

## C24EA SERIES ELECTRIC CONVECTION STEAMERS

C24EA6      ML-136058  
C24EA10     ML-136059



C24EA6 SHOWN

19271

**- NOTICE -**

This Manual is prepared for the use of trained Vulcan Service Technicians and should not be used by those not properly qualified. If you have attended a Vulcan Service School for this product, you may be qualified to perform all the procedures described in this manual.

This manual is not intended to be all encompassing. If you have not attended a Vulcan Service School for this product, you should read, in its entirety, the repair procedure you wish to perform to determine if you have the necessary tools, instruments and skills required to perform the procedure. Procedures for which you do not have the necessary tools, instruments and skills should be performed by a trained Vulcan Service Technician.

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# GENERAL

## INTRODUCTION

This manual is applicable to the models and ML numbers listed on the cover page. Procedures apply to all models unless specified otherwise.

### Steam Cooking

Convection steamers offer an efficient way to produce many foods in either small portions or larger batches. Convection steam cooking will steam cook fresh foods or will steam defrost and cook frozen foods providing the maximum color, flavor and nutritional value with the least expenditure of energy and labor. The atmospheric steaming compartment allows the operator to open and close the door anytime during a cooking cycle. The generator heating elements will shut off when the door is opened then re-start when the door is closed.

## MODELS COVERED

|   |
|---|
| <b>Model Designations</b> (based on 2.5 inch pan depth) |
| C24EA6 - Six pan (3 pans per compartment)               |
| C24EA10 - Ten pan (5 pans per compartment)              |

## SPECIFICATIONS

All C24EA steamers, with exception of 480V steamers, are shipped pre-wired for 208/60/3 operation. Steamer heating element wiring change is required if connecting to 208/60/1, 240/60/1 or 240/60/3 electrical service.

### ELECTRICAL SPECIFICATIONS

| Volts | Phase | C24EA6   |      | C24EA10  |      |
|-------|-------|----------|------|----------|------|
|       |       | Total KW | Amps | Total KW | Amps |
| 208   | 1     | 16.9     | 81   | 25.6     | 121  |
| 240   | 1     | 19.0     | 79   | 25.6     | 110  |
| 208   | 3     | 16.9     | 48   | 25.2     | 72   |
| 240   | 3     | 19.0     | 51   | 25.6     | 67   |
| 480   | 3     | 17.2     | 21   | 25.6     | 32   |

**NOTES:**

1. Voltage values are @ 60HZ.
2. Heating elements on three phase machines are not wired as a balanced load. The amps listed are the maximum on any leg.
3. Total KW and amps include heat exchanger elements.

### WATER SUPPLY REQUIREMENTS

|   |                     |
|---|---------------------|
| Supply pressure should be                   | 20-60 psig          |
| In line strainer for supply line (Supplied) |                     |
| Total dissolved solids (TDS)*               | less than 60 ppm    |
| Total alkalinity                            | less than 20 ppm    |
| Silica                                      | less than 13 ppm    |
| Total Chloride                              | less than 4.0 ppm   |
| PH factor                                   | 6.5 to 8            |
| Undissolved Solids                          | less than 5 microns |

\*17.1 ppm = 1 grain of hardness

Water hardness below 4 grains/gal requires water treatment to reduce potential corrosion. Hardness above 6 grains/gal should be treated by water conditioner, water softener or in-line treatment.

### Water Conditioning

It is recommended that a local water treatment specialist be consulted before the installation of any steam generating equipment.

Furnishing the steam generator with properly conditioned water to reduce scale formation is important. Scale formation will reduce steam output, cause premature component failure and shorten equipment life. Most water supplies contain scale producing minerals such as calcium and magnesium. As steam is generated, the minerals remain and dissolve into the remaining water. As the concentration of these minerals increases past a certain point, they precipitate from the water and coat the inside of the steam generator, heating elements, thermostat bulbs and water level probes. Because of the high temperature of these surfaces, the precipitated minerals bake onto them and become very difficult to remove.

This phenomenon causes several problems:

1. Reduces the heat transfer efficiency of heating elements.
2. Causes premature failure of heating elements.
3. Water level probes will give false readings.
4. Temperature sensing bulbs will sense temperature incorrectly.

These problems are common to any manufacturer's steamer regardless of design, but they can all be prevented by furnishing the steam generator with properly conditioned water. Vulcan recommends the water contain less than 60ppm of total dissolved solids (TDS) and have a PH factor between 6.5 to 8.

Other chemical properties in water supplies can also affect good steam generation and vary from within each state and locality.

The water level probes in the steam generator use ions in the water to detect the water level. Do not use fully demineralized or de-ionized water since it is non-conductive and the water level can not be detected.

**NOTE:** The use of strainers, or filters will not remove minerals from the water.

Steamers that operate over a long period of time without the benefit of properly conditioned water, and have developed a heavy scale build up, should be cleaned before connecting to a conditioned water supply.

### REFERENCE MATERIAL

For replacement parts, refer to Catalog of Replacement Parts F35454.

For operation, cleaning and maintenance instructions, refer to Installation and Operation Manual F35430.

### LUBRICATION

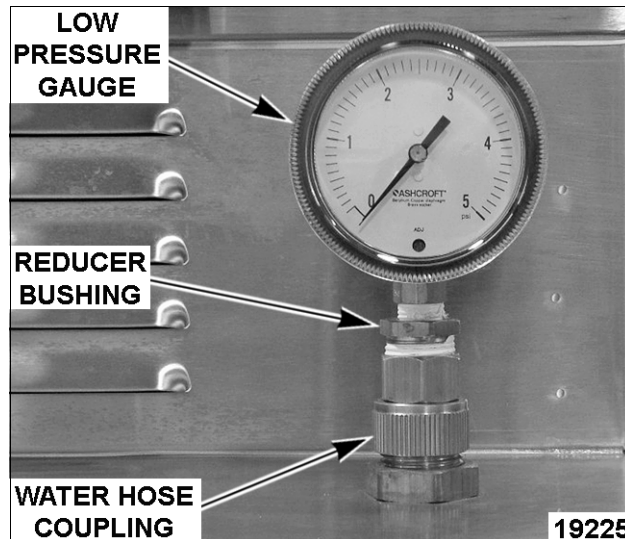
| Component                   | Lubrication Type                 |
|-----------------------------|----------------------------------|
| All NPT Fittings            | Pipe Thread Sealant, Loctite 565 |
| Door Handle Sliding Bracket | Lubriplate 630AA                 |

### TOOLS

- Standard set of hand tools.
- VOM with A/C current tester (any quality VOM with a sensitivity of at least 20K ohms per volt can be used).
- Anti Static Kit, Part No. TL - 84919.

