Steam Generator

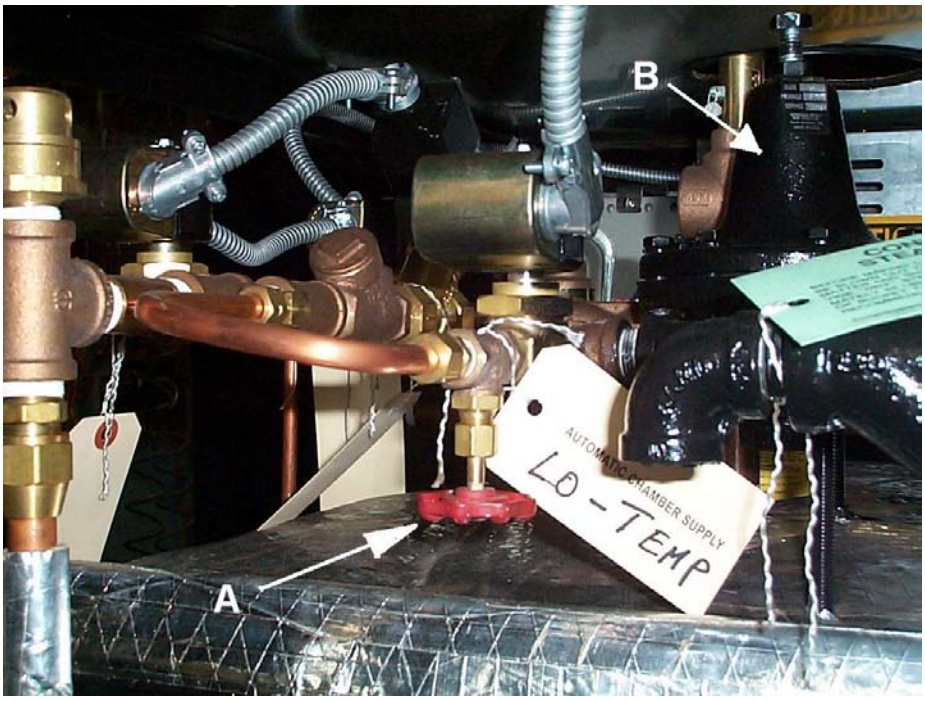
D) Fast Exhaust Solenoid

E) Johnson Automatic Waste-Water Cooling Valve

F) Drain

9. Low-Temp Sterilizers

On sterilizers equipped with Low-Temp cycle, there is an adjustment valve located on the center rear of the sterilizer marked “A” in the picture below.



This ¼ inch needle adjustment valve is tagged “Automatic Chamber Supply – Low Temp” and it controls the flow of steam into the chamber. To increase the flow of steam, turn the valve counter-clockwise. You will only need to adjust this valve once.

If the chamber temperature during the Low-Temp cycle overshoots the setting on the recorder, you should lower the setting on the chamber pressure regulator. This pressure regulator is marked “B” in the picture above and is adjacent to the adjustment valve “A”. You can lower the pressure setting by turning the adjustment nut on top of the sterilizer counterclockwise.

10. Plumbing Schematic

11. Electrical Schematics

12. Spare Parts List

13. OEM Components Specifications