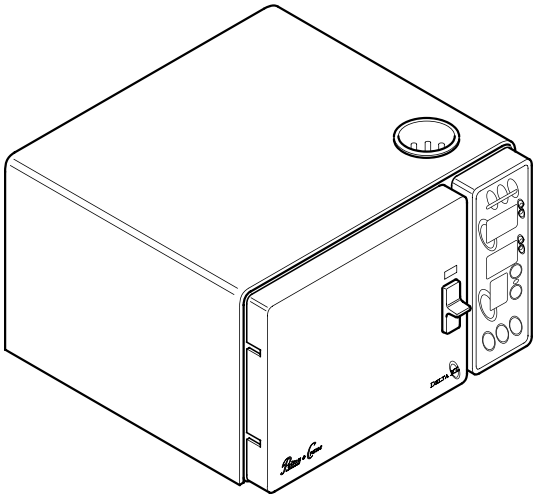
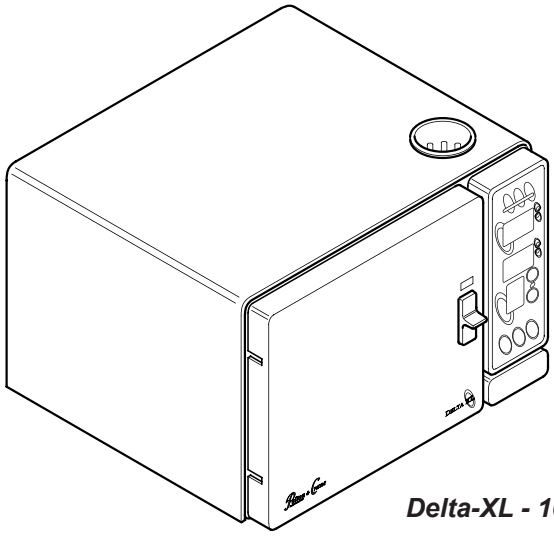
Pelton & Crane

DELTA XL

# PARTS LIST & SERVICE GUIDE

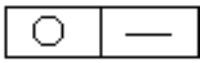


*Delta-XL - 8"*



*Delta-XL - 10"*

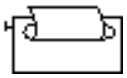
## Table of Symbols


On/Off Power Switch

Power


Ground

Mode


Printer Connection

Printer On/Off

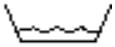

Arrows


Attention: Printer Connection Only

Clear/Start

Program


Hot Surface


Low Water


Dry


Ready


Sterilize

0473

The conformity of the quality management system is certified with Certificate No. 369CE, dated April 8, 1999 by:

AMTAC Certification Services, LTD
Norman Road, Broadheath, Altrincham
Cheshire WA 14 4EP, United Kingdom

The identification number of the notified body for implementation of the procedure set out in Annex V of the Directive is 0473.

The authorized representative :

Medical Device & QA Services
76, Stockport Road
Timperley
Cheshire
WA15 7SN
United Kingdom

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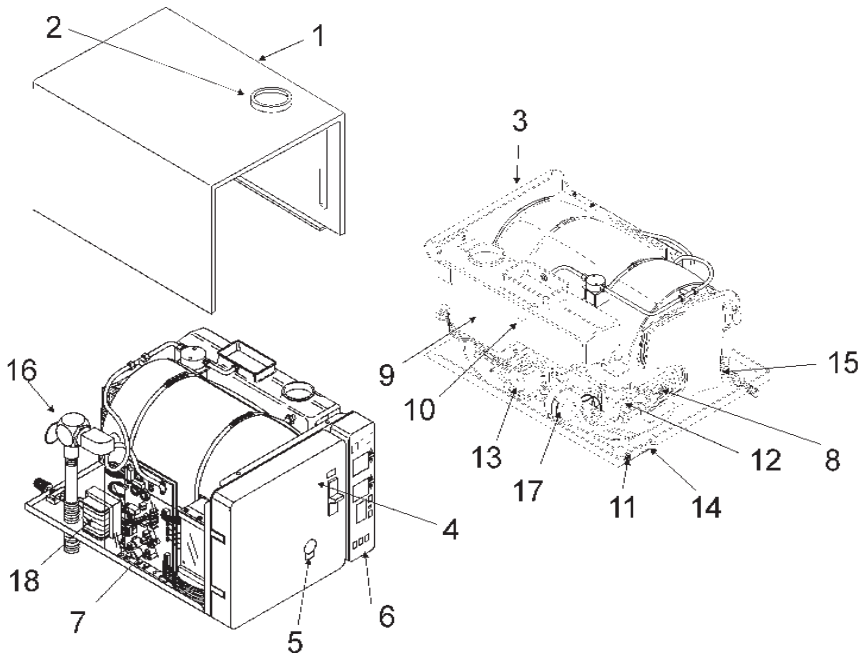
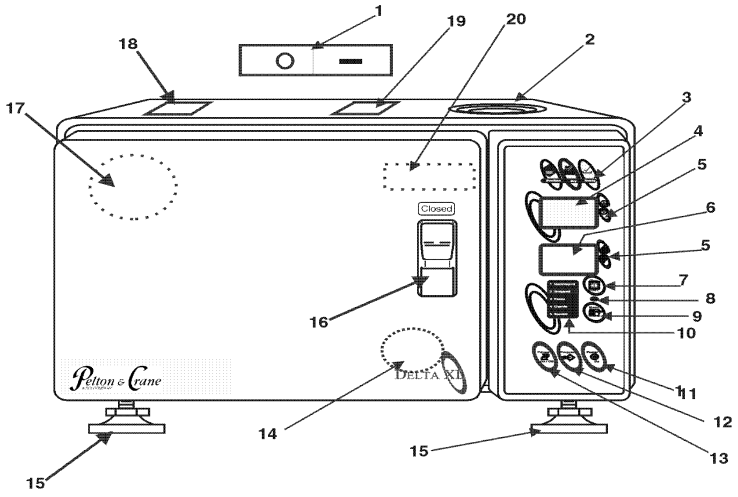
10 Water Level Switch (inside reservoir)
11 Printer Jack
12 Solenoids
13 Drying Pump
14 Master Power Switch
15 Heating Element (mounted on bottom of chamber)
16 Safety Valve
17 Filter
18 Transformer




## Operating Features

1. Power Switch/Circuit Breaker (rear of unit)
2. Reservoir Fill
3. Operation Indicator Light
4. Display Window (Pressure) kPa
5. Arrow Switches
6. Display Window (Temp/Time) C/F / Minutes
7. Clear/Start Switch
8. Low Water Light
9. Mode Selection Switch
10. Mode/Program Display
11. Power On Switch
12. Programming Switch
13. Printer On/Off Switch
14. Quick Drain Connection (inside door)
15. Leveling Feet
16. Door Lock
17. Safety Valve (rear corner of unit)
18. Operating Instructions Label
19. Caution Label
20. Serial Number Plate (inside door)




## Safety Features

The design of the autoclave has these safety features for your protection:

Door Lock
Door can be opened only when internal pressure is at atmospheric pressure.

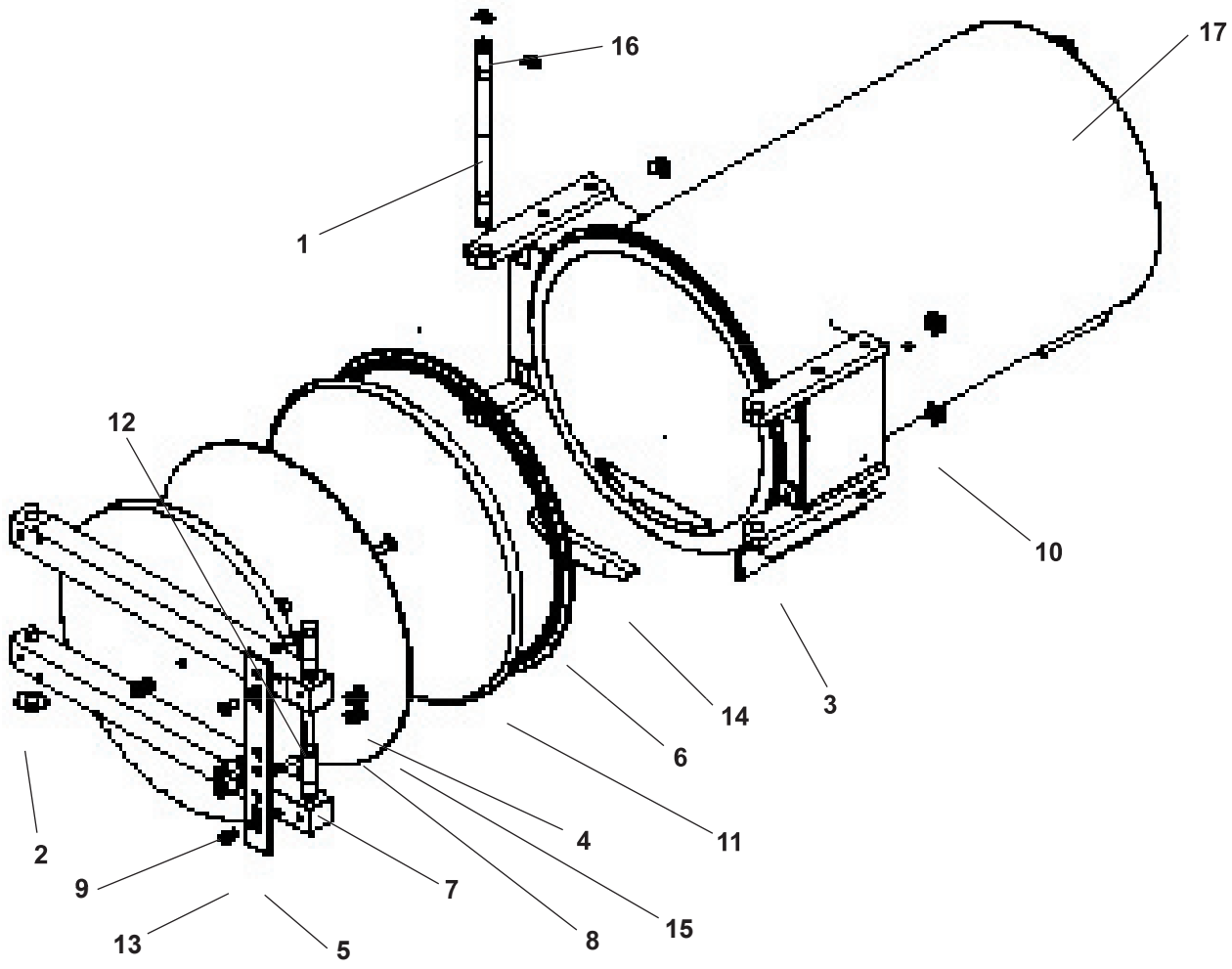
Vent Valve
The vent valve will open and the P-2 alarm will display should the chamber pressure exceed 240 kPa.

Safety Valve
The safety valve opens as backup protection should the chamber pressure exceed 262 kPa.

Overheat Protection
Chamber temperature is protected with a surface sensor so the temperature will not exceed 159°C. It has additional overheat protection should the temperature of the heating elements reach 180°C.

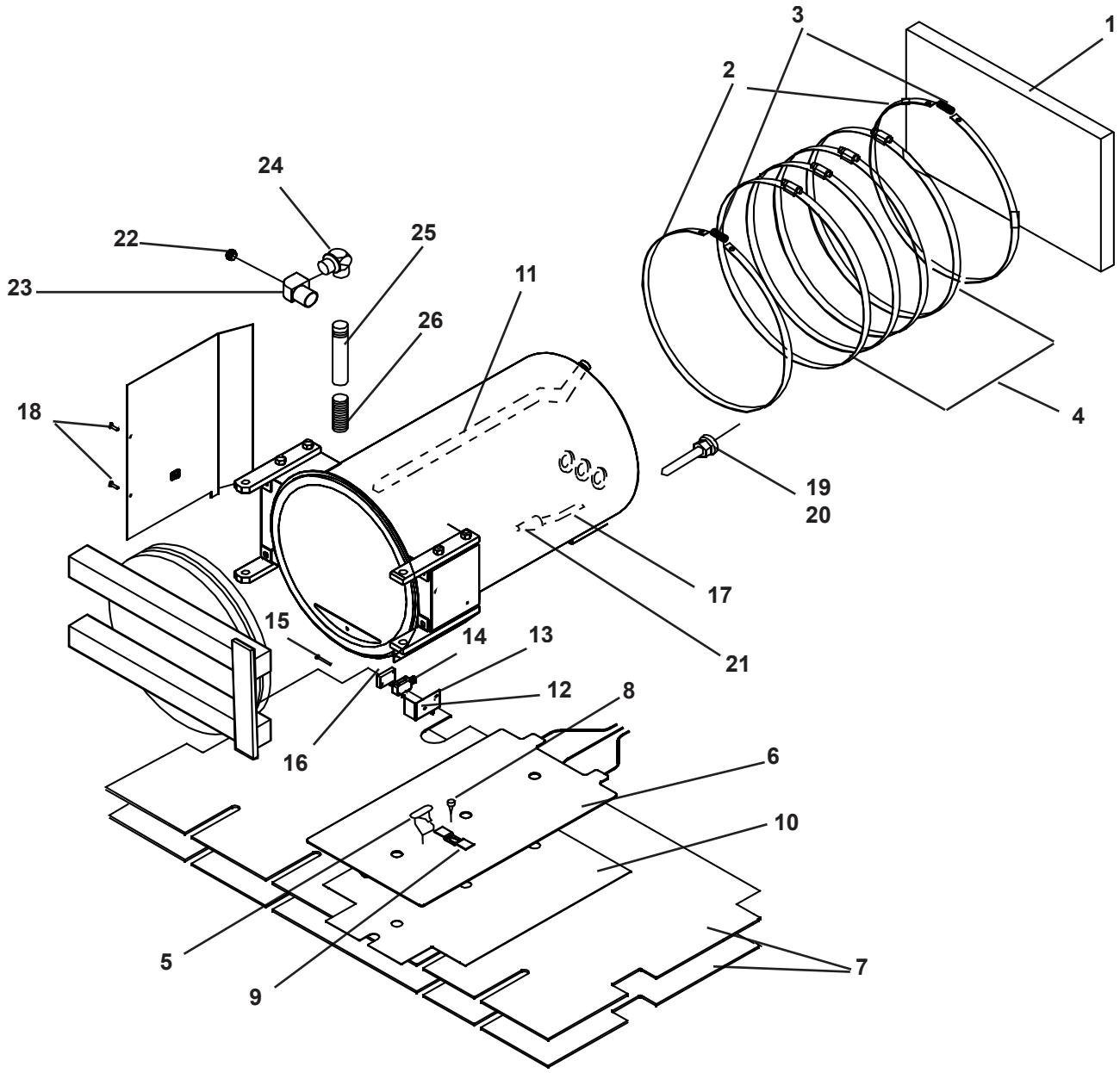
Electrical Power Interruption
In case of a power failure during the sterilization cycle, pressure in the chamber is automatically vented to the atmosphere and display is blank.

Chamber and Door




| No. | Part No. | Description |
|---|---|---|
| | | |

## Chamber, Heating Element And Insulation

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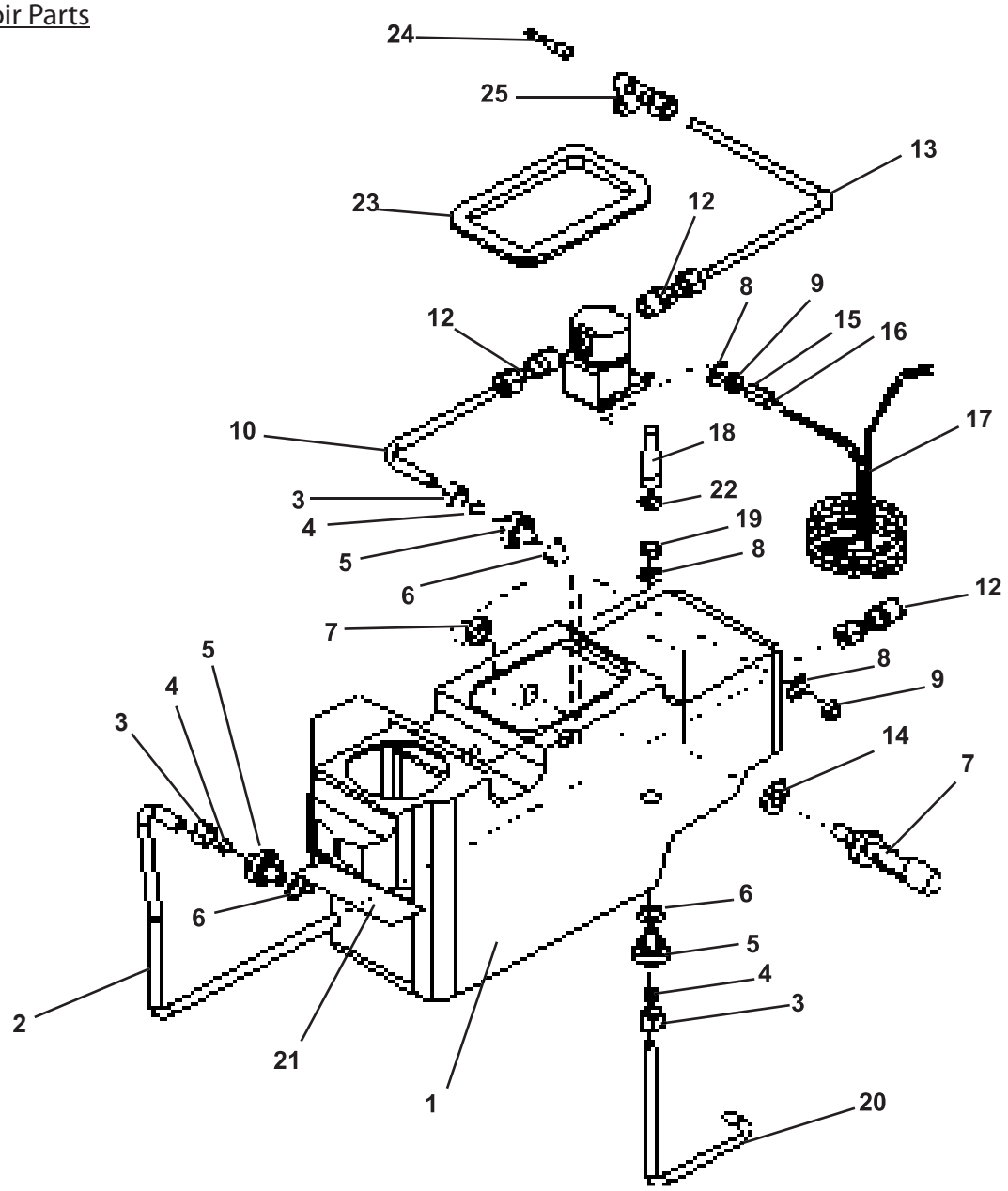
Reservoir Parts