### Special

- Torque Wrench - Capable of measuring 70 in-lbs.
- Aluminum Foil Tape - (McMaster-Carr Part No. 7631A21) or equivalent.
- Single use Constant Tension Band Clamps for the specific hose size being used. Refer to parts catalog for part number.
- Pressure Gauge Assembly
  - Low Pressure Gauge - 0 to 5 psi. recommended (Grainger Part No. 2C641).
  - Water Hose Coupling - swivel type (Grainger Part No. 4KG87).
  - Reducer Bushing (Grainger Part No. 6MN61).
  - Pipe thread sealant (as required).





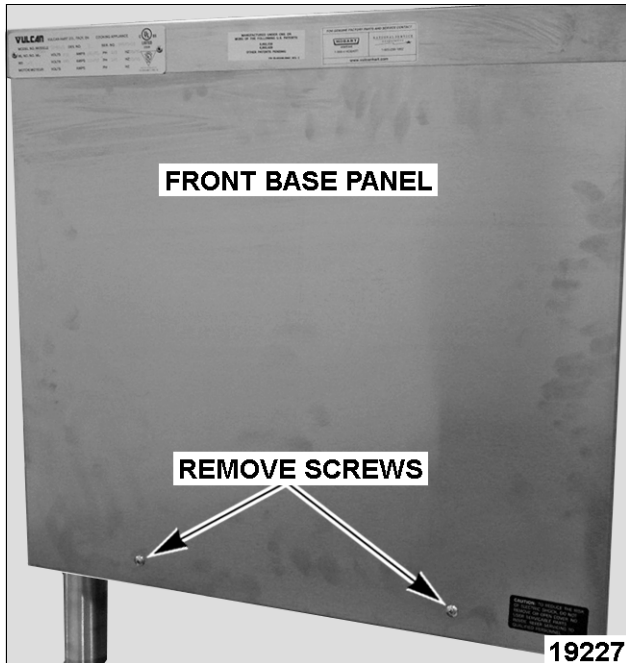
# COVERS AND PANELS



**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

## FRONT BASE PANEL

1. Remove screws from the bottom of panel.

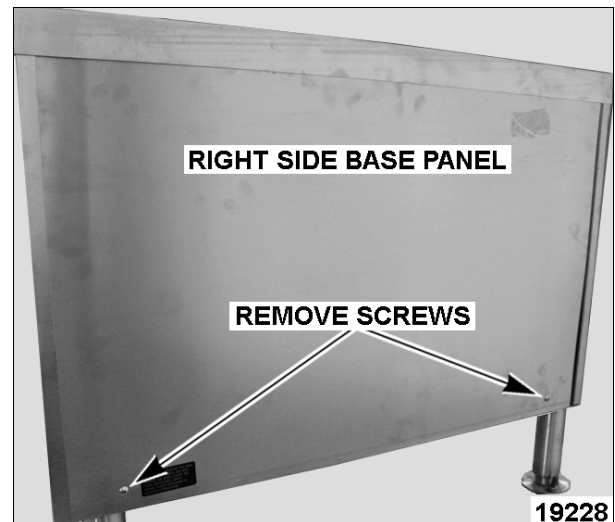


2. Pull bottom of panel out and slide down to clear tabletop cover.
3. Reverse procedure to install.

## RIGHT AND LEFT SIDE BASE PANELS

**NOTE:** Removal of left side panel is identical to the procedure for the right side panel.

1. Remove FRONT BASE PANEL.
2. Remove screws from the bottom of panel.



3. Pull bottom of panel out and slide down to clear tabletop cover.
4. Reverse procedure to install.

## REAR BASE PANEL

1. Remove electrical power connection to machine.
2. Turn off water supply and disconnect plumbing to machine.
3. Remove screws securing water valves to panel.
4. Remove screws from the bottom of panel.