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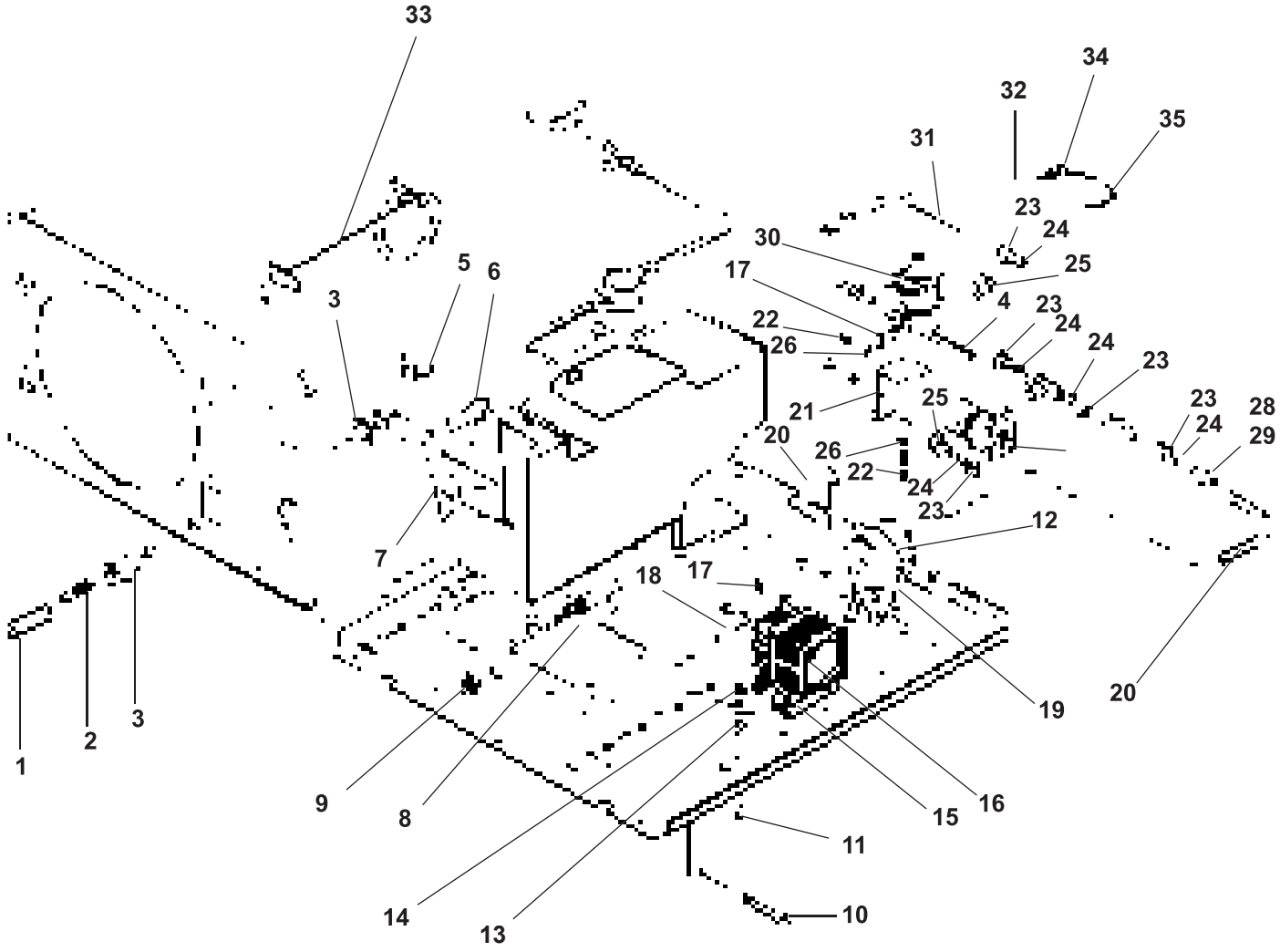
## Plumbing Parts

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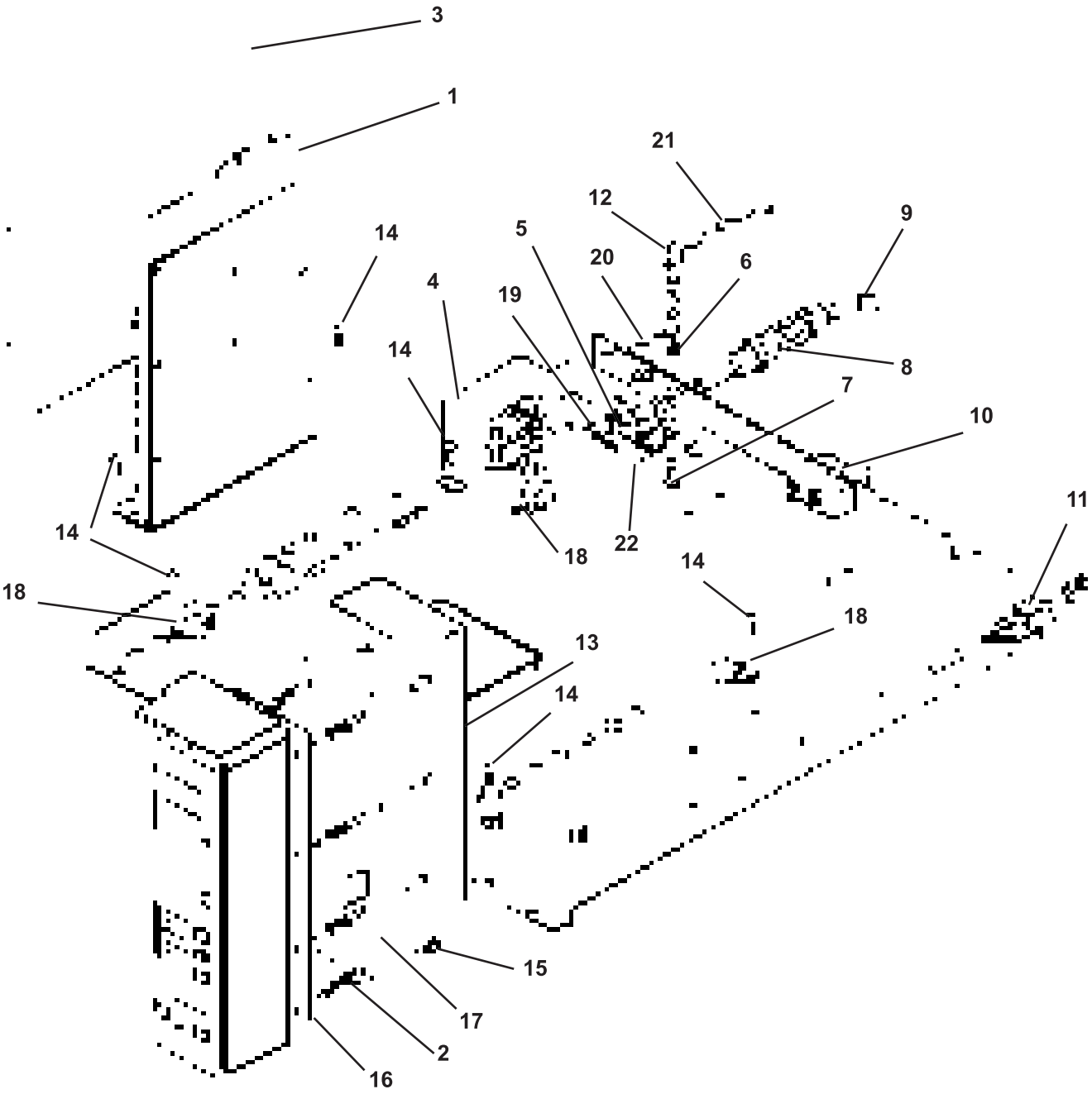


| No. | Part No. | Description | No. | Part No. | Description |
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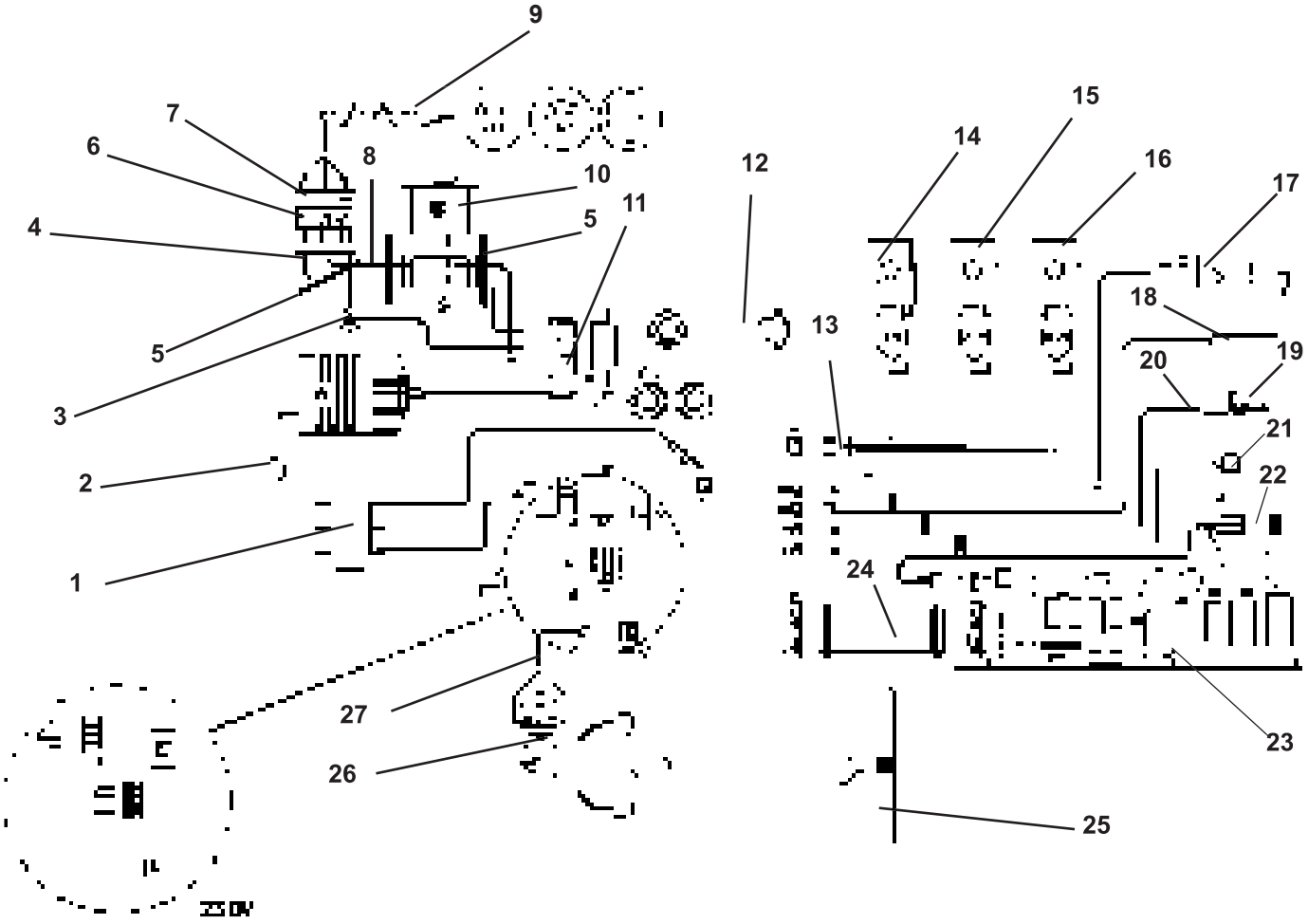
Electrical Diagram




| No. | Part No. | Description | No. | Part No. | Description |
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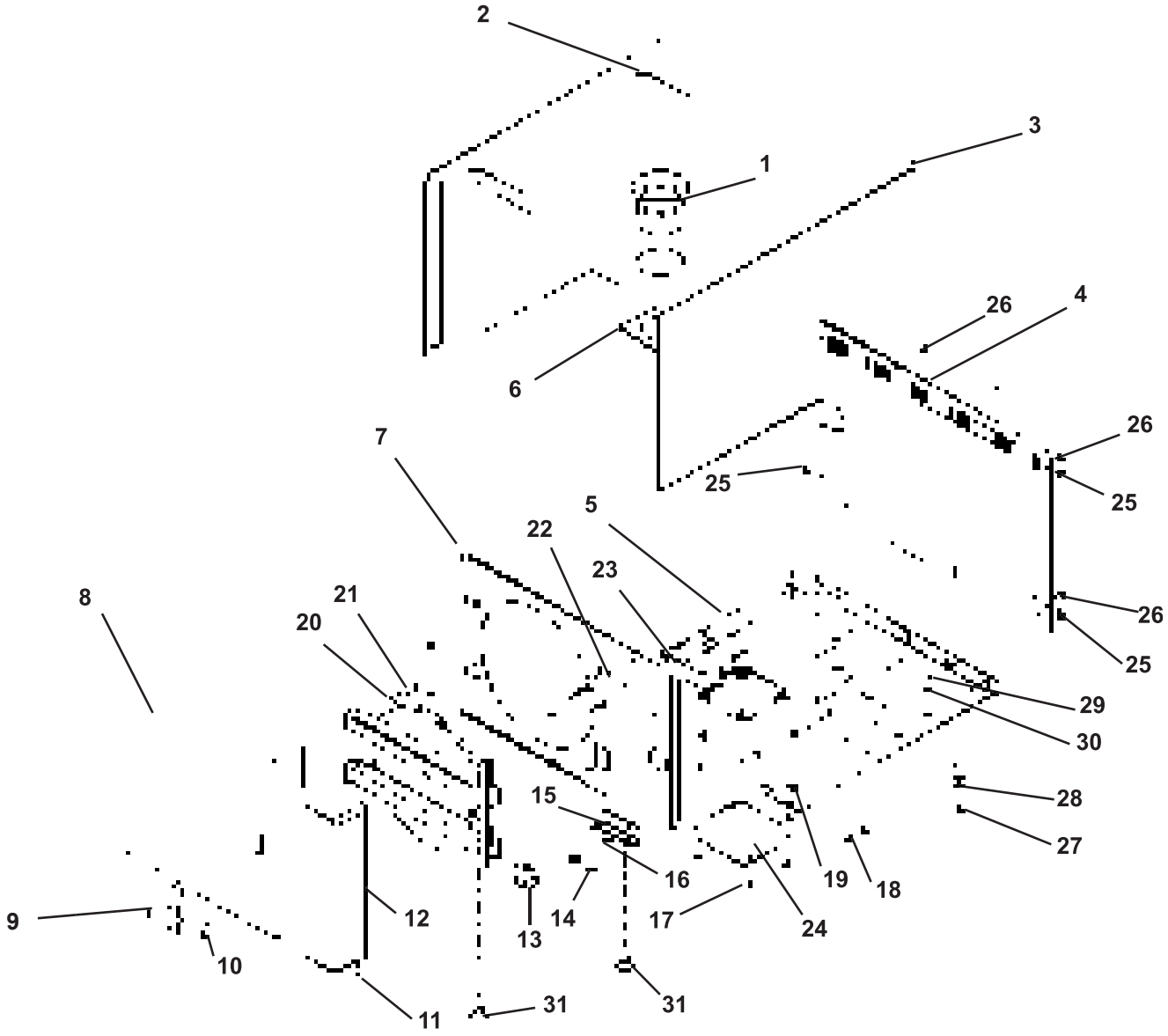
## Front Frame and Casing Parts




| No. | Part No. | Description | No. | Part No. | Description |
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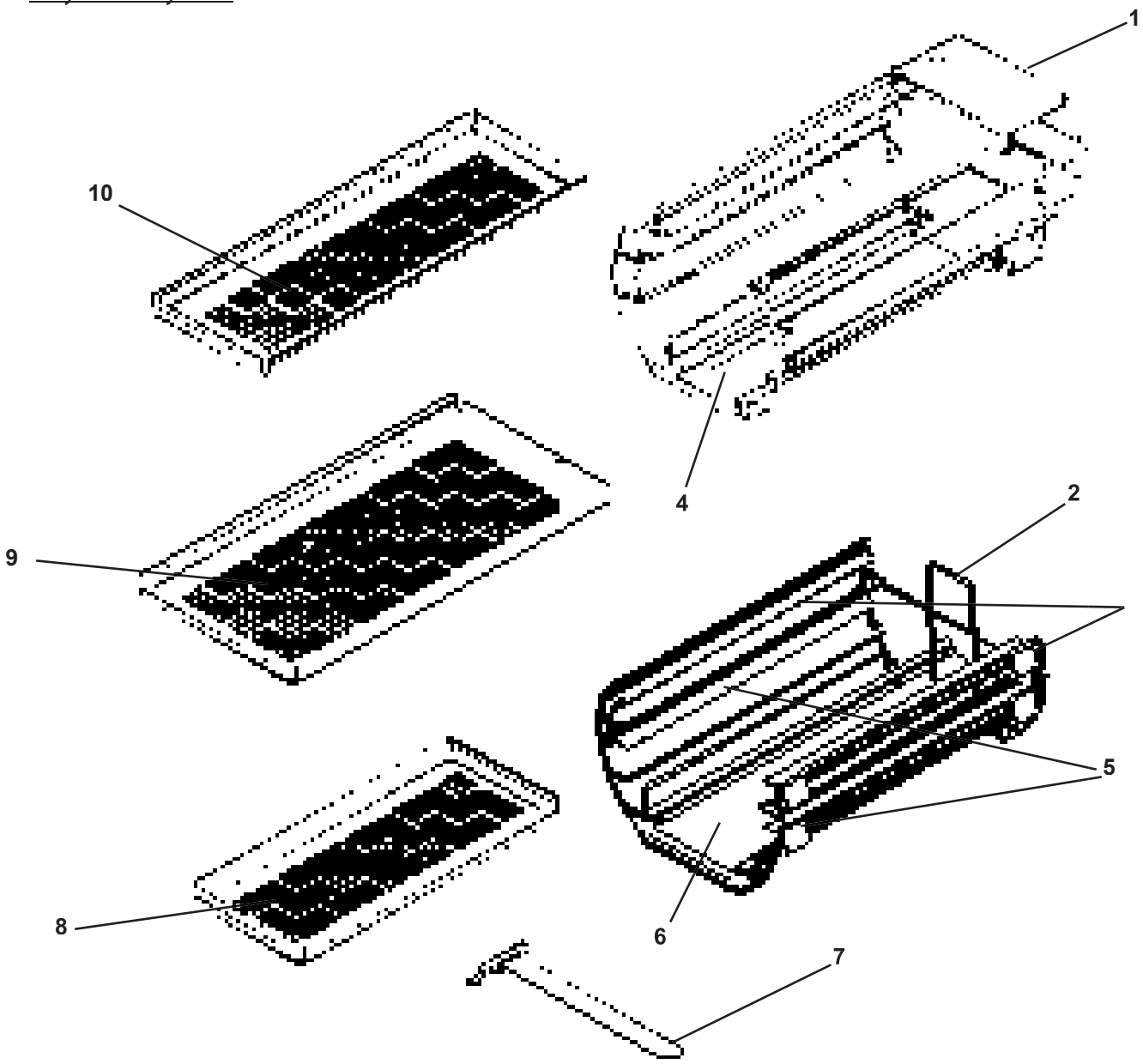
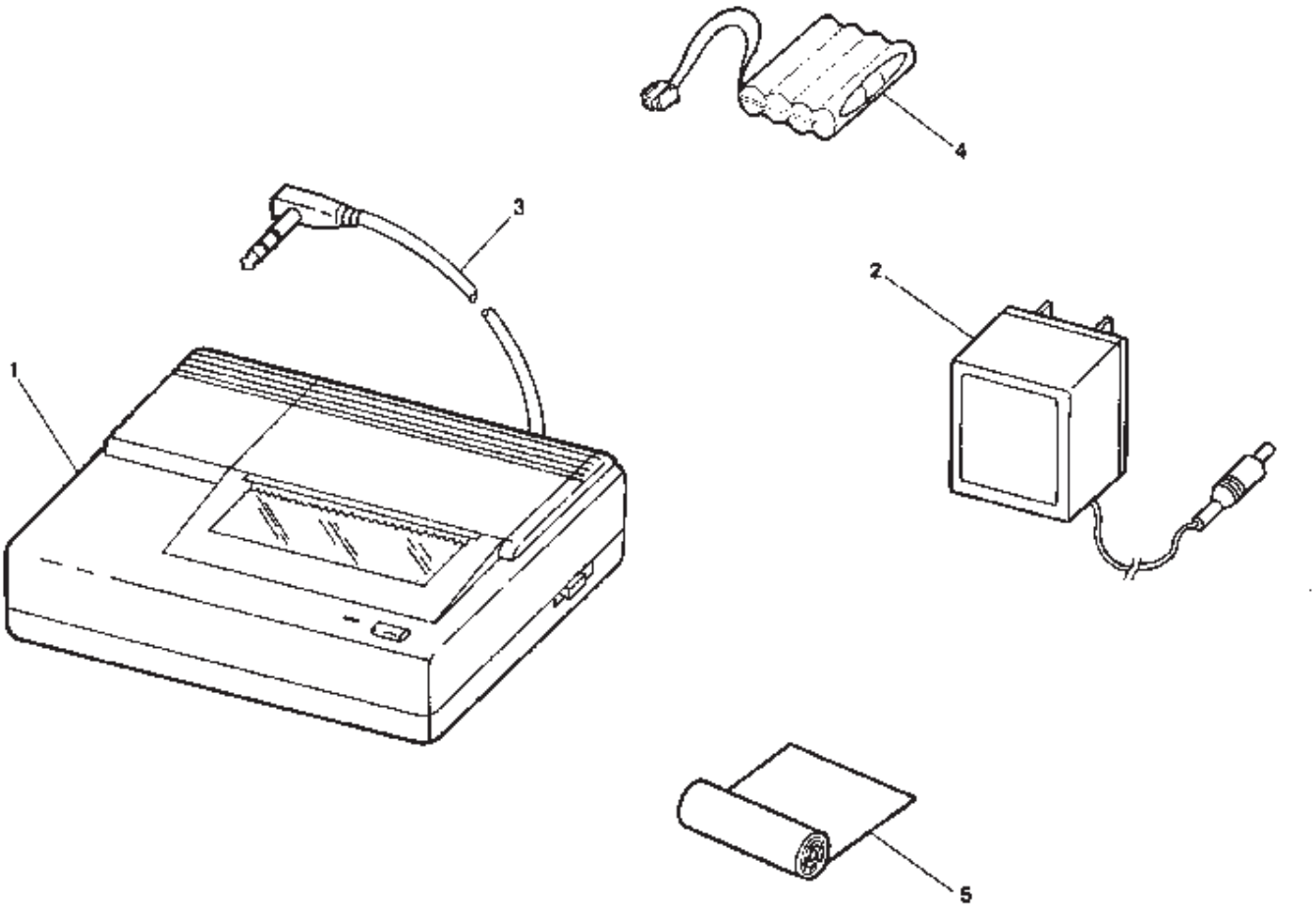
| | | | | | |

Tray and Tray Rest




| No. | Part No. | Description |
|---|---|---|
| | | |

Time/Temperature Printer




| No. | Part No. | Description |
|---|---|---|
| | | |

- Measurements

Instruments required

1. Digital multimeter model FLUKE 8000 A, or equivalent.
   Accuracy: AC voltage ± 0.5% of reading plus 1 digit.
   DC voltage ± 0.1% of reading plus 2 digits.
   DC current ± 0.3% of reading plus 1 digit.
2. Testleads: Small needle point testleads are required when voltage measurements are performed at connectors which remain plugged.

Always switch the unit OFF before connecting measuring instruments.
Select the correct type of current/voltage and set the measuring range according to the expected measured values.
Carry out continuity tests only with the unit switched OFF.

- Warm-up period & self-test

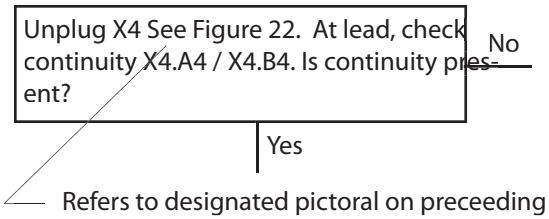
Do not press any buttons when switching ON!
After switching ON, the unit runs a self-test for the unit electronics.

- Interference with electromedical devices by radio telephones

To guarantee the operational safety of electromedical devices, the operation of mobile radio telephones in the medical practice or hospital area is prohibited.

- Troubleshooting tree guidelines

Element, component identifier: Located at the top of each page.




- When using the troubleshooting trees

and a connector is unplugged for continuity or voltage measurements, the term:
"at lead" indicates that the measurement is to be performed on the cable or "lead" end.
"at board" indicates that the measurement is to be performed on the PCB connector.

- Resetting the unit

Turn the power off at the main Power Switch.
Turn unit back on after 10 seconds..

- Replacing parts

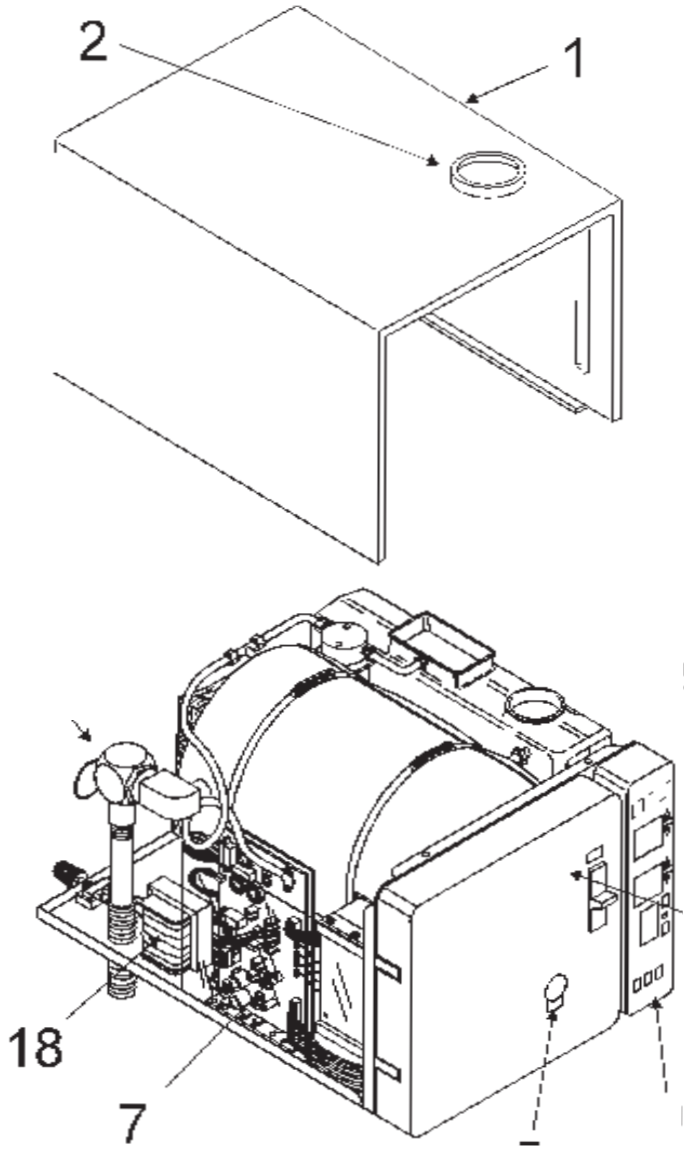
Switch the unit OFF and unplug before replacing parts.

To protect electrostatic-sensitive devices (ESD) on PC-boards, observe the ESD guidelines. Avoid coming into contact with electronics components. As well as possible, handle PC boards only at the edge. Discharge yourself by touching a grounding point.
Transport PC boards only in the original transport bags!

Find article numbers required for ordering replacement parts in the List of Spare Parts documents, order number P/L 4702135 for the 8" unit or P/L 4702143 for the 10" unit.
The pictorial representations in the spare parts list offer valuable assistance for replacement of parts.

## Removing/Reinstalling Cover

1. To remove cover, remove only the two bottom screws of rear panel.
2. Remove reservoir fill cup.
3. Slide cover to rear, then lift front of cover slightly to clear top of reservoir.




Note: When replacing cover, make sure lip of front panel engages in slot along all edges. Reinstall screws and reservoir fill cup.

The Sterilizer is a fully automatic autoclave, which allows an operator to select one of the four preset functions (Wrapped, Unwrapped, Packs and Liquids) and one user-programmable function (Special) for sterilization or disinfection. The microprocessor automatically selects the cycle time, temperature and pressure for the preset programs. See User Manual.

When the operator depresses the "CLEAR/START" button, the unit will display the selected mode's parameters for four seconds and then fill the chamber with distilled water from the reservoir. When the filling period is complete, automatic activation of the heating elements builds temperature and pressure for the desired cycle.

As the temperature in the unit rises above 90° C., the microprocessor monitors the unit for saturated steam conditions and starts the air bleeding process via an electronic bellows function. If this process cannot be completed in seven minutes, then the unit automatically aborts the cycle and displays a flashing "FAIL" on the display to indicate possible blocked or defective bellows. See "FAIL" in the Troubleshooting section. The cycle is aborted at this point to avoid a possible overpressure condition.

At the point that saturated steam conditions are met, the unit will continuously build temperature and pressure to the minimum values of the mode selected. These values are:
134°C and 216 KPa for Wrapped and Unwrapped,
121°C and 115 KPa for Packs and Liquids.

For the Special mode, the values can be set to the operator's preference. See User Manual.

Once sterilization parameters are achieved, if the pressure drops more than 4 KPa below the selected pressure, or if the temperature drops more than 1°C below the selected temperature, the countdown timer will stop until these parameters are again met. If the timer does not resume countdown within three minutes, the unit will automatically abort the cycle and display "FAIL" continuously. See "FAIL" in the Troubleshooting section.

After the cycle is complete and the chamber is vented, the drying cycle begins. Filtered ambient air is pumped through the chamber for a preset time. The time is set at the factory for 30 minutes, but can be changed from 0-99 minutes. See User Manual.

1. H20- Insufficient water in sterilizing chamber.

2. Fail- a) Unit takes more than 45 minutes to reach operating temperature;
   b) Door opened after "FILL", display extinguishes;
   c) Unit takes more than 7 minutes between 101° C. and 110° C.;
   d) More than a 3 minute lapse in sterilize countdown due to leak causing more than 4 KPa pressure or if pressure decrease.

3. Door- Door not fully closed during fill cycle.

4. P1- Pressure sensor out of calibration or not working.

5. P2- Unit reaches 241 KPa before displaying 135° C.

6. SS-1- Steam sensor is defective or autoclave is too cold (Under 10° C.).

7. SS-2- Surface sensor circuit open during self test.

8. SS-3- Steam sensor too hot (Over 140° C.).

9. LB- Low battery condition in front control panel.

10. U1- Transformer problem.

11. S1- Fill/ Vent solenoid coil or circuit open.

12. S2- Dump solenoid coil or circuit open.

13. S3- Bellows solenoid coil or circuit open.

## Component Description by Function

- Door Lock

  The door locking mechanism prevents opening of the door while the unit is pressurized.

- Safety Valve

  The safety valve serves as backup protection in case of over pressure in the chamber. The safety valve opens if chamber pressure exceeds 2.6 bar

  NOTE:

  When replacing the safety valve, use only the type for which the unit was originally certified.

- Fill/Vent Solenoid

  The fill / vent solenoid serves two purposes under software control:

  • When in the fill process this, solenoid allows water to enter the chamber from the reservoir. It is open for a minimum of one minute during this process. It will be open for longer periods of time as each successive cycle is run based on the amount of water in the reservoir. If there is pressure in the unit at the time the fill cycle starts, then this timer will be delayed until all pressure has been exhausted in order to facilitate rapid cycling of the unit.

  • When in the venting process, and the pressure is between 0.40 and 0.20 bar, this solenoid is used to extract the Water from the chamber.

- Bellows Solenoid

  This solenoid is under software control and also serves two purposes:

  • When in the venting process, this solenoid is used to exhaust the pressure from the working value down to 0.40 bar.

  • When in the air-bleeding process, this solenoid is used as an electronic bellows to remove the air from the chamber in order to obtain saturated steam conditions.

- Dump Solenoid

  This solenoid is under software control. Its primary purpose is to rapidly exhaust residual chamber pressure. Normally, during the venting process, it will be opened at 0.20 bar, but it may be opened during the filling process to exhaust residual pressures.

- Reservoir Assembly

  The reservoir assembly holds water (approx. 4 liters) for filling the autoclave chamber. Drain tube in the reservoir allows the operator to drain from the front of the sterilizer (see User Manual, "Maintenance").

  The condensing coil in the reservoir condenses steam, coming from the chamber, back into water for reuse in the next cycle.

- Water Level Indicator

  A float mechanism activates the low water light on the front panel when water level in reservoir drops (see User Manual, chapter "Operations").

- Heating Element

  The heating element allows for even heating of the chamber. The power level is controlled by the microprocessor for preheat, sterilization and drying cycles. When the unit is turned on, the heaters are energized in preheat mode (0600-1800 hrs) to minimize the warm-up time for the first cycle. The heaters modulate ON/OFF at a given duty cycle and depend upon the incoming line voltage and frequency in every process.

- Air Pump and Filter

  A positive displacement air pump forces ambient air through a 0.3 μm filter and then through the chamber for the programmed time.

- Microprocessor MPU / Front Panel Printed Circuit Board

  There are two PC boards located underneath the front cover, which contain the microprocessor and the display driver/ push button controller. These two PCBs are stacked one on top of the other.

  The top PCB is the microprocessor board, which has LEDs and test points for monitoring the input-output status of the processor.

  The bottom PCB is the display driver/ Push-button controller.

  WARNING: If the Display (bottom) PCB is defective, return it with the display and cover intact. Do NOT attempt to remove it from the cover !

- Power Board

  This PCB carries all of the necessary driver circuitry for the solenoids and the heater and the interfaces for all temperature sensors and the pressure sensor. This PCB has indicators and test pins for monitoring the input/output status of this board.

- Transformer

  This Transformer generates all of the low voltage supplies required to operate the unit.

## Audible Signals

The Sterilizer provides some of its status information through audible signals:

A single beep sounds each time a button or the main power switch is activated.

Five continuous beeps indicate the beginning of the drying cycle. Five more beeps indicate the completion of the drying cycle.

Continuous beeps for one minute indicate an operational error. Beeper can be silenced during an operational error by depressing the "CLEAR/START" button. Be sure to record the display status before depressing the button as the display may also be cleared at this time. (The "DOOR" alarm is cleared if the door is closed).

## Normal Cycle Description

- After loading the Sterilizer, close the door, select the proper Mode and depress "CLEAR/START". The unit will display selected modes parameters for four seconds, after which it will display "FILL" as water runs in from the water reservoir into the chamber.

  After filling, the display will show the current pressure ("PRES") and temperature ("TEMP"). The heater will begin cycling on and off to start chamber heat-up and pressure build-up. Pressure should start to build at about 90° C.

  Once the sterilization cycle begins, it is controlled by the pressure. The sterilization timer will be shown in the lower window, (unless the operator has programmed the unit to show temperature during the sterilization instead of time) and will count down when the select temperature and pressure parameters are above their minimum values.

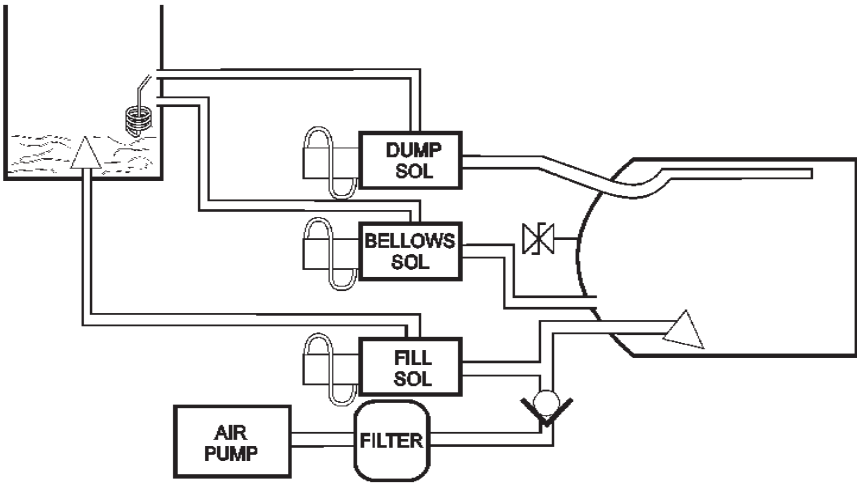
  If pressure loss occurs, the timer will pause, since it only counts down when the select temperature and pressure parameters are above their minimum values. A "FAIL" alarm will occur if the cycle pauses for more than a total of three minutes because of pressure loss.

- At the end of the sterilization time, the bellows solenoid opens to lower chamber pressure to 40 KPa. When the pressure reaches 40 KPa the bellows solenoid will close and the fill/vent solenoid will open and the remaining water will be extracted from the chamber. This process continues until the pressure reaches 20 KPa, at which time the fill/vent solenoid will close and the bellows solenoid will reopen along with the dump solenoid, to rapidly vent the remaining pressure. (The "Liquids Cycle" is an exception: This cycle cools down without venting to prevent the liquids from boiling over from a sudden pressure drop).

- At this point, the drying cycle begins. A nominal 30 minute drying cycle is preprogrammed. The drying time can be changed from 0-99 minutes. See User Manual.
  To start another load, depress "CLEAR/START" to initiate the sterilization process again.

  See also User Manual.

Table: Valve Actuation Operation Mode




| Solenoid | Fill | Sterilize | Vent >40 KPa | Vent (40-20 KPa) | Dump (20 KPa) | Off |
|---|---|---|---|---|---|---|
| | **Cycle Process** | | | | | |
| Fill/Vent Solenoid | Open | Closed | Closed | Open | Closed | Closed |
| Bellows Solenoid | Open | Closed | Open | Closed | Open | Open |
| Dump Solenoid | Open | Closed | Closed | Closed | Open | Closed |

To run self check, simply turn on main power switch at back of unit and wait for the unit to beep and finish a series of clicks. At this time, depress and hold the "CLEAR/START", then depress the "POWER", letting go of both at the same time.

This operation does not check "Lb" for low battery.

The printer may be used as a diagnostic tool. Cycles recorded in the Sterilizer's memory may be downloaded to the printer starting with the last cycle first. Press and hold the "PRINTER" button to download the memory. To stop the download process, depress "CLEAR/START". Eight lines are printed out per run cycle.

Note: Unit will turn off after the download process is complete.

Mineral buildup on chamber wall or water spots on chamber and contents.

- Problem Cause
  Minerals in water deposit on chamber or on contents.
- Corrective Action
  Clean per User Manual. Refill using distilled demineralized water.

Unit takes an excessive amount of time (over 21 min. from warm start) to reach sterilization temperature.

- Problem Cause
  1. Load is too large.
  2. Low power line voltage.
  3. Leak in valves.
- Corrective Action
  1. Remove some packages/articles for faster heating.
  2. Correct voltage if possible.
  3. Refer to " FAIL" in Troubleshooting.

Water flows into bottom of Sterilizer when unit is not in "FlLL" cycle.

- Problem Cause
  1. Leaking fill solenoid valve.
  2. Hole in condensing tube.
- Corrective Action
  1. Clean or replace fill solenoid valve.
  2. Replace condensing tube.

Unit drips on counter when door is opened after cycle.

- Problem Cause
  Rubber spacer missing or damaged.
- Corrective Action
  Replace rubber spacer.

Water comes out of fill opening on top of case when unit vents to reservoir.

- Problem Cause
  1. Reservoir overfilled.
  2. Cracked or loose condenser tube causing turbulence.
- Corrective Action
  1. Drain some water. With unit in standby and chamber dry, fill only to bottom of filler cup opening.
  2. Tighten or replace condenser tube.