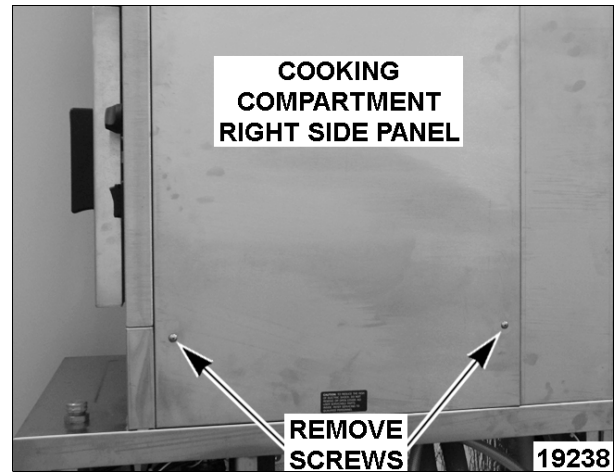


5. Pull bottom of panel out and slide down to clear tabletop cover.
6. Reverse procedure to install.

## COOKING COMPARTMENT RIGHT AND LEFT SIDE PANELS

**NOTE:** Removal of left side panel is identical to the procedure for the right side panel.

1. Remove screws from the bottom of panel.



2. Pull bottom of panel out and slide down to clear top cover.
3. Reverse procedure to install.

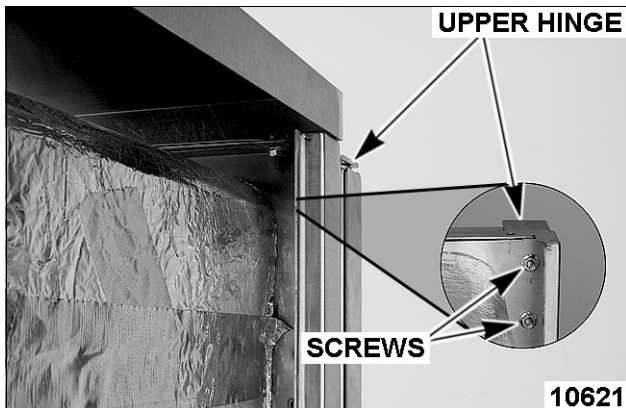
# DOOR



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

## REMOVAL

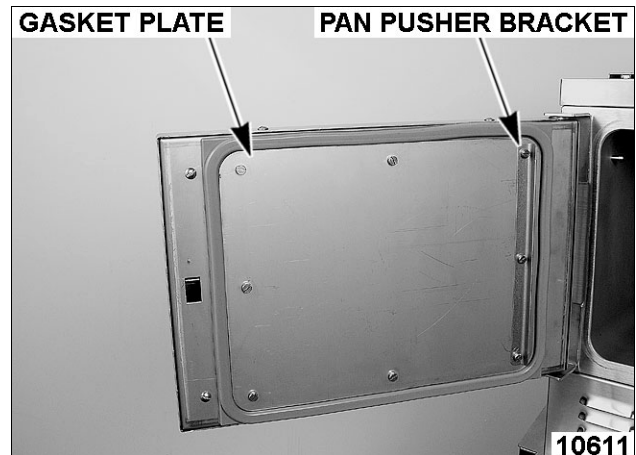
1. Close door.
2. Remove COOKING COMPARTMENT LEFT SIDE PANEL as outlined under COVERS AND PANELS.
3. Remove nuts from upper hinge located inside front panel.



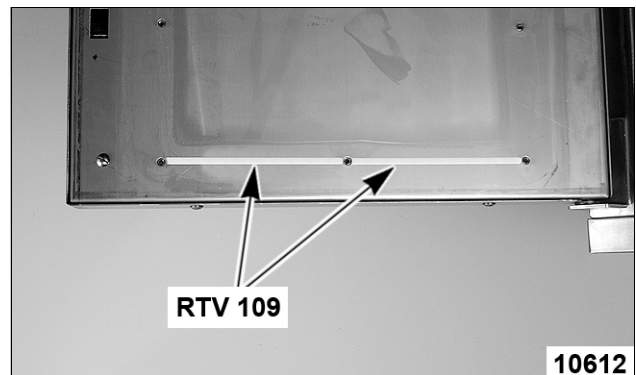
4. Open door slightly, and while holding door, pull upper hinge away from front panel.
5. Pull upper hinge out of upper door hinge bushing.
6. Lift door assembly up and off lower door hinge.
7. Reassemble parts removed in reverse order.
8. Check door for fit and proper sealing of gasket.

## GASKET

1. Open door.
2. Remove the shoulder screws and pan pusher bracket from gasket plate.



3. Remove gasket plate.
4. Remove gasket from inner door panel.
5. Remove RTV from bottom part of inner door panel. Apply RTV 109 to bottom of door where shown when assembling gasket to door.

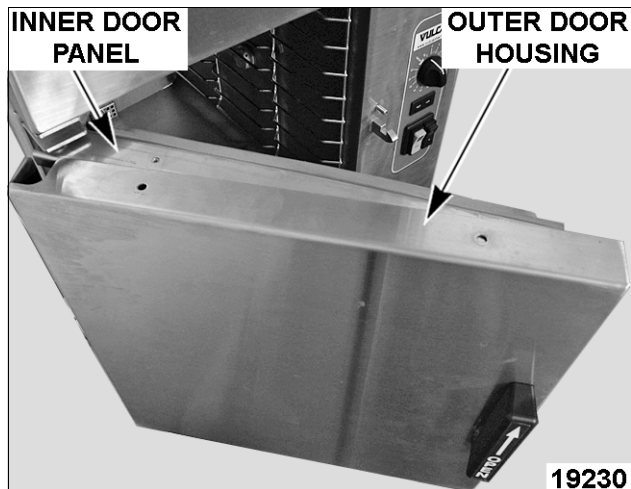


6. Place a small amount of RTV109 into the inner door panel gasket screw holes before assembly.
7. Position the new gasket on gasket plate and reverse procedure to install.

## DOOR HANDLE

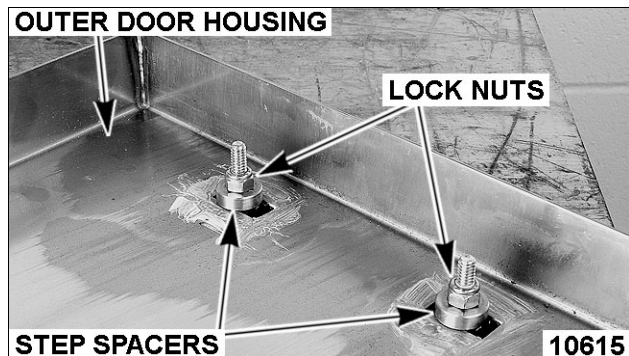
### Removal

1. Open door.
2. Remove screws from top and bottom of door assembly.



3. Pull outer door housing away from inner door panel starting at the hinge side of door to separate the door halves.

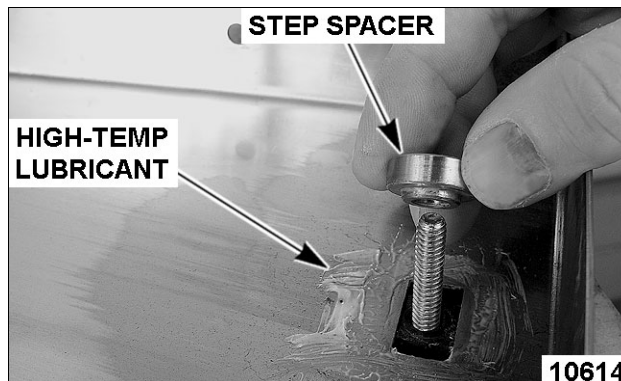
**NOTE:** The smaller radius of the step spacers fit into the slots of the outer door housing and is used to provide clearance for handle operation.