Dark stains on instruments

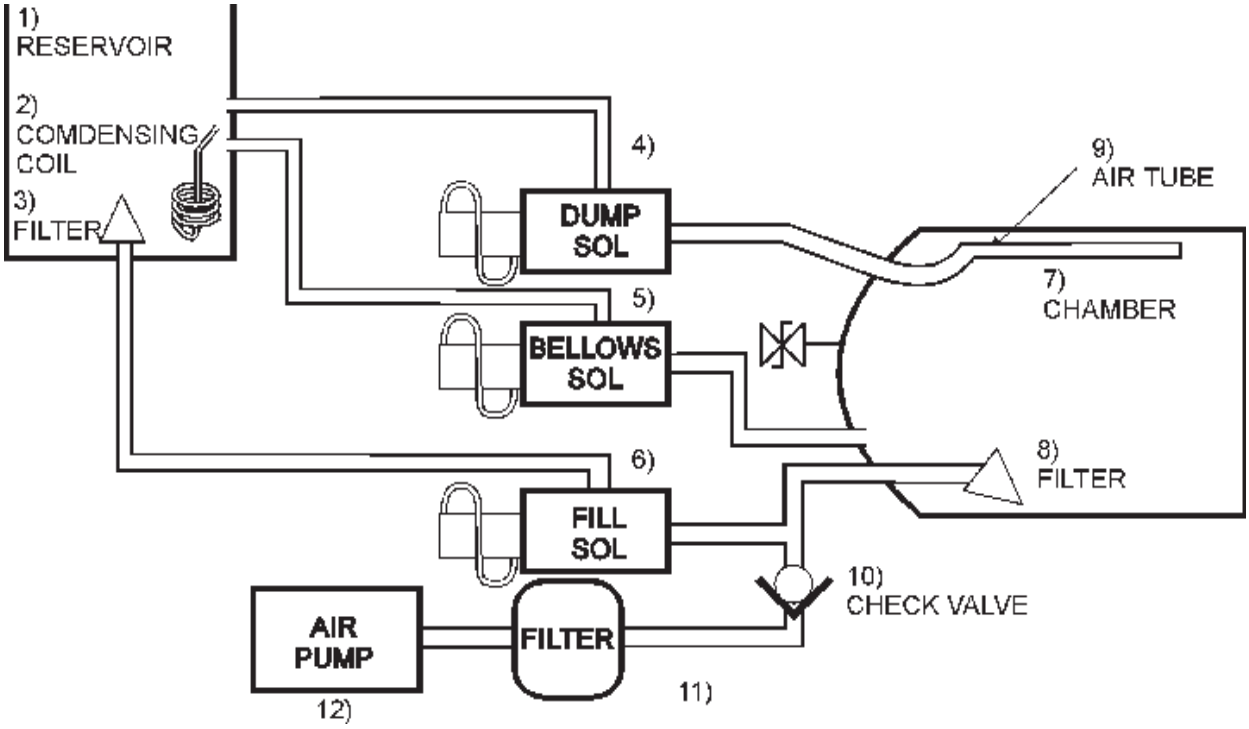
- Problem Cause
  1. Electroplating.
  2. Chlorine stains.
- Corrective Action for
  1. Do not mix dissimilar metals in the same package. Separate carbon steel, aluminum chrome and brass from stainless steel trays by using a tray liner.
  2. Do not use toweling or packaging which may contain chlorine bleach residue.

Chamber cracks

- Problem Cause
  Chlorine.
- Corrective Action
  Never use chlorine cleaners or materials in chamber. Wrapping materials should not be cleaned with chlorinated bleaches.

## Plumbing Diagram

1. Reservoir
2. Condensing Coil
3. Filter (Reservoir)
4. Dump Solenoid
5. Bellows Solenoid
6. Fill/Vent Solenoid
7. Chamber
8. Filter (Chamber)
9. Air Tube
10. Check Valve
11. Filter (Air)
12. Air Pump



The H2O alarm is a direct response from the Surface Sensor. The Surface Sensor is a temperature sensitive device that is fastened to the underside of the chamber. It monitors the temperature of the chamber and can distinguish, by the increase in temperature, when the water level has receeded beyond a safe level. At this point (159° C.), the Surface Sensor opens and H2O is displayed. This is to prevent a boil dry situation that can ruin the heating element and chamber. This is caused by one of the following conditions: A) The chamber will not fill properly; B) The unit is not properly leveled; C) The chamber leaks under pressure; D) Defective or loose Surface Sensor or defective cable.

Close the door and start an "Unwrapped" cycle. When the "FILL" display changes to a temperature and pressure display, open the door. This will abort the cycle. Is the water level in the chamber approximately half way up the dam in the front of chamber?

Yes → See "H2O (Path B)."

No

Clean or replace reservoir filter and chamber filter. Does chamber fill properly now? See Figures 8 and 9.

Yes → Unit is OK. Run another cycle to test.

No

Is the unit properly leveled?

No → Adjust the front feet, so that the front of the unit is approximately 1/4" higher than the rear.

Yes

Is the reservoir filled to the correct level with distilled water?

No → Be sure to fill the reservoir to the bottom of the fill cup with distilled water.

Yes

See Next Page

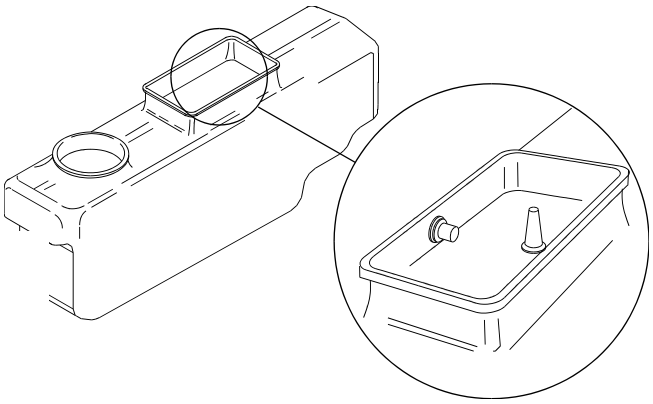


Figure 8.

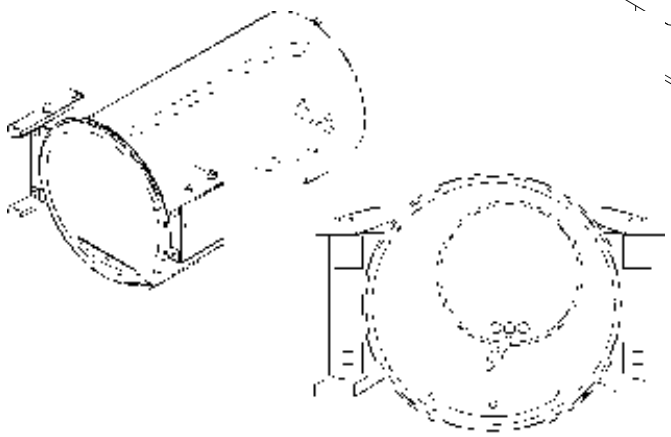


Figure 9.

Yes

Was the unit drained of all its water or recently moved to a new location?

Yes → The unit could have an air lock preventing it from filling. Manually fill the chamber, with distilled water, to the top of the dam located at the front of the chamber. Close the door and depress "CLEAR/START". This will eliminate the air lock and allow the unit to fill properly.

No

Close the door, remove the casing and start an unwrapped cycle. Observe LEDs D20 and D18 on the Power PCB. Are they illuminated? See Figure 3.

No → Turn the unit ON. Remove screws and lift off Front Control Panel, leaving cables connected. Press the "CLEAR/START" button. Does LED D3 ("Fill/Vent") illuminate? See Figure 1.

No → Replace MPU PCB.

Yes → See Next Page

Yes → Check ribbon cable between MPU PCB and Power PCB. Is it open or disconnected? See Figure 4.

No → Replace Power PCB. See repair procedure.

Yes → Reconnect or replace.

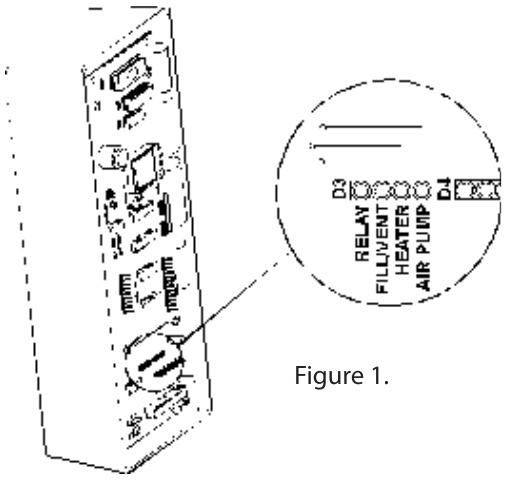



Figure 1.

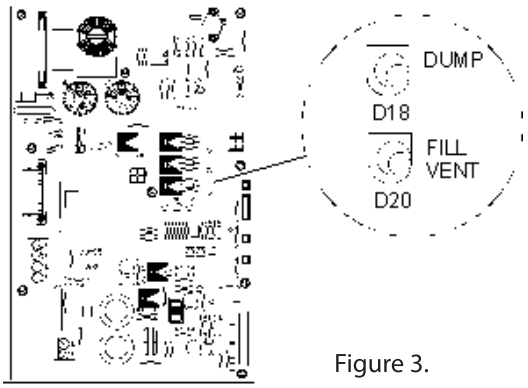



Figure 3.

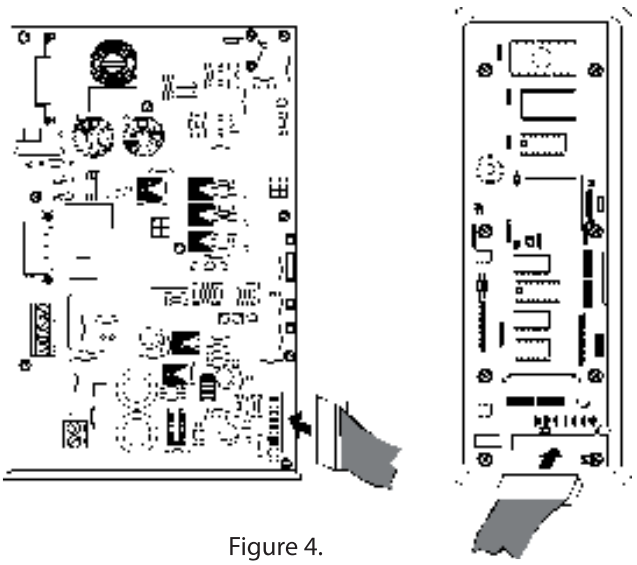


Figure 4.

Yes

Measure the voltage of all three solenoids while "FILL" is displayed on the front panel. The voltage should be approximately 12VDC at the fill and dump solenoids and 0VDC at the bellows solenoid. See Figure 2.

No

Check for 12VDC output from Power PCB at connector P5, pin 1-pin 4 for dump solenoid and pin 3 - pin 6 for the fill/vent. See Figure 4.

No → Replace Power PCB. See repair procedure.

Yes

Check solenoid cables, between solenoid & Power PCB. Are cables disconnected or damaged? See Figure 6.

No → Replace Power PCB. See repair procedure.

Yes → Reconnect properly or replace cable.

Yes

Disconnect power to the unit, unplug one wire from each solenoid and measure the resistance of the solenoid coils. The resistance should be approximately 16 OHMS. See Figure 7.

No → Replace solenoids as necessary.

Yes

Check dump and fill/vent solenoids and tubings for blockage.

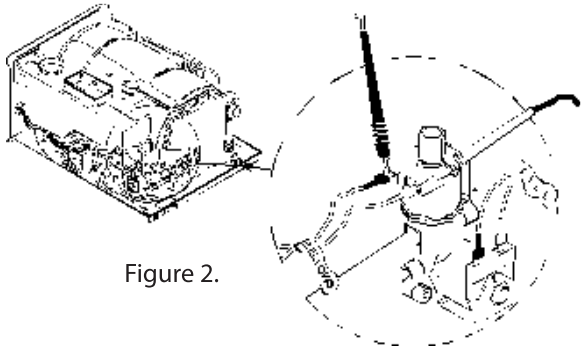


Figure 2.

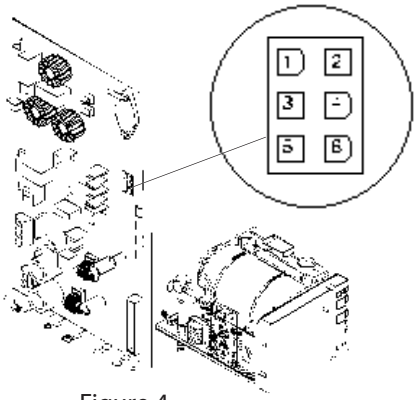



Figure 4.

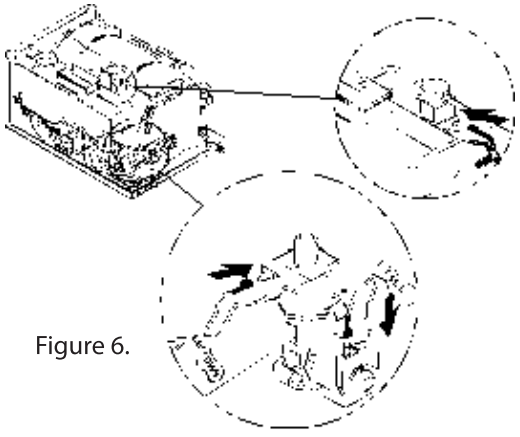


Figure 6.

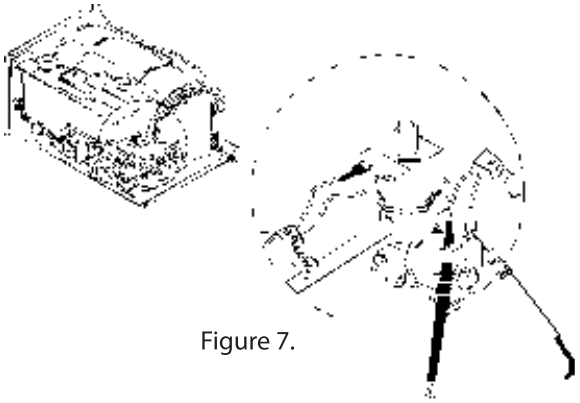


Figure 7.

As the chamber begins to build pressure, excess water will start returning to the reservoir through the condensing coil via the bellows solenoid. At 90° C., the air purging process begins. This process opens and closes the bellows, while sampling for a pure steam atmosphere. The purging process is complete at 110° C. After this occurs, no water should return to the reservoir until sterilization is complete.

Branch 2
"Checking for External Leaks"

Close the door and start and "Unwrapped" cycle. After the unit reaches 111° C., is any water or steam returning to the reservoir?

No

Are there any external water leaks with the unit running and under pressure?

Yes → Tighten or replace parts as needed.

No → See Next Page Branch 2

Yes → Branch 1
"Checking for Internal Leaks"

Is water or steam returning through the condensing coil after the unit reaches 111° C.? See Figure 12.

Yes → Check for obstruction in bellows solenoid. Replace plunger kit for the bellows solenoid if the solenoid resistance is approximately 16 OHMS. If the resistance is not approximately 16 OHMS replace the bellows solenoid. See Figure 10.

No

Is water or steam returning through the fill filter located in the reservoir? Note: Look for a disturbance in the water around the filter.

Yes → Check for obstruction in fill solenoid. Replace plunger kit for the fill solenoid if the solenoid resistance is approximately 16 OHMS. If the resistance is not approximately 16 OHMS replace the fill solenoid. See Figure 14.

No → See Next Page Branch 1

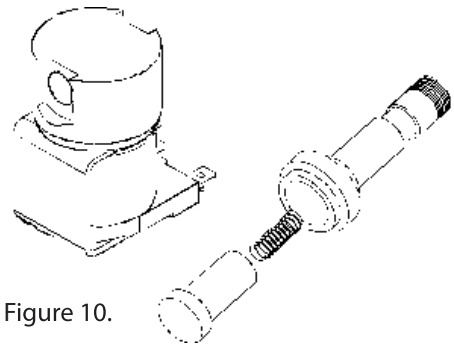


Figure 10.

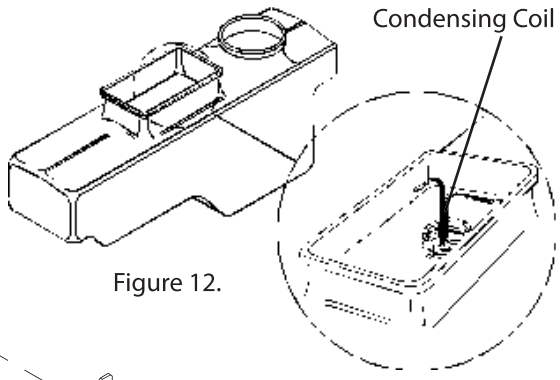



Figure 12.

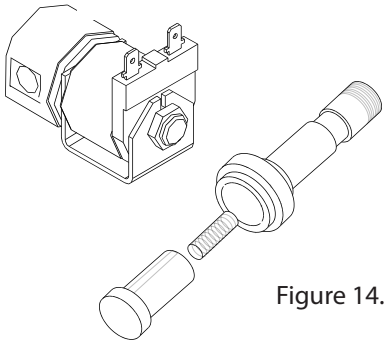


Figure 14.

Branch 1

No

Is water or steam returning through the tubing in the top of the reservoir, located under the square lid?

No → Solenoids are OK.

Yes

Check for obstruction in dump solenoid. Replace plunger kit for the dump solenoid if the solenoid resistance is approximately 16 OHMS. If the resistance is not approximately 16 OHMS replace the dump solenoid. See Figure 15.

!CAUTION! IF ALL OF THESE CONDITIONS ARE MET AND THE UNIT STILL HAS H2O FAILURES, TIGHTEN HEATER BANDS AROUND CHAMBER AND/OR REPLACE SURFACE SENSOR.

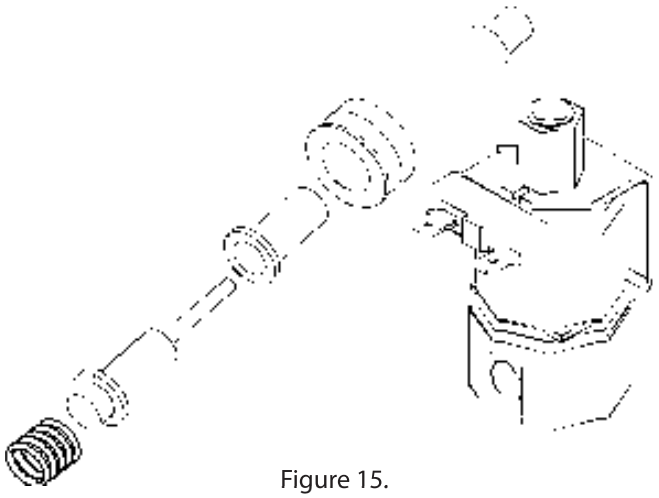


Figure 15.

Branch 2

No

Is water or steam leaking from the door?

Yes → Check to see if items in chamber are blocking door open.

No → Replace door gasket.

Yes → Remove and run another cycle.

No

Is steam leaking out of the safety relief valve? See Figure 13.

No → Check for cracked chamber or other signs of water leakage from the chamber.

Yes

Pull and release the chain on the safety valve to reseat it. Does this stop the leaking? See Figure 13.

Yes → Unit is OK.

No

Replace the safety relief valve.

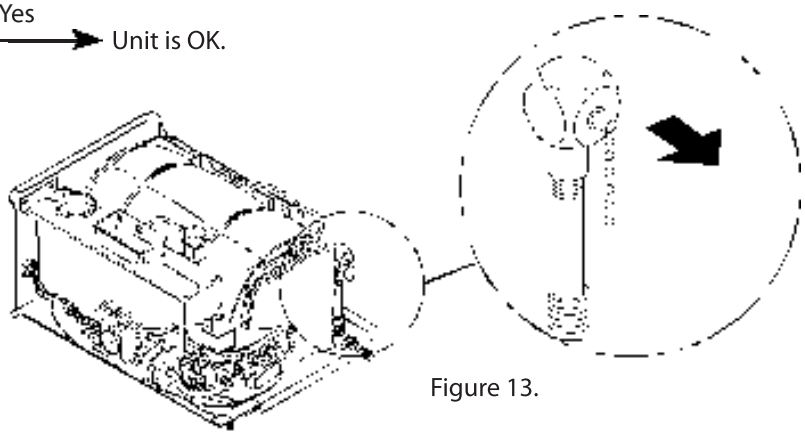


Figure 13.

Observe the temperature (in degrees C.) and the pressure (in KPa) on the front display panel. Do they correlate or become numerically equal between 122° and 125° C.?
See Figures 15 & 16.

Yes → Unit OK.

No

Replace steam sensor. Again observe the temperature (in degrees C.) and the pressure (in KPa) on the front display panel. Do they correlate or become numerically equal between 122° and 125° C.?

Yes → Unit OK.

No

Replace Power PCB.

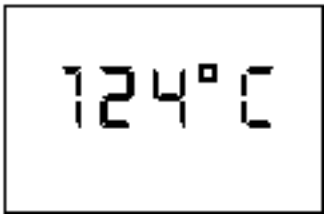



Figure 15.


Figure 16.

Note: Program the unit to display temperature in degrees C., and pressure in KPa.

Is steam/water returning to the reservoir through the condensing coil between 90° and 110° C.?

No

Does LED D17 (Bellows) on Power PCB cycle OFF and ON between 90° C. and 110° C.? See Figure 17.

No → See Next Page Branch 2

Yes

Check bellows coil for correct resistance.It should be approximately 16 OHMS. See Figure 16.

No → Replace Bellows Solenoid.

Yes

Check and inspect bellows solenoid and associated lines for blockage.

Yes

No

Check heater LED D15, it should flash on and off continuously. Is it ON continuously? See Figure 19.

Yes → Replace Power PCB.

No → See Next Page Branch 1

Yes

Is the RTD (steam) Sensor properly connected at P13 of the Power PCB?

No → Reconnect RTD Sensor.

Yes

Measure voltage from TP6 to TP8 on the power PCB.The voltage should read10mV per degrees C. (ie, 100mV = 10° C.) See Figure 18.

Yes → RTD Sensor OK.

No → Replace Power PCB.

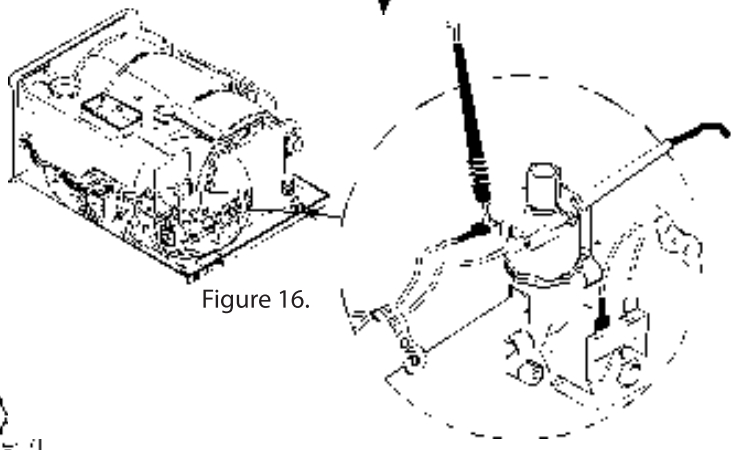


Figure 16.

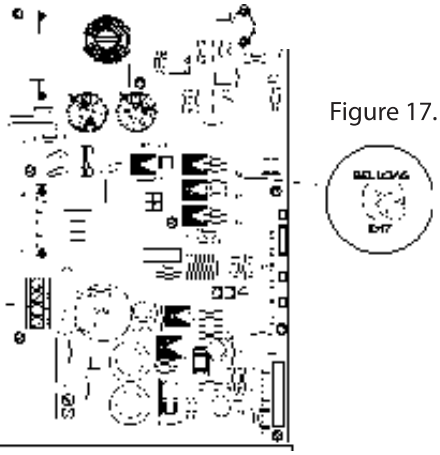


Figure 17.

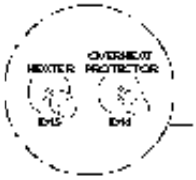



Figure 19.

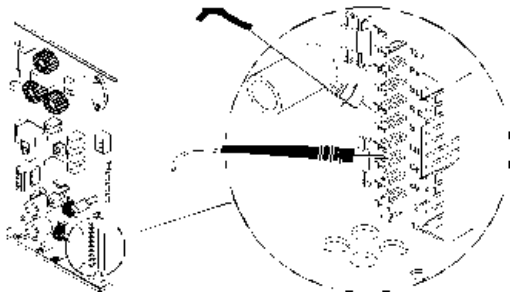


Figure 18.

Note: Program the unit to display temperature in degrees C., and pressure in KPa.

Branch 1

No

Observe the temperature and pressure windows on the front display. As temperature and pressure are going up, pressure should numerically equal temperature on KPa/°C. scale, or correlate, between 122° and 125° C.

Yes → Temperature and pressure components are OK.

No

Replace Steam Sensor. Observe the temperature and pressure windows on the front display. As temperature and pressure are going up, pressure should numerically equal temperature on KPa/°C. scale, or correlate, between 122° and 125° C.

Yes → Temperature and pressure components are OK.

No

Replace Power PCB.

Branch 2

No

Does LED D4 (Bellows) on Front MPU PCB cycle OFF and ON between 90° and 110° C?
See Figure 4.

No → Replace MPU PCB.

Yes

Check ribbon cable. Is it properly connected? See Figure 5.

No → Replug ribbon cable.

Yes

Check continuity of ribbon cable. If it checks out OK, replace Power PCB.

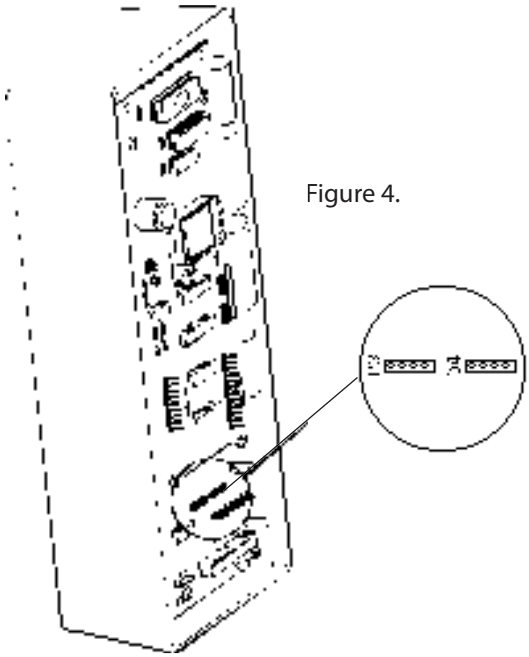


Figure 4.

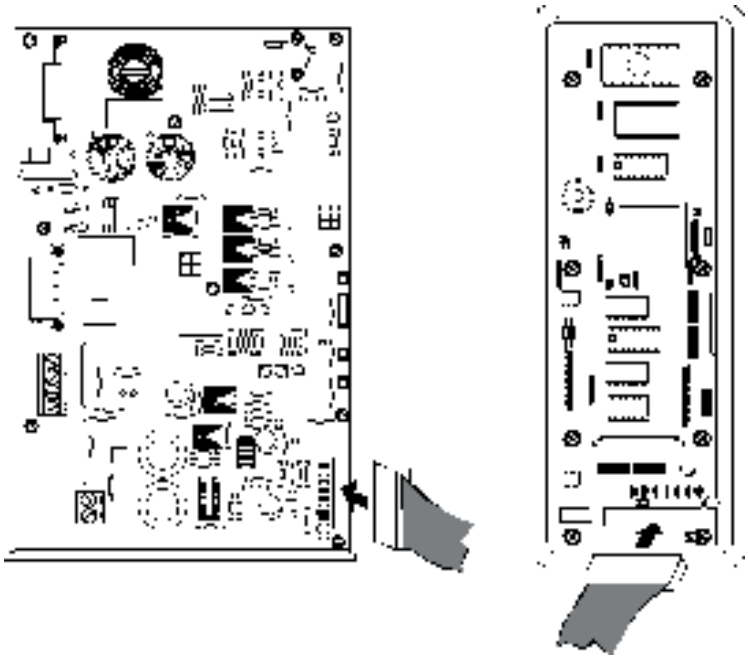
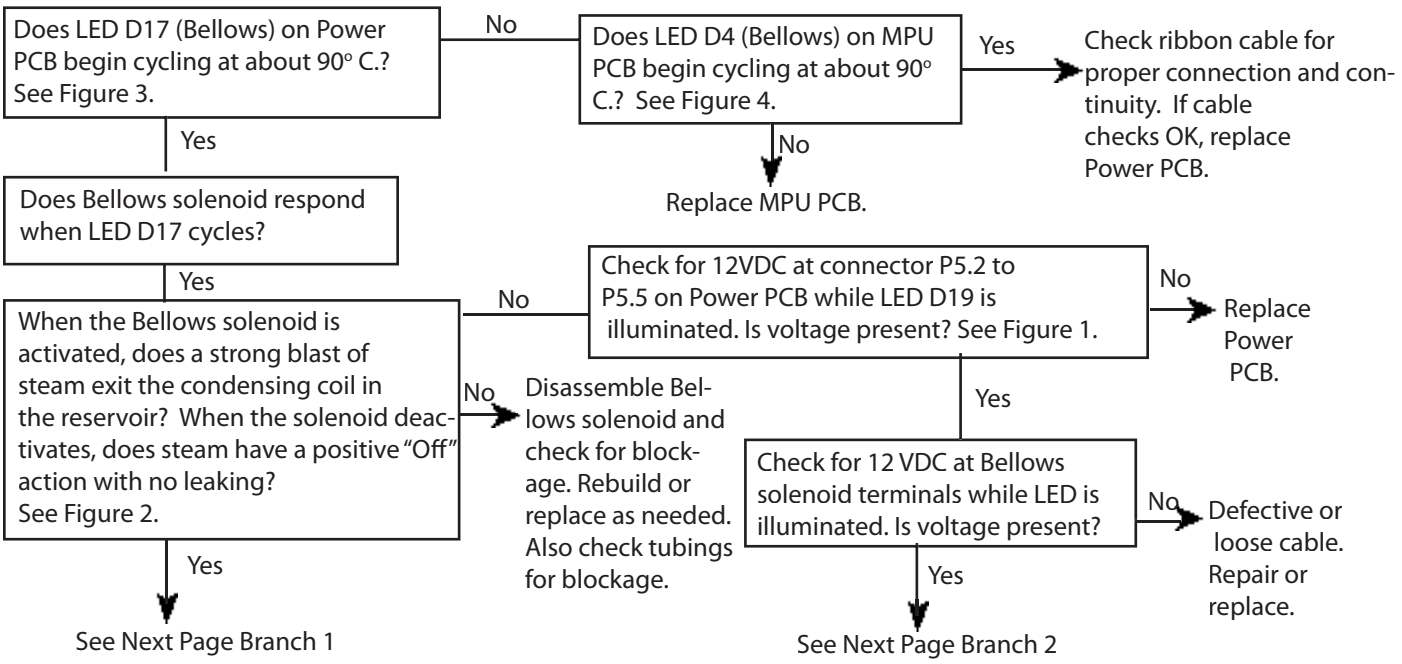


Figure 5.

The Fail alarm is a response from several different sensors and aborts the cycle because a condition has been detected that will not allow the
completion of a successful cycle. The following conditions will cause a Fail alarm: A) The air purging cycle (between 101° C. and 110° C.)
takes more than 7 minutes; B) The unit takes more than 45 minutes to reach sterilization parameters; C) During the "Sterilization" portion
of the cycle, the chamber temperature or pressure drops below minimum parameters for 3 minutes (accumulated time); D) The door circuit is
interrupted after the "Fill" portion of a cycle is complete.
Note: The first three conditions will show a constant "Fail" display. The fourth condition flashes "Fail".

The microprocessor allows 7 minutes for the unit to purge air out of the chamber. This process begins at 90° C., and ends at 110° C.



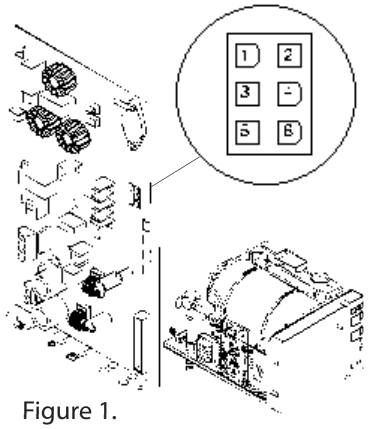



Figure 1.

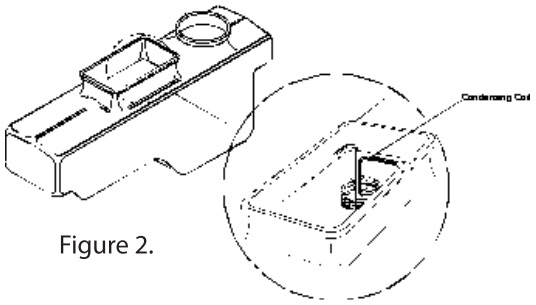


Figure 2.

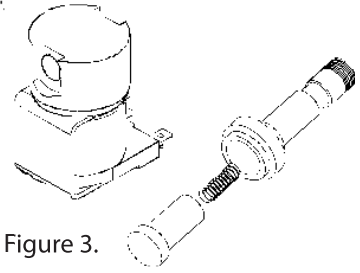


Figure 3.

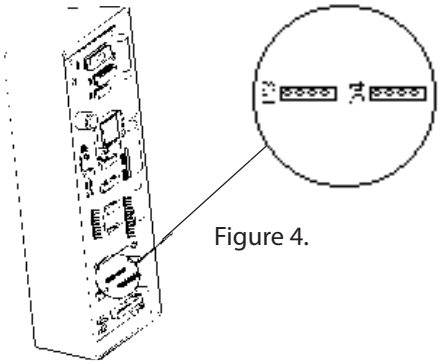


Figure 4.

Branch 1

Yes

Verify that the Dump and Fill/ Vent solenoids are not leaking. See "H2O (PATH B) - CHECKING INTERNAL LEAKS" section. Are they seated properly?

No → Clean, repair or replace as necessary.

Yes

See "FAIL (PATH B) - CHECKING HEATING ELEMENT."

Branch 2

Yes

Unplug leads from Bellows solenoid and check for approximately 16 OHMS resistance. See Figure 4.

No → Replace solenoid.

Yes

Disassemble Bellows solenoid and check for blockage. Rebuild or replace as needed. Also check tubings for blockage. See Figure 5.

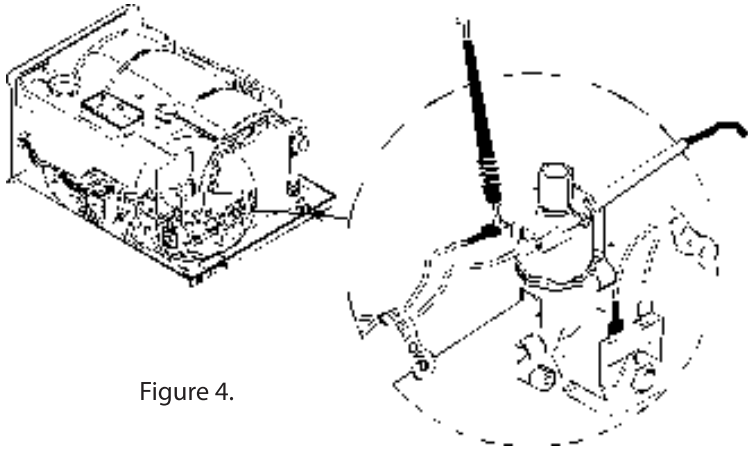


Figure 4.

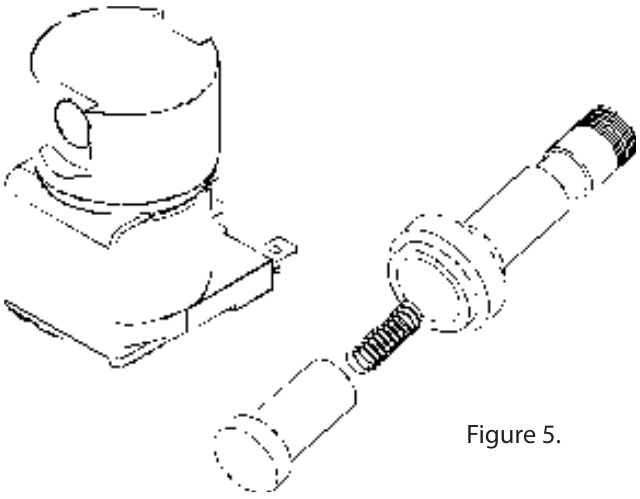


Figure 5.

Unit takes more than 45 minutes to reach sterilization.

During the first 10-15 minutes of the sterilization cycle, does the unit reach at least 90° C.-110° C.?

No → Is the Overheat Protector LED D14 on the Power PCB illuminating? See Figure 20.

Yes → Check for defective Overheat Protector or loose connection. Repair or replace as needed.

No → Is the Heater LED D15 on the Power PCB cycling ON and OFF? See Figure 20.

No → Replace Power PCB.

Yes → CHECKING HEATING ELEMENT

Disconnect power to the unit. Remove the three heater wires from Power PCB at TB1. Twist the two white wires together and measure the resistance between the white wires and the black wire. On 8" units, this should be approximately 7.5-9.5 OHMS. On 10" units it should be approximately 5.5-6.5 OHMS. See Figure 19.

No → Replace Heating Element.

Yes → See Next Page Branch 2

Yes → Is the unit building pressure?

No → See Checking for Internal/External Leaks in "H2O" section.

Yes → Allow the unit to cool. Remove RTD (Steam) sensor from the rear of the chamber. Place it in ice water until display reads 0° C. Turn unit off, unplug RTD sensor from Power PCB (connector P13) and measure resistance across the sensor. Is the resistance approximately 1000 OHMS?

No → Replace RTD sensor.

Yes → See Next Page Branch 1

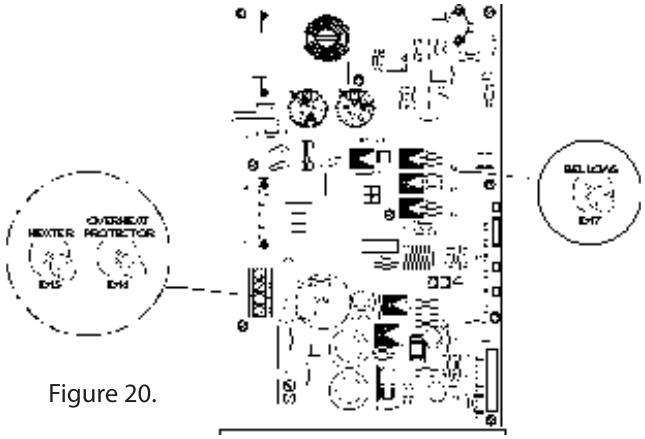



Figure 20.

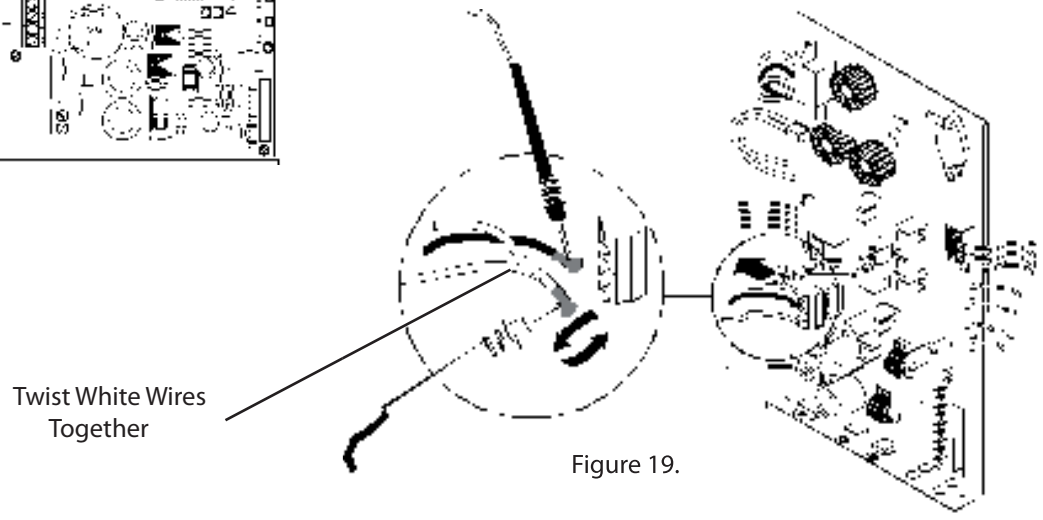



Figure 19.