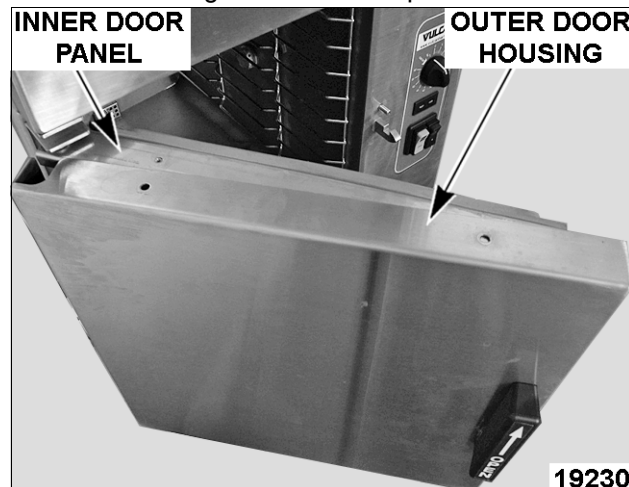
4. Remove lock nuts and stepped spacers from threaded studs of door handle.

### Installation

1. Apply Lubriplate 630AA around slots of outer door housing where step spacers contact housing.
2. Install door handle into outer door housing such that hinge side of door housing is to the left and arrow on handle is pointed upward.
3. Install step spacer with smaller radius toward handle and door housing. Smaller radius is a slip fit with outer door housing slot.



4. Install lock nuts and tighten until no gap exists between handle, step spacer and lock nut. Do not over-tighten lock nuts.
5. Close inner door panel so that latch mechanism engages striker on front panel.
6. Install outer door housing onto inner door panel.
7. Align the top and bottom screw holes of outer door housing with inner door panel.



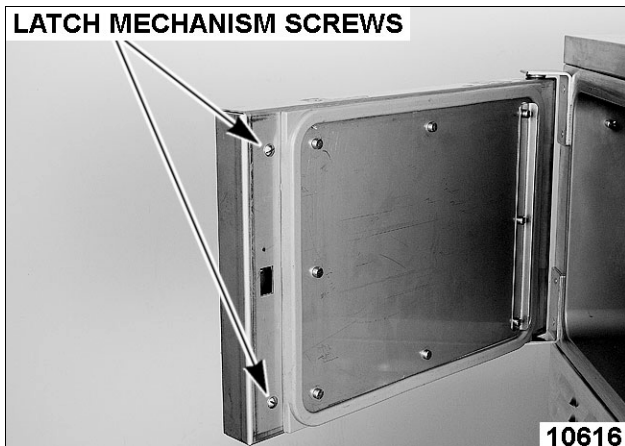
8. Install screws to secure door halves together. Apply Loctite 242 to threads of screws before assembly.
9. Check opening and closing operation of door.

## LATCH ASSEMBLY

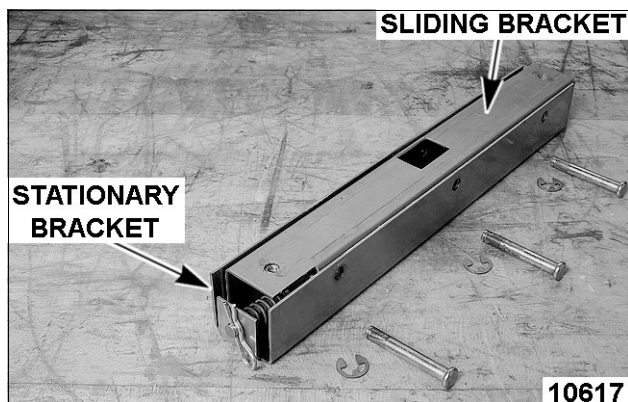
### Removal and Disassembly

1. Separate outer door housing assembly from inner door panel as outlined under DOOR HANDLE.
2. Remove screws securing latch assembly to inner door panel and remove latch mechanism.