Branch 1

Yes

During a cycle, does the crossover (the point at which the steam value in KPa equals the temperature value in ° C.) occur between 122 and 125?

No → Defective Pressure Transducer. Replace Power PCB.

Yes

Check for improper loading methods in chamber. Run an empty load. If it runs OK, unit was overloaded.

Branch 2

Yes

Measure resistance from each heating element lead to the frame of the chamber. The reading should be infinite. Is it?

No → The element is grounded. Replace element.

Yes

Leave the wires disconnected and reconnect the unit. Start a cycle. Measure for line voltage output at connector TB1.1-TB1.2, and TB1.3-TB1.2 for 120V units and TB1.1-TB1.3 for 230V units. (This output will be cycling ON and OFF with LED D15). See Figure 1.

No → Replace Power PCB.

Yes

Check for improper loading methods in chamber. Run an empty load. If it runs OK, unit was overloaded.

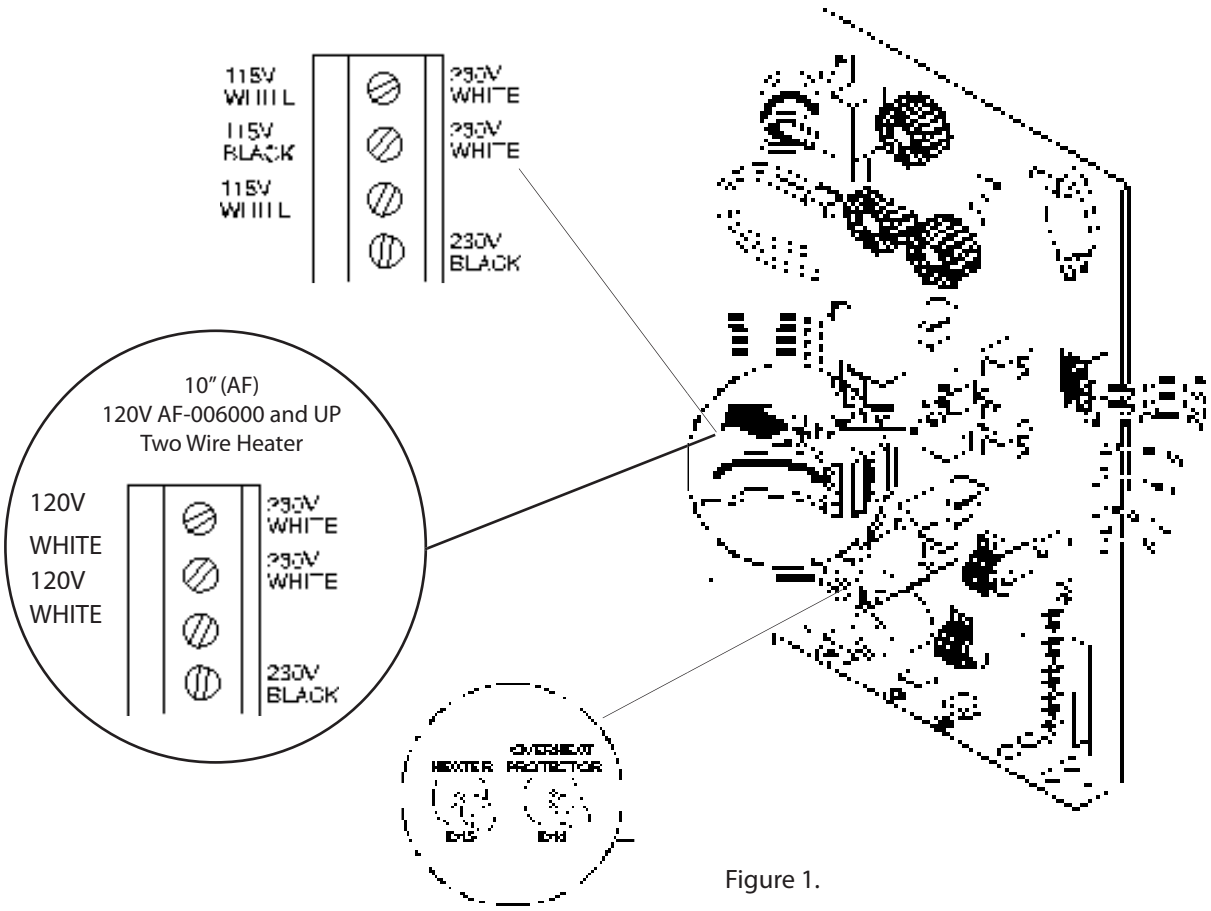



Figure 1.

If the unit fails during this portion of the cycle, it is due to a steam leak.

Remove the unit cover and start an "Unwrapped" cycle. When the unit reaches sterilization lift the lid off of the reservoir. Check for leaking solenoids as described in "CHECKING FOR INTERNAL LEAKS" in the "H20" section. Are solenoids leaking?

No

With unit still in sterilization parameter, hold a mirror under the discharge line of the Safety Valve. Does the mirror fog up? See Figure 3.

Yes → Replace Safety Valve.

No

Yes

Repair, clean or replace Solenoid as needed.

Check for door leaks. It may be necessary to remove the door cover to check this. To remove door cover, first remove 2 Allen screws from the side of door handle and slide handle off. Open door and remove 4 screws that hold cover on. If the door is leaking, check the following conditions:

1) Verify that tray rest inside the chamber is not blocking door open.
2) Remove door gasket. Check for debris in or behind gasket. Check for cuts or wear. Gasket is reversible, but should be replaced if it does not fit tightly in the ring.
3) Check the face of the chamber that contacts the door gasket. If a mineral deposit has accumulated, remove with Scotch-Brite or Bon-Ami.
4) Check the 4 screws that hold the front frame to the chamber (2 between hinges and 2 between locking posts). Tighten as necessary.
5) On older units, it may be necessary to replace the door insulation. This is located between the door frame plate and the plate that holds the door gasket. Is door leaking?

Yes → Repair as needed.

No

Pull silicone tubing off drying pump filter. When the unit is pressurized, is steam leaking from tube?

No → With a small mirror, (while unit is under pressure) check each plumbing filling for steam leaks. Tighten or replace as needed.

Yes

Replace Check Valve.

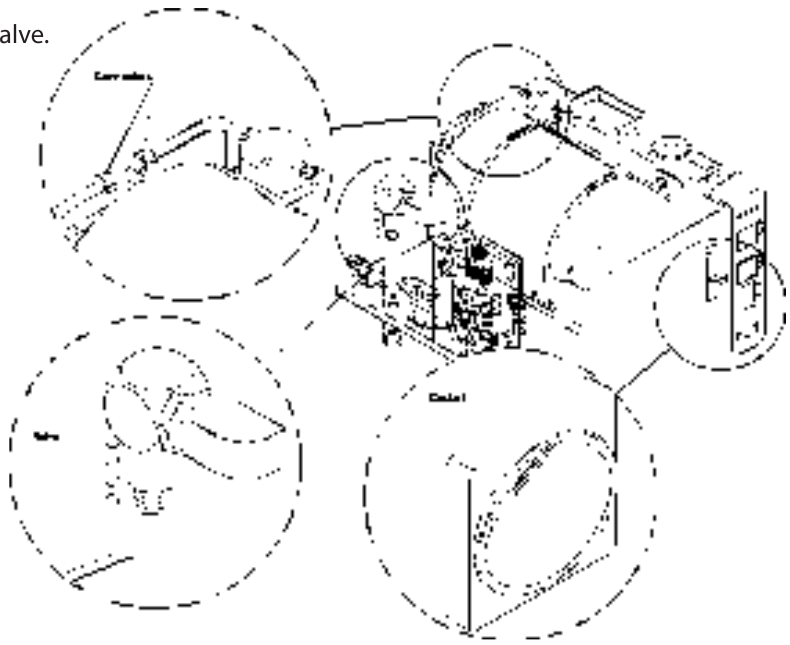


Figure 3.

Door switch circuit was interrupted after "Fill" function was completed.

Was door opened after fill display changed to temperature/pressure?

Yes → Unit is OK. Close door and start another cycle.

No

Turn unit off and unplug. Remove the cover. Unplug connector P9 from Power PCB. Measure resistance between the two wires with the door closed. Is continuity present?
See Figure 6.

Yes → Check for intermittent connection on cable or switch.

No

Check condition of the cable. Replace if damaged. If cable is OK, remove the 2 nuts securing the door switch cover just below the lower door locking tab. The switch closes the circuit when depressed. Readjust, tighten or replace switch as needed.

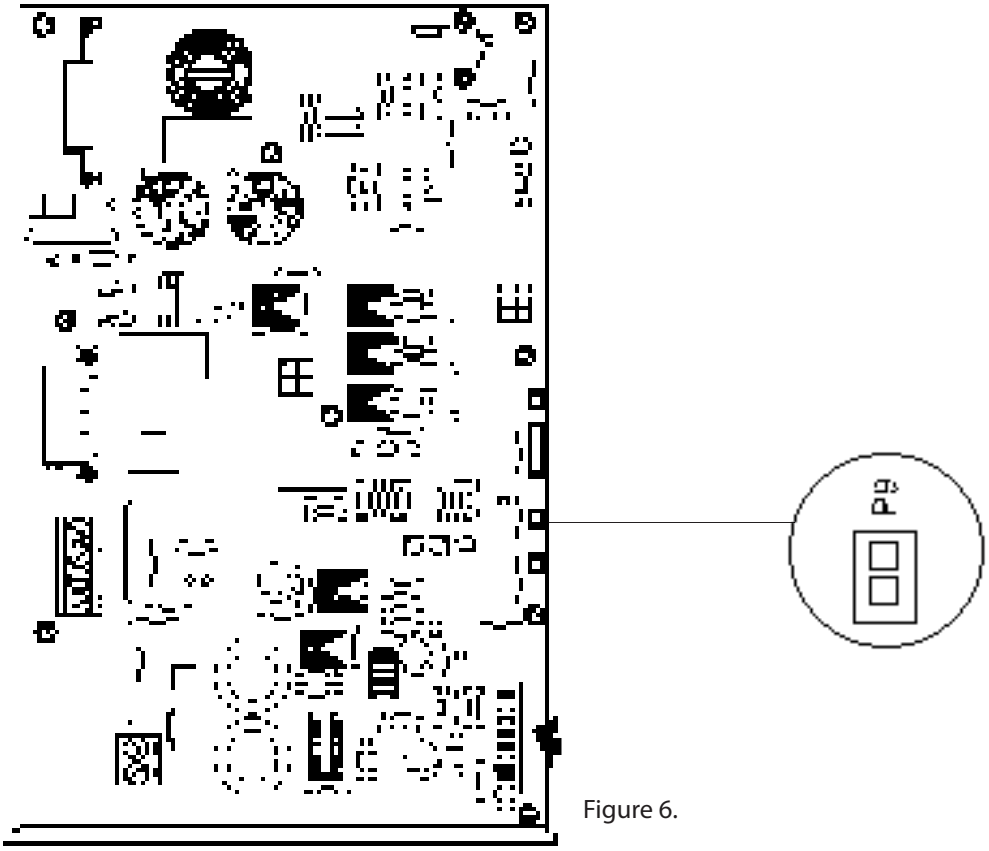



Figure 6.

Note: Be certain the chamber has not been overloaded. See User Manual. If not overloaded, continue below.

Has the unit been properly leveled?
- No → See leveling instructions in User Manual.
- Yes →

Remove trays and tray rest from chamber. Run an "Unwrapped"cycle. When the sterilization portion is complete and the chamber vents to 0 KPa, open the door.
!CAUTION! DO NOT PLACE ANY PART OF YOUR BODY (HEAD, ARMS, ETC.) ABOVE DOOR AS STEAM WILL BE COMING OUT OF CHAMBER.
Is there any water in the chamber?
- Yes → Check, clean, or replace chamber and reservoir filters. Be sure the filter in the chamber is installed securely and touching the bottom of the chamber.
- No →

Has the drying cycle been programed too short?
- Yes → See drying time programming instructions in the User Manual.
- No →

Check technique of drying such as: Placement of bags in the chamber; type of bags used and if the door was shut during the drying cycle. Is chamber loading technique OK?
- No → See User Manual.
- Yes →

Is the air filter for the air pump dirty or clogged? See Figure 22.
- Yes → Replace filter.
- No → See Next Page

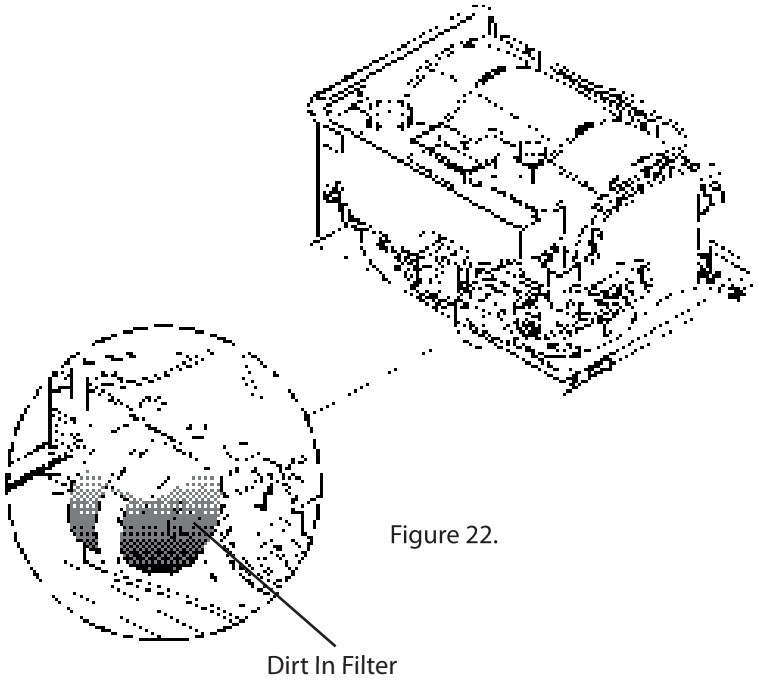



Figure 22.

No

Is there any moisture in the air filter? See Figure 23.

Yes → Replace the filter and Check Valve, located in the tubing between the filter and the chamber.

No

Is the pump running during the dry cycle?

No → Check for 120 VAC at connector P4 on Power PCB. Is voltage present? See Figure 28.

Yes → Defective Air Pump or cable. Repair or replace as needed.

No → Defective Power PCB.

Yes

Remove air line from inlet of filter and check for air flow. See Figure 25.

Yes → Remove air line from outlet of filter and check for air flow. See Figure 26.

Yes → Remove air line from Check Valves. Is air flowing from the tubing? See Figure 27.

Yes → Open chamber door and remove chamber filter. Is air flow present?

Yes → Reinstall filter. Is air flow still present?

Yes → Air flow should be present in reservoir at condensing coil and dump solenoid malfunction or blockage.

No → Clean or replace chamber filter.

No → Replace Check Valve

No → Replace Tubing.

No → Replace Air Filter.

No

Remove air line from pump. Is air flow present? See Figure 24.

No → Replace Air Pump.

Yes → Replace Air Line.

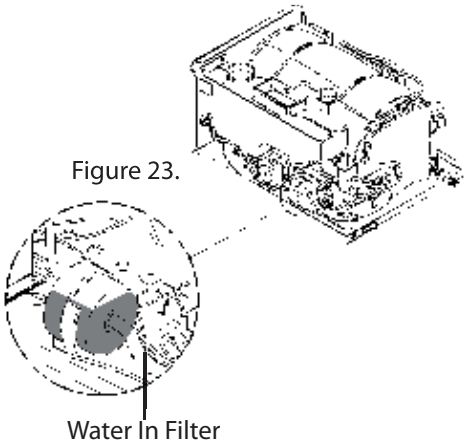



Figure 23.

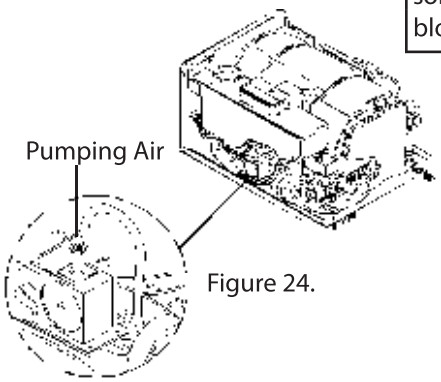



Figure 24.

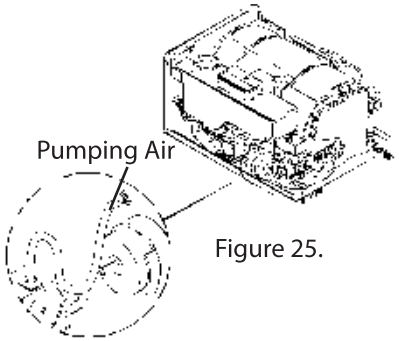



Figure 25.

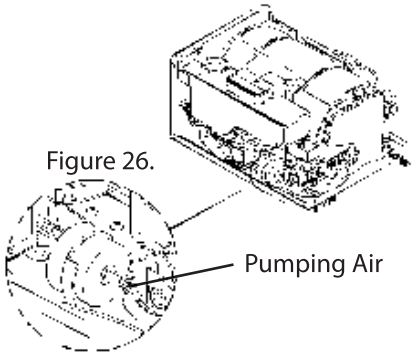



Figure 26.

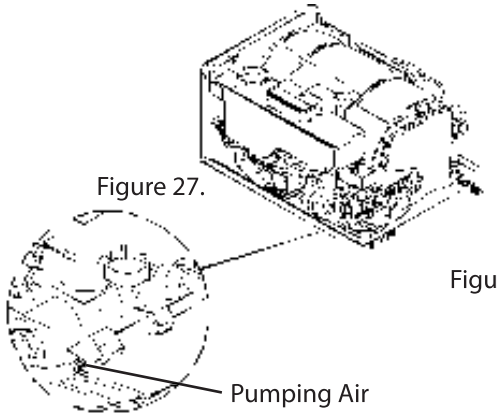



Figure 27.

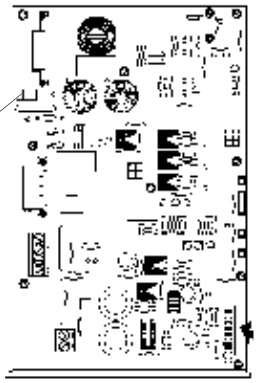


Figure 28.

Is the unit plugged in? Is the main power switch in the On position? Is there power to the outlet?

Yes

Depress "POWER" button on the front panel. Does the unit turn on?

Yes → Unit is OK.

No → Plug the unit in and turn it ON.

No

Are LEDs D11, D12 and D13 on the Power PCB illuminated? See Figure 28.

Yes

Check for +12, -12, +24 and +5VDC power supplies on MPU PCB. Ref:
+12 TP1(+) - TP5(-)
- 12 TP2(+) - TP5(-)
+5 TP3(+) - TP5(-)
+24 TP4(+) - TP5(-)
See Figure 29.

No → Defective or loose ribbon cable. Repair or replace as needed.

Yes

Is +56VDC present at $TP7^{+}$ - $TP5^{-}$ on MPU PCB? See Figure 26.

No → Replace display PCB and cover assembly.

Yes

Does D1 POW light when power button is depressed? See Figure 27.

No → Replace display PCB and cover assembly.

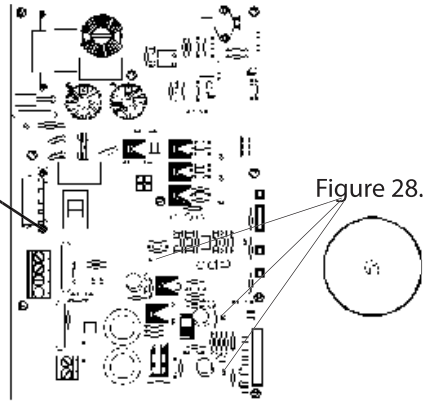
Yes → Defective MPU PCB.