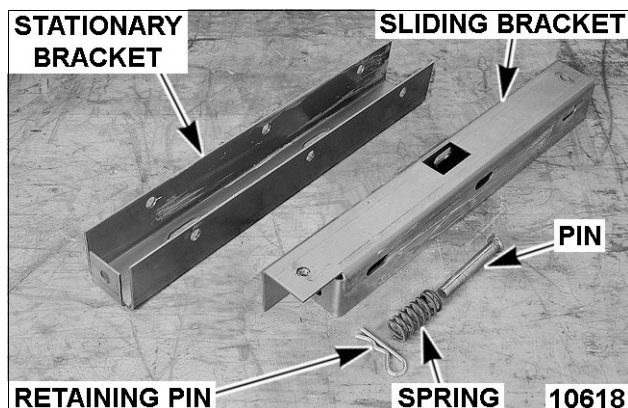
#### LATCH MECHANISM SCREWS



3. Remove E-clip from latch assembly pins and pull pins from latch mechanism.

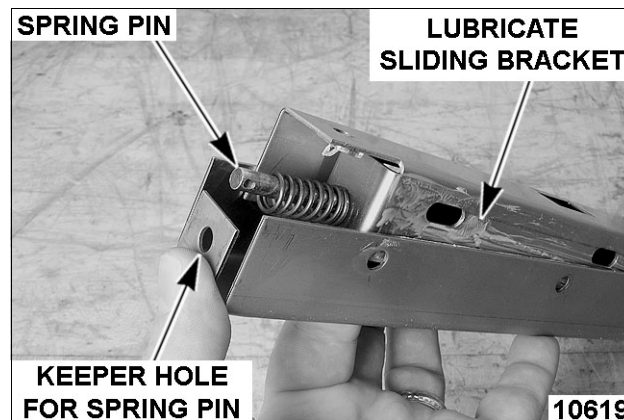


4. Remove retaining pin from spring pin.
5. Separate sliding bracket from stationary bracket.



### Assembly

1. Apply Lubriplate 630AA to sides of sliding bracket.
2. Insert spring pin into bottom of sliding bracket.
  - A. Place spring over spring pin.
3. Assemble sliding bracket into stationary bracket.
4. While holding head of spring pin against bottom of sliding bracket, insert spring pin into keeper hole in bottom of stationary bracket.



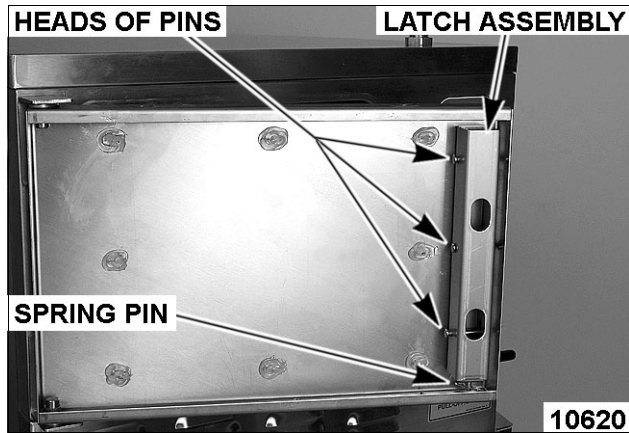
- A. Secure spring pin in place with retaining pin.

**NOTE:** Install pins such that heads of pins will be facing inward toward hinge side of inner door panel when latch assembly is installed.

5. Install pins to assemble stationary and sliding brackets together.
  - A. Secure pins into position with E-clip.

**Installation**

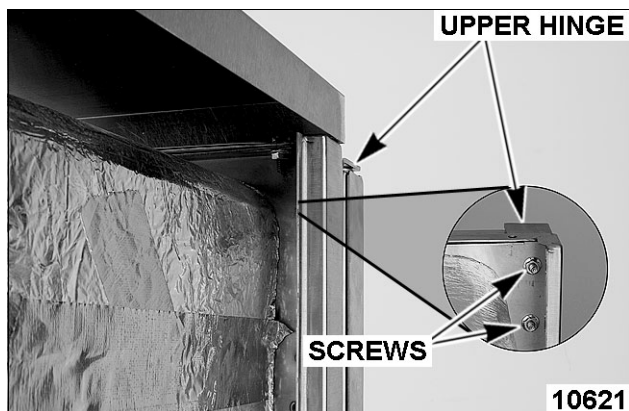
1. Install latch assembly onto inner door panel with spring pin toward bottom of door panel.
  - A. Apply Loctite 271 to threads of screws before assembly and secure latch assembly to inner door panel.



2. Install outer door housing assembly as outlined under DOOR HANDLE.
3. Check opening and closing operation of door.
4. Check steamer for proper operation and leaks around door seal.

**HINGE BEARINGS**

1. Close door.
2. Remove COOKING COMPARTMENT LEFT SIDE PANEL as outlined under COVERS AND PANELS.
3. Remove nuts from upper hinge located inside front panel.



4. Open door slightly, and while holding door, pull upper hinge away from front panel.
5. Pull upper hinge out of upper door hinge bearing.
6. Lift door assembly up and off lower door hinge.
7. Pry hinge bearing out from door assembly.

8. Remove outer door housing.

**NOTICE** Do not drive bearing into place. The inner door panel could be damaged. Press bearing into position.

**NOTE:** When replacing door hinge bearings, replace both hinge bearings.

9. Position replacement hinge bearing over hinge opening in door assembly.



- A. Press hinge bearing fully into door assembly using a C-clamp or equivalent.

10. Reassemble parts removed in reverse order.

11. Check door for fit and proper door gasket sealing.

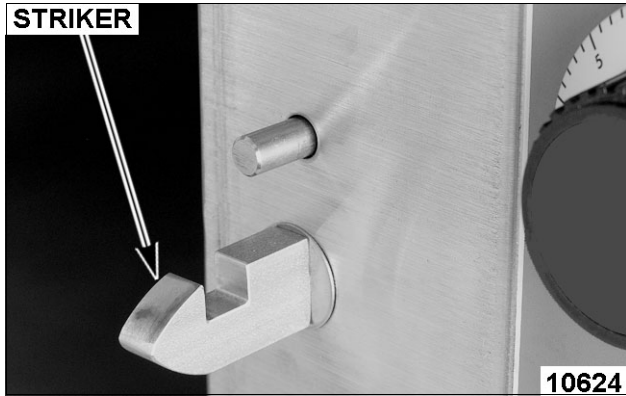
**DOOR LATCH ADJUSTMENT**

**Opening a Jammed Door**

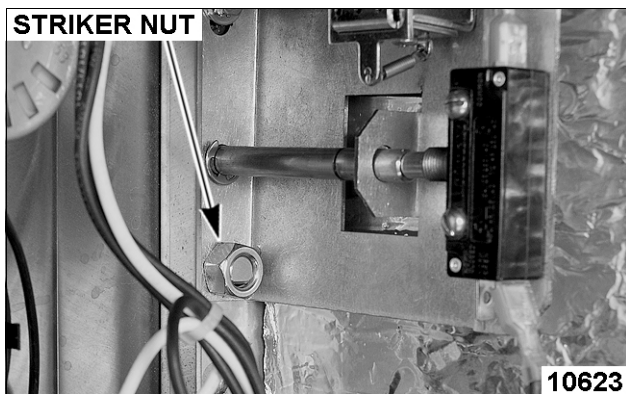
**NOTICE** Should the steamer door jam and cannot be opened, do not force or pry the door as damage will occur.

1. Lift up on bottom of door at the handle end to disengage latch.
  - A. If door does not open, remove COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.

- B. Locate the striker that catches on door latch near steam chamber on front panel.



- C. Remove the nut from striker and this should release it from the panel.



- D. Open door.
2. Remove striker.
  3. Remove any burrs on striker that may cause latch to stick.
  4. Apply Loctite 271 to threads of striker.
  5. Reinstall striker with slotted side up. Snug striker nut. Perform Adjustment, so door will not jam.

**Adjustment**

1. Reinstall striker with slot pointing upward and hand tighten nut only.
2. Close door to center striker in front panel mounting hole.
3. Open door and check striker slot for horizontal alignment. The slot on striker must be kept horizontal in order for door latch to catch properly and latch.
4. Once proper slot alignment has been set, hold striker close to its base then tighten the striker nut. Be careful not to damage striker slot when tightening or door may not latch properly.

**NOTE:** Do not over-tighten nut. If over-tightened, striker may turn and change alignment.

**NOTE:** If door does not open easily, add shims between striker and cabinet front. When adding shims make certain that door gasket seals properly and steamer does not leak. Remove shims as necessary until leaking stops.

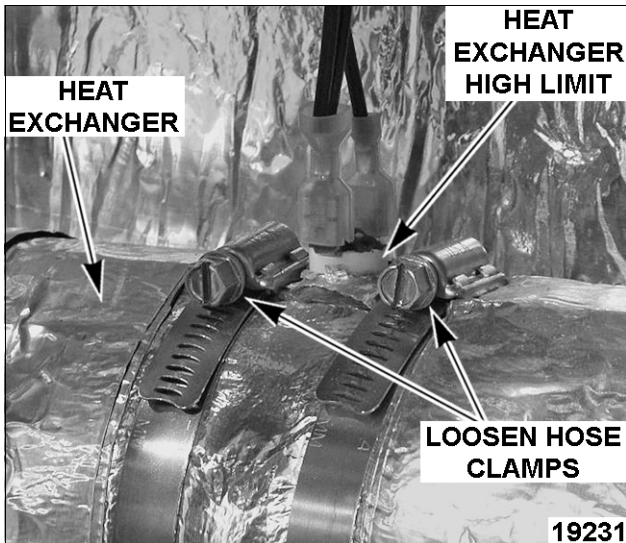
# THERMOSTAT AND HIGH LIMITS

## HEAT EXCHANGER HIGH LIMIT

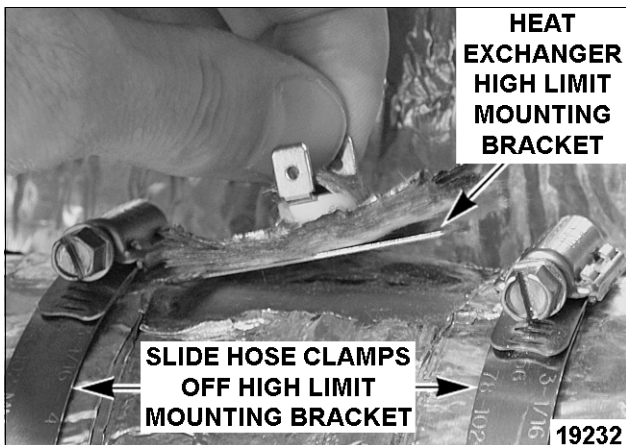


**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Disconnect electrical lead wires from heat exchanger high limit.
4. Loosen hose clamps securing heat exchanger high limit to the heat exchanger surface.



5. Remove heat exchanger high limit.



6. Reassemble parts removed in reverse order.
7. Check steamer for proper operation.

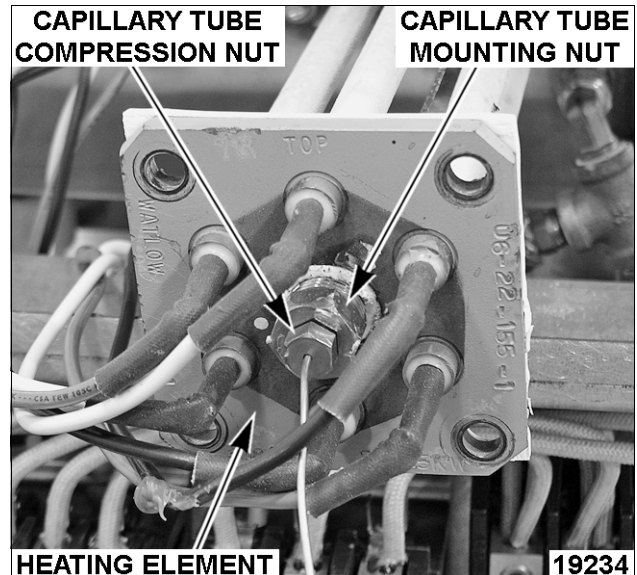
## STEAM GENERATOR HIGH LIMIT



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

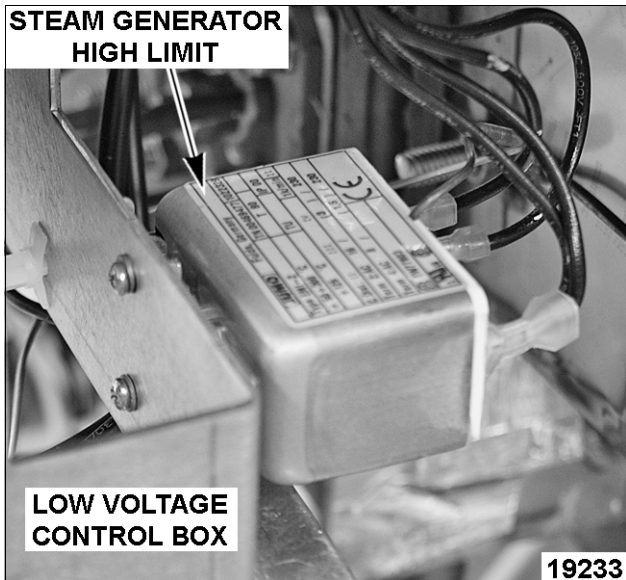
### Removal

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Remove heating element (1HTR) from steam generator as outlined under HEATING ELEMENTS AND CONTACTORS.
4. Fully loosen capillary tube compression nut and slide it away from heating element.
5. Remove capillary tube mounting nut from heating element mounting plate.



6. Disconnect electrical wiring to high limit.
7. Remove high limit from the rear of low voltage control box.



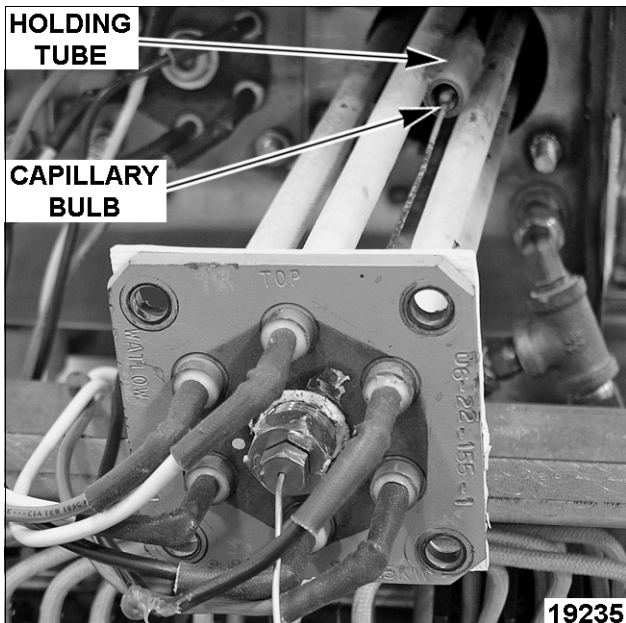


RIGHT SIDE SHOWN

8. Remove capillary tube from heating element.

**Installation**

1. Route capillary bulb through the opening in heating element mounting plate. Ensure there are no sharp bends in capillary tubing while installing.
  - A. Insert capillary bulb into the holding tube on heating element.
2. Apply pipe thread sealant to threads then install large capillary tube mounting nut.
  - A. Ensure capillary bulb is centered in the holding tube. Tighten the capillary tube compression nut.



3. Install heating element with a new gasket. Torque mounting nuts to 70 in-lbs and tighten using an alternating pattern.

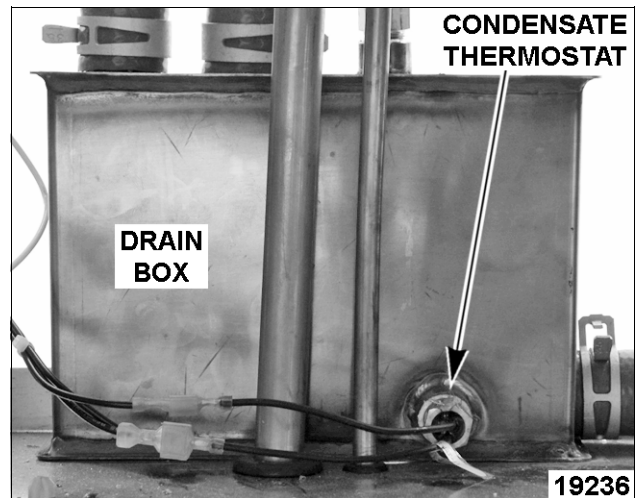
4. Secure high limit to low voltage control box then coil excess capillary tube length near the high limit.
5. Check steamer for proper operation and leaks around heating element gasket and high limit capillary tube nuts.

**CONDENSATE THERMOSTAT**



**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Disconnect electrical wiring to condensate thermostat.
4. Remove condensate thermostat from the rear of drain box.



REAR OF DRAIN BOX SHOWN

5. Reassemble parts removed in reverse order. Apply pipe thread sealant to threads of thermostat before assembly.
6. Check steamer for proper operation and leaks around condensate thermostat.

# TIMERS

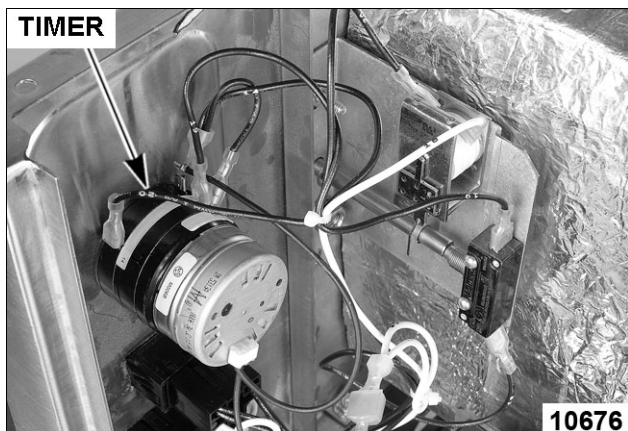


**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

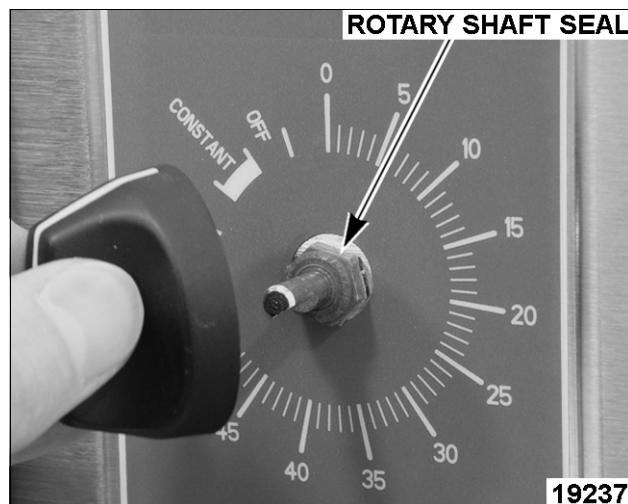
## REMOVAL AND REPLACEMENT

**NOTE:** When the timer reaches zero, an external buzzer will sound and steam will stop entering the cooking compartment. The constant steam setting allows for continuous steam operation.