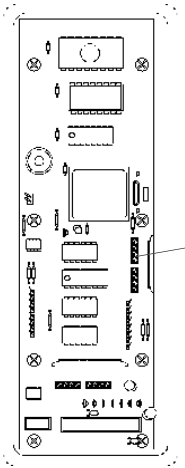
No

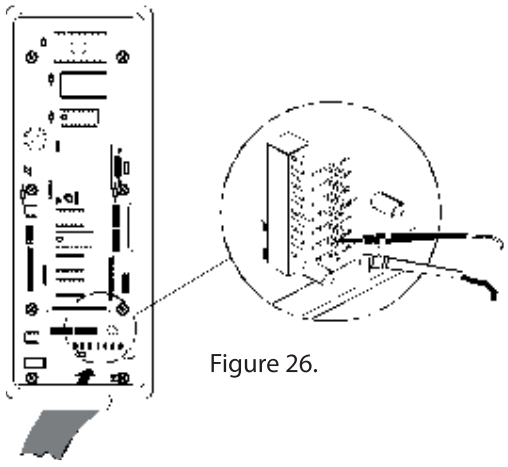
For 120 volt units:
Check for 120 volt output to transformer at connector P6.1 to P6.2 and P6.3 to P6.4. Is voltage present?
For 240 volt units:
Check for 240 volt output to transformer at connector P6.1 to P6.4. Is voltage present? See Figure 25.

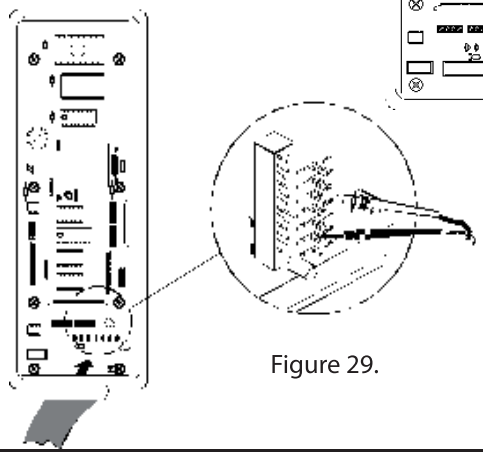
Yes → See Next Page Branch 1

No → See Next Page Branch 2



Branch 1

Yes

Check for low voltage return from transformer at P7. See Figure 28. P7.1 - P7.2 and P7.3 - P7.2 should be 16VAC each.P7.1 - P7.3 should be 32 VAC each. Are voltages present?

No → Defective transformer or cable. Repair or replace as needed.

Yes

Check fuse F1 on Power PCB. Is fuse OK? See Figure 29.

No → Replace fuse. Does fuse blow again?

Yes → Replace Power PCB.

No → Unit is OK.

Yes

Check the following DC voltages on Power PCB:
+12VDC TP2(+) - TP8(-)
+5VDC TP9(+) - TP8(-)
+24VDC TP10(+) - TP8(-)
+15VDC TP11(+) - TP8(-)
Are these voltages correct? See Figure 31.

No → Replace Power PCB.

Yes

Power PCB is OK.

Branch 2

No

Is proper voltage present at P3.1-P3.3 (120VAC or 240VAC) and is voltage selector switch SW1 in correct position? See Figures 30 & 32.

Yes → Replace Power PCB.

No

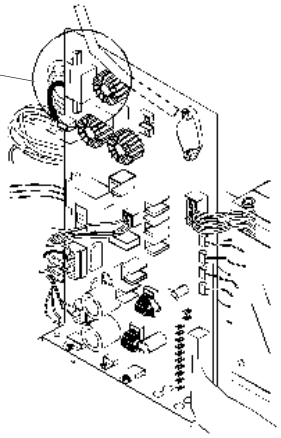
If voltage is not present, recheck incoming power and unit circuit breaker. Turn unit circuit breaker Off and back On. Is power present now?

Yes → Unit is OK.

No

Defective unit circuit breaker or cable. Repair or replace as needed.

Figure 30.



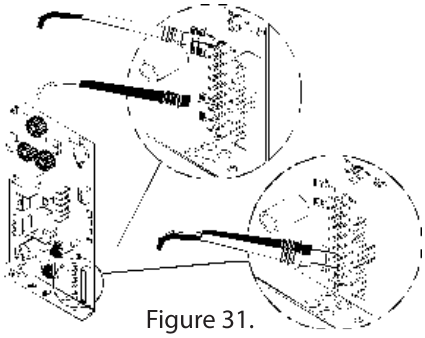


Figure 31.

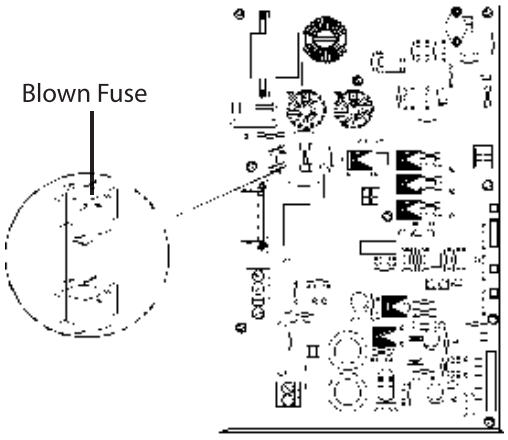



Figure 29.

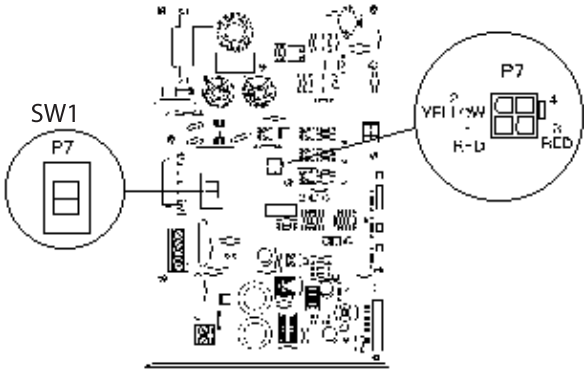



Figure 32.

Branch 1

Front panel will not illuminate.

Yes

Note: Turn unit Off.
Check ribbon cable for damage; unplug and reseat ribbon cable. Use a volt meter to determine if 56VDC is present on the MPU PCB between TP 5 and TP 7.
See Figure 33.

No

Is 5VDC present between TP3 and TP5 on the MPU PCB?
See Figure 34.

Yes → Replace front control panel less MPU PCB.

No

Is 5VDC present between TP9 and TP8 on Power PCB?
See Figure 35.

Yes → Defective ribbon cable.

No

Check for other control voltages on Power PCB. Are they present?

No → Is fuse FU1 OK and is correct line voltage connected to Power PCB at P3? See Figure 36.
Is the 16/32 VAC supply from the transformer OK?

No → Repair or replace as needed.

Yes → Defective Power PCB.

Yes → Defective Power PCB.

Branch 2

Missing segments on the front display.

Yes → Press "POWER ON/OFF" and "CLEAR/START" buttons at the same time. Do all the segments light on the front panel?

No → Defective Front Panel and/or Display PCB. Replace Front Control Panel less MPU PCB.

No

Dim front display control panel.

Yes

Check to see if 56VDC is present on MPU PCB in the front control panel.
See Figure 37.

No → Check 5VDC supply to MPU in Branch 1. Repair or replace as needed.

Yes → Replace front control panel less MPU PCB.

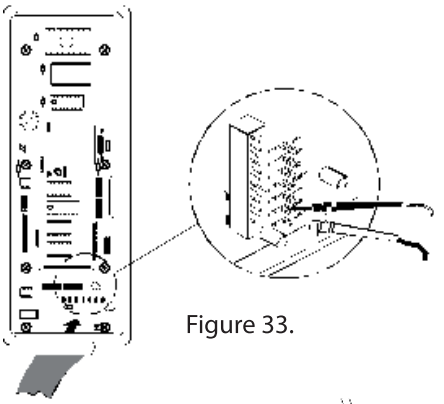


Figure 33.

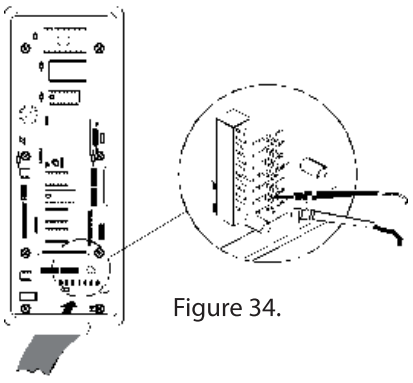


Figure 34.

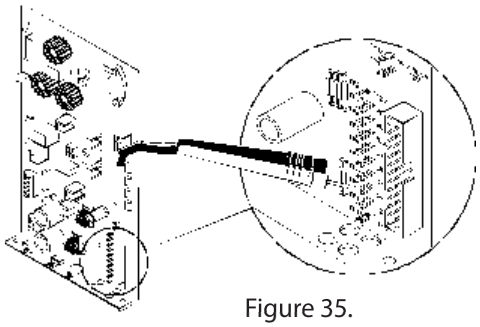


Figure 35.

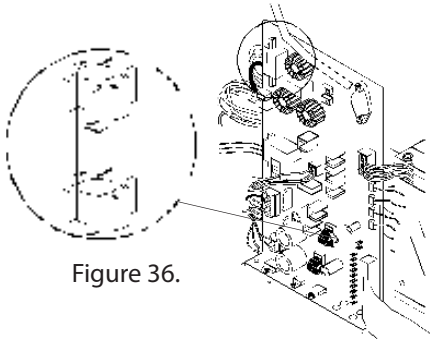


Figure 36.

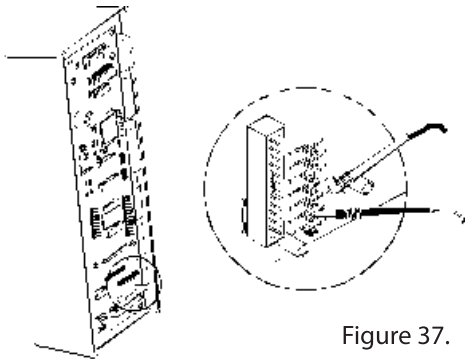


Figure 37.

Dented cover. — Yes → Replace cover.

No

Warped door cover. — Yes → Check for a bad door gasket, which could let steam reach the front door, replace if necessary and replace door cover.

No

Paint peeling from cover, or discoloration of cover. — Yes → Replace cover.

No

Missing or damaged labels. See Figures 36 - 40.

Yes

Replace as neccessary.

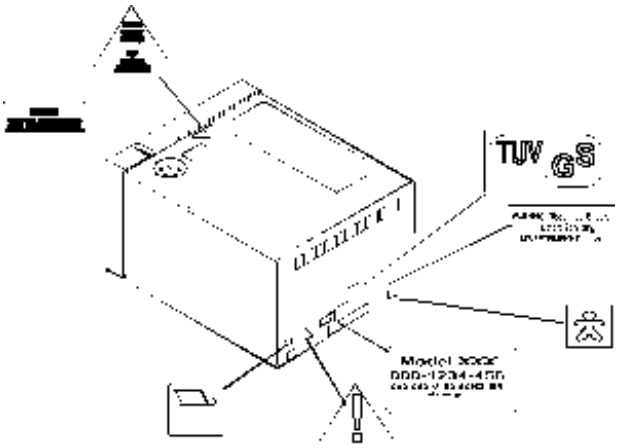



Figure 36.-TUV 230V

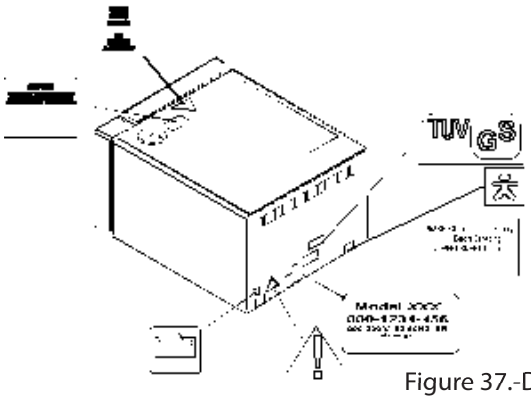



Figure 37.-Delta 230V

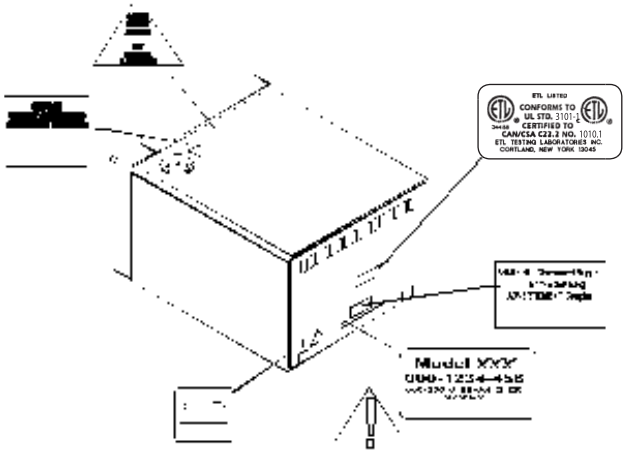


Figure 38.-Delta 120V

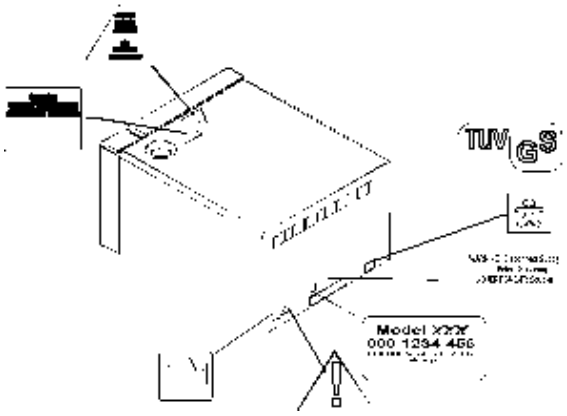



Figure 39.-Siemens 230V

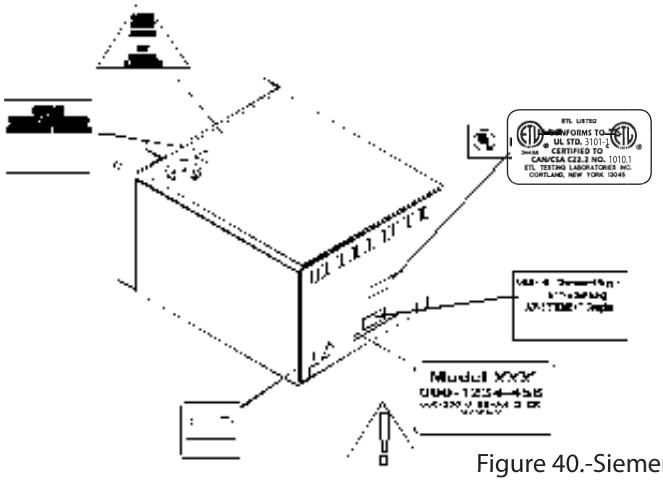
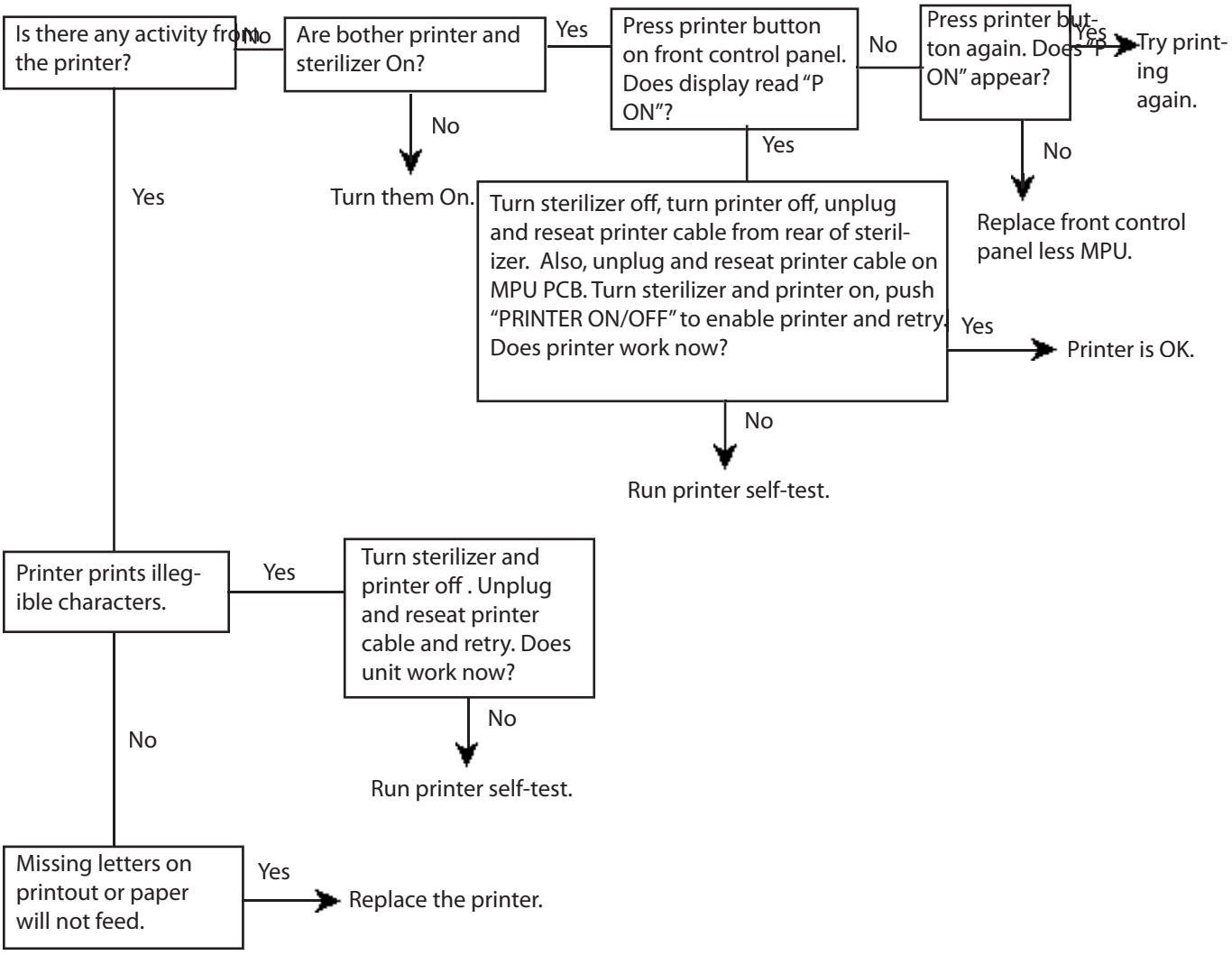


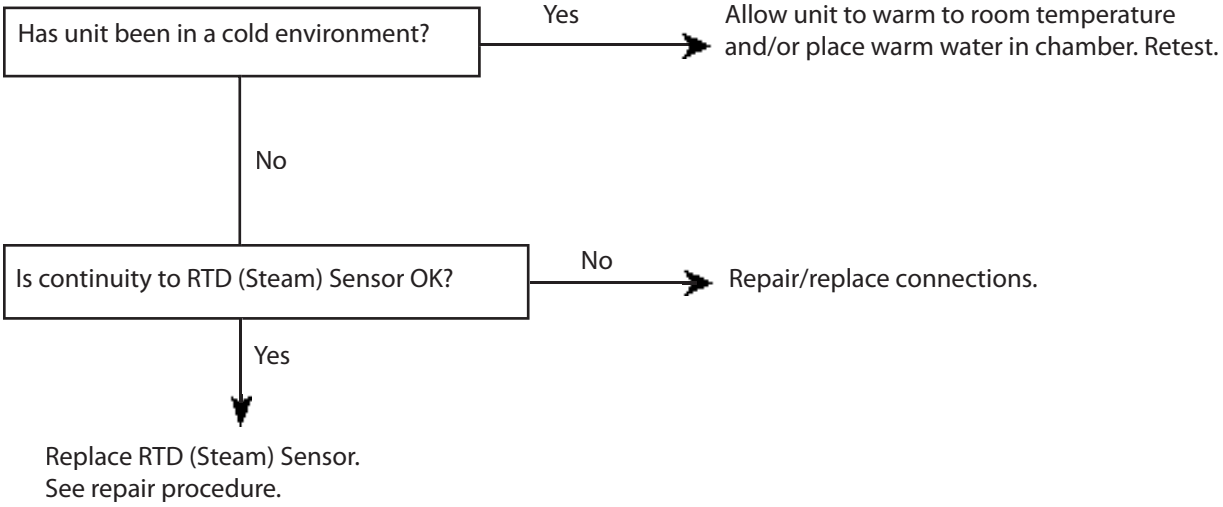
Figure 40.-Siemens 115V



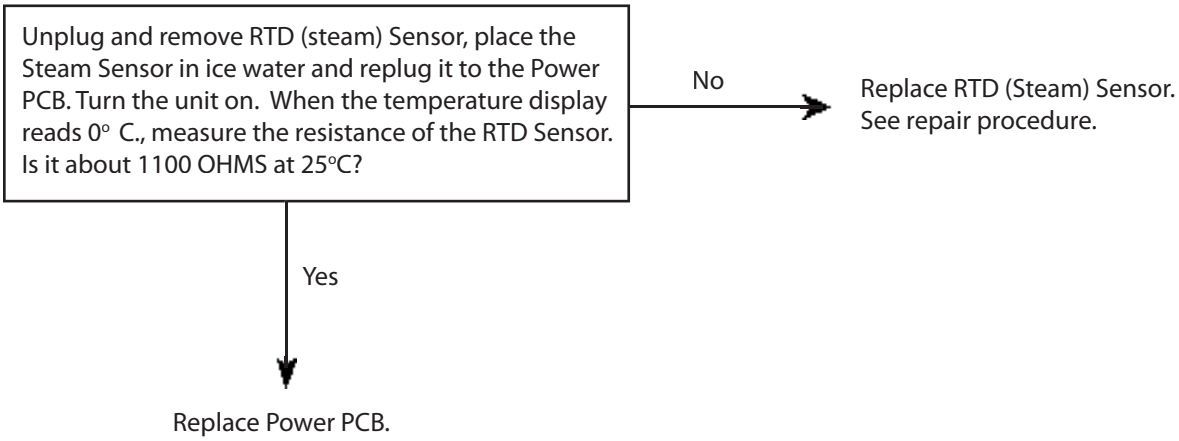

Printer Self-Test

1. Turn Off the printer and sterilizer.
2. Unplug the printer from the sterilizer.
3. Hold down PF (Paper Feed) button on printer and turn printer switch to "ON".
4. The printer is now in Test Mode and should start printing exclamation marks, numbers and the alphabet, in proper sequence.
5. If the printer is functioning properly, turn it to "OFF". If not, it is defective.
6. Turn the printer back to "ON" position and reconnect it to the sterilizer, making sure that the interconnect cable is properly seated on both ends.
7. Press the "PRINTER" button on the sterilizer front panel. If the display reads "POFF", press one more time. Display will read "P ON."
8. Unit is now ready for use. If the printer continues to fail, check the continuity of the three wire cable from the MPU PCB, the printer jack and the interconnect cable.
9. Repair or replace as needed.

## Troubleshooting SS-1

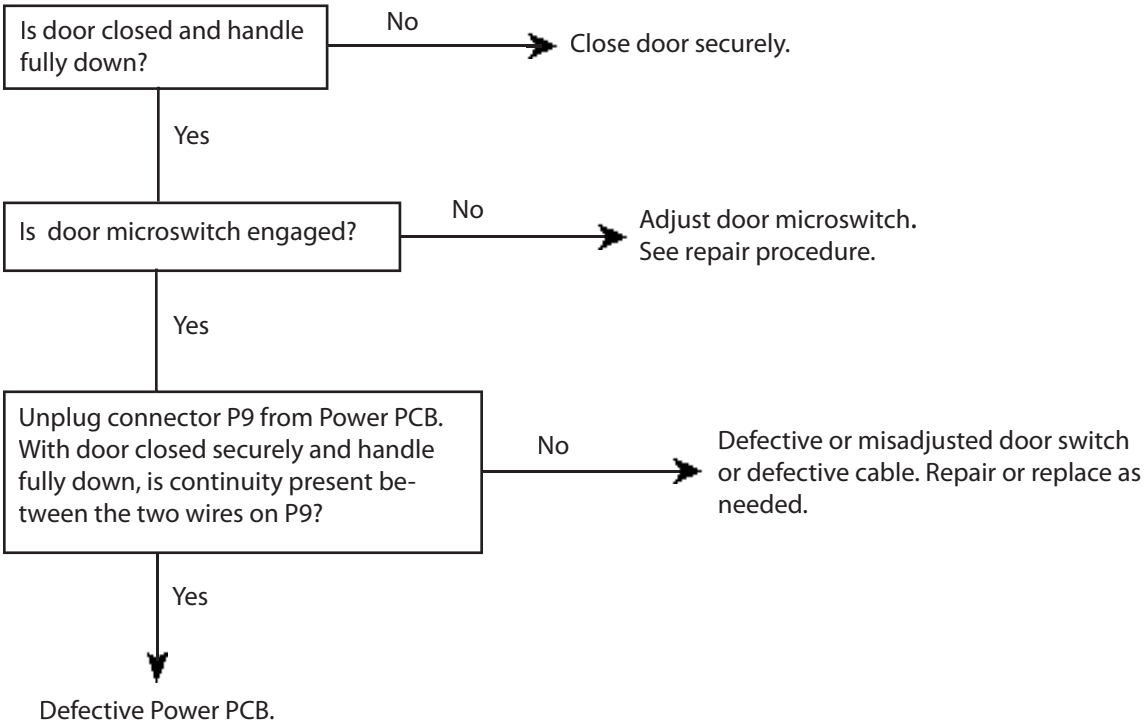



## Troubleshooting SS-3




## Troubleshooting Lb

Replace Front Panel MPU PCB.
See repair procedure.


Is door closed and handle fully down?
No
Close door securely.
Yes
Is door microswitch engaged?
No
Adjust door microswitch.
See repair procedure.
Yes
Unplug connector P9 from Power PCB. With door closed securely and handle fully down, is continuity present between the two wires on P9?
No
Defective or misadjusted door switch or defective cable. Repair or replace as needed.
Yes
Defective Power PCB.

Is surface connector P8 plugged into the Power PCB properly? See Figure 8.

No → Repair connections.

Yes

Unplug connector P8 from the Power PCB. With the unit at about room temperature, is there continuity between the two wires on connector P8?

No → Replace Surface Sensor. See repair procedure.

Yes → Replace Power PCB. See repair procedure.

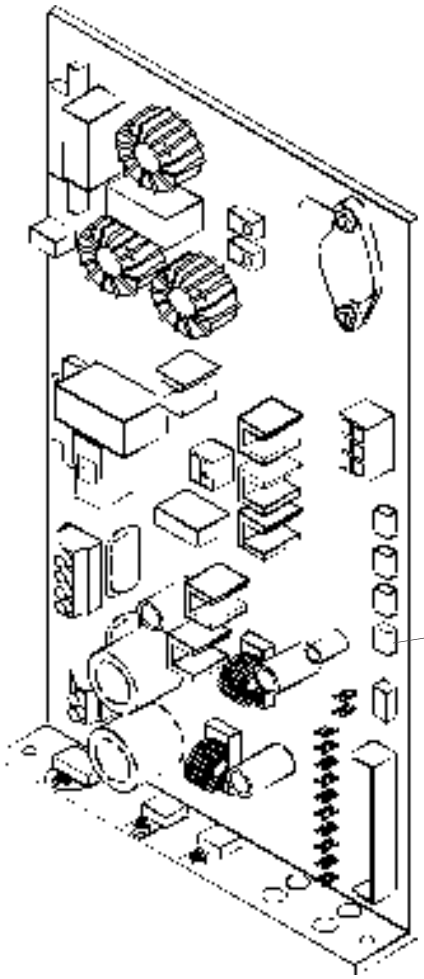


Figure 8.

Check input voltage to the transformer at P3 on Power PCB, blue wire to brown wire. It should be 115VAC or 230VAC, depending on unit specifications. See Figure 41.

No → Check voltage to the unit. Also, check the switch on the back of the unit be sure it is in the "ON" position.

Yes

Check output voltage from transformer at P7 on the Power PCB, red wire to red wire approximately 32VAC and yellow wire to either red wire approximately 16VAC. See Figure 42.

No → Replace Transformer. See repair section.

Yes

Replace Power PCB. See repair section.

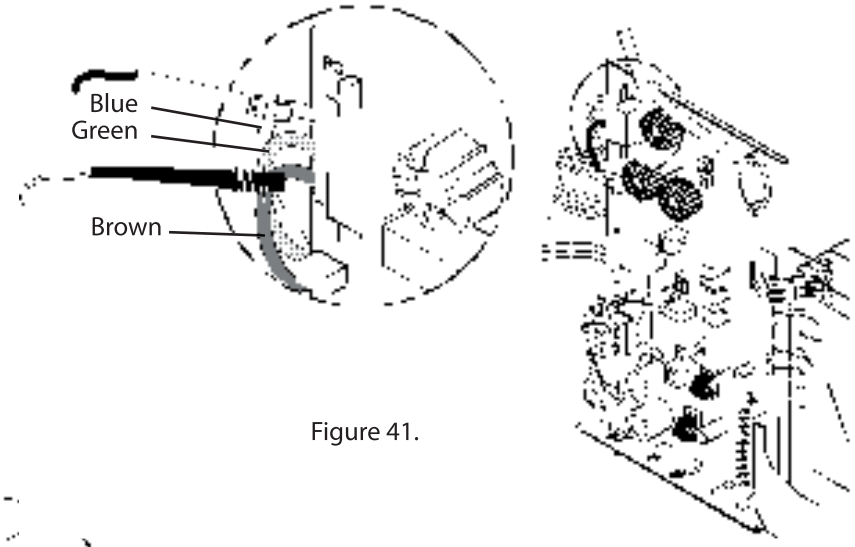



Figure 41.

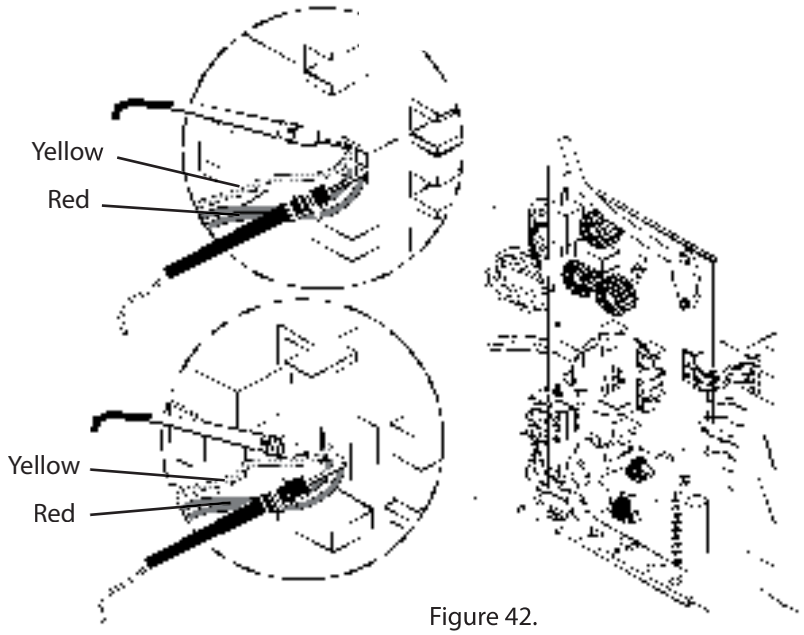



Figure 42.

Is resistance of Fill Vent Solenoid approximately 16 OHMS? See Figure 43.

No → Replace Fill/Vent Solenoid. See repair procedure.

Yes

Are connections to Fill/Vent Solenoid OK?

No → Repair/replace connections.

Yes

Is Ribbon Cable OK? Check for broken wires or loose connections.

No → Replace Ribbon Cable.

Yes

Recheck all cables. If cables are ok, replace MPU PCB.

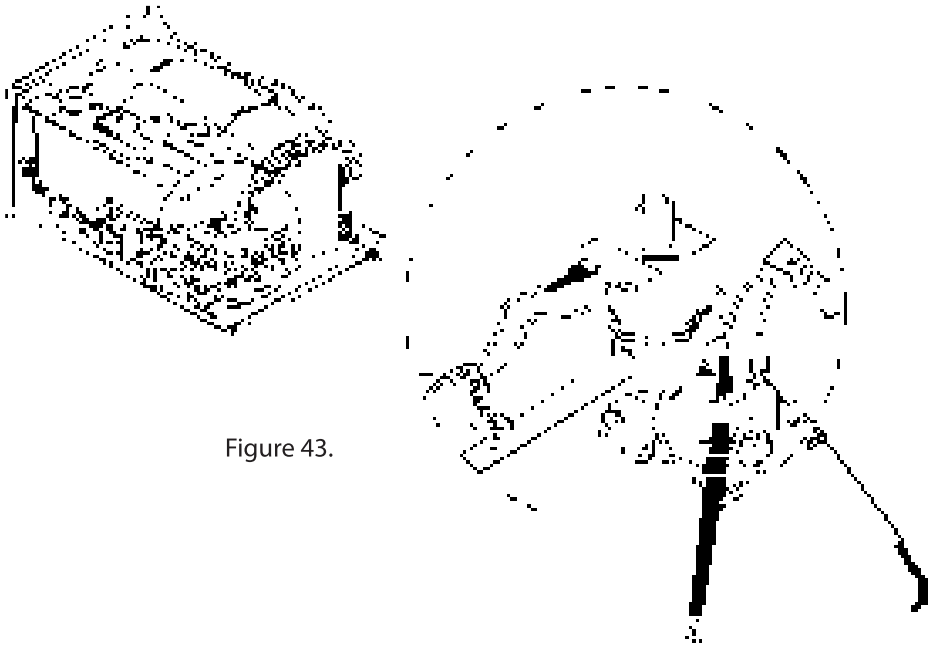


Figure 43.

Is Dump Solenoid coil resistance approximately 16 OHMS? See Figure 44.

No → Replace Dump Solenoid. See repair procedure.

Yes

Are Dump Solenoid connections OK?

No → Repair/replace connections.

Yes

Is Ribbon Cable OK? Check for broken wires or loose connections.

No → Replace Ribbon Cable.

Yes

Recheck all cables, If cables are OK, replace MPU board.

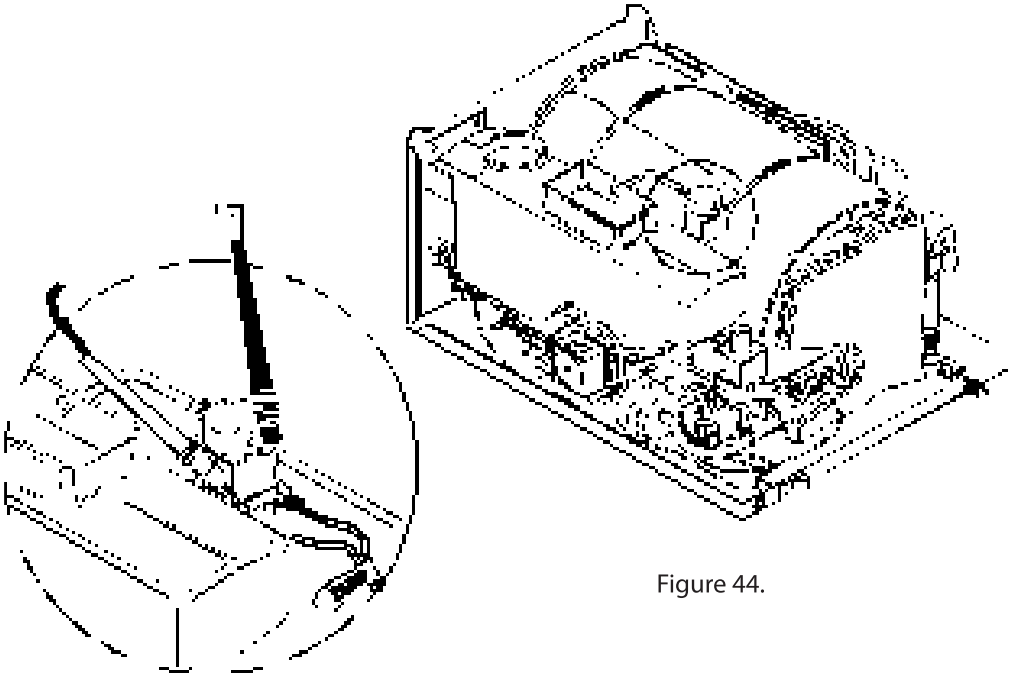


Figure 44.

Is Bellows Solenoid coil resistance approximately 16 OHMS?
See Figure 45.

No → Replace Bellows Solenoid.
See repair procedure.

Yes

Are Bellows Solenoid connections OK?

No → Repair /replace connections.

Yes

Is Ribbon Cable OK? Check for broken wires or loose connections.

No → Replace Ribbon Cable.

Yes

Recheck all cables, If cables are OK, replace MPU board.

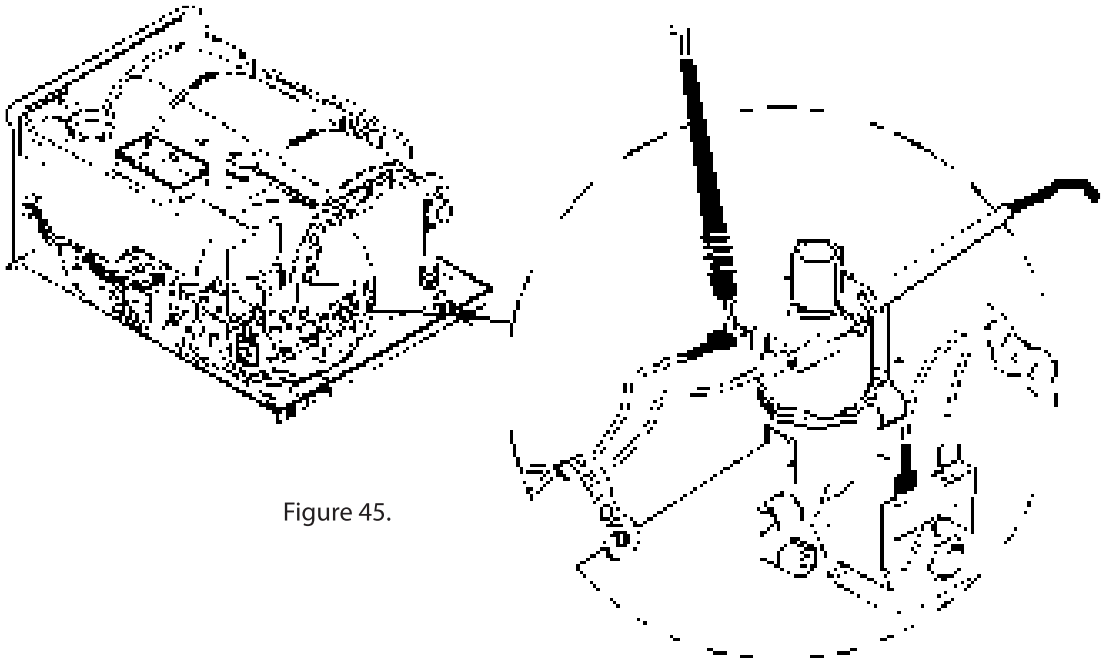


Figure 45.

## General Ordering Information

| | |
|---|---|
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| Customer Service Fax Orders | 1-800-659-7255 |
| Technical Support (8 A.M. – 6 P.M. EST) | 1-800-659-5922 |
| Technical Support Fax | 1-704-659-7255 |

## Purchase Information

Write in the model and serial number below for the dental chair.

MODEL: _____

SERIAL NUMBER: _____

DATE PURCHASED: _____

DATE INSTALLED: _____

DEALER NAME AND ADDRESS:

_____

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_____

_____

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## Notes

Notes

Pelton & Crane

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