1. Remove COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.
2. Note electrical connections then disconnect wiring from timer being serviced.



UPPER COMPARTMENT SHOWN



4. Reverse procedure to install.
5. Check steamer for proper operation.

3. Pull knob from timer shaft.
  - A. Remove rotary shaft seal from timer shaft then remove timer from front panel.
  - B. Inspect rotary shaft seal. Replace if damaged, worn or signs of moisture migration into control area around timer shaft is evident.

# HEATING ELEMENTS AND CONTACTORS

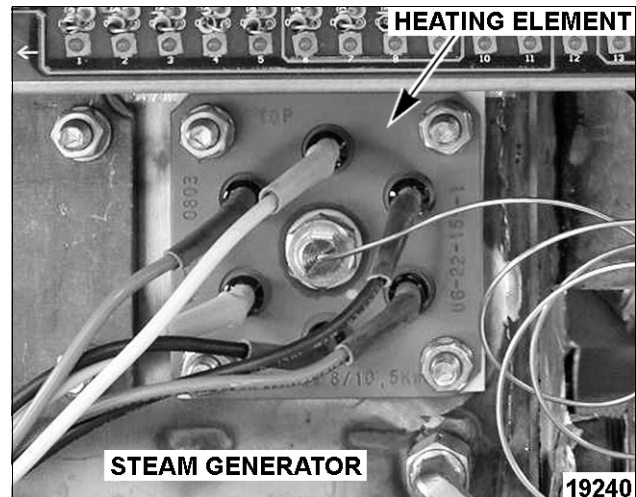
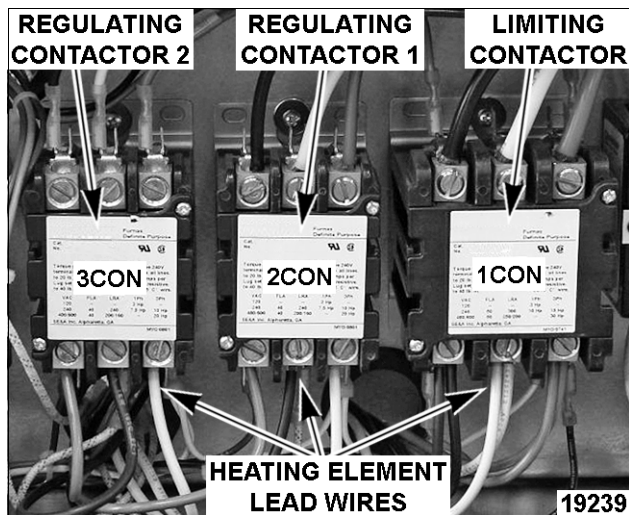


**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

## REMOVAL AND REPLACEMENT

### Heating Elements

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Remove top screw securing cover to high voltage box.
4. Note electrical connections for the heating element being replaced then disconnect heating element lead wires from contactors.



**HEATING ELEMENT (1HTR) WITH STEAM GENERATOR HIGH LIMIT SHOWN**

- A. If replacing heating element (1HTR), remove STEAM GENERATOR HIGH LIMIT.
  - B. Pull heating element out of steam generator.
6. Reassemble parts removed in reverse order. Torque mounting nuts to 70 in-lbs and tighten using an alternating pattern.

**NOTE:** When installing heating element 2HTR or 3HTR, install pipe plug in the center of heating element mounting plate. Apply pipe thread sealant to threads before assembly. Use a new gasket whenever installing a heating element.

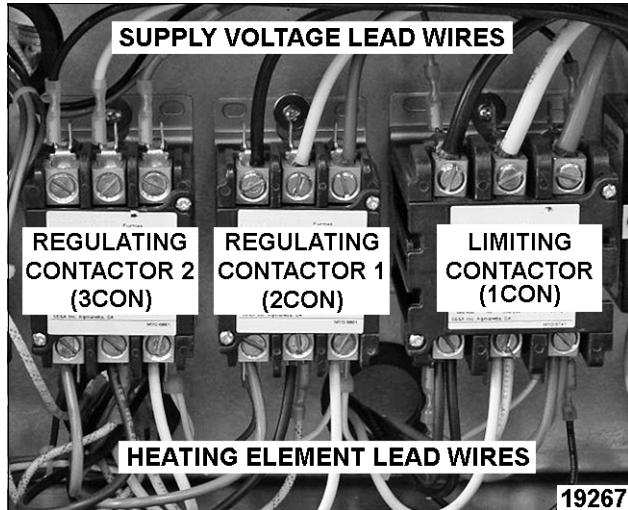
**NOTE:** Refer to STEAM GENERATOR HIGH LIMIT for proper placement of capillary bulb.

5. Remove mounting nuts and lock washers securing heating element to steam generator.

7. Check steamer for proper operation and leaks around heating element.

**Contactors**

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Remove top screw securing cover to high voltage box.
4. Note electrical connections for the contactor being replaced then disconnect lead wires from contactor terminals and coil.
5. Remove screws securing contactor to high voltage control box then remove contactor.



6. Reassemble parts removed in reverse order.
7. Check steamer for proper operation.

**HEATING ELEMENTS  
DIAGNOSTIC CHECK**



**⚠ WARNING** Certain procedures in this section require electrical test or measurements while power is applied to the machine. Exercise extreme caution at all times. If test points are not easily accessible, disconnect power and follow lockout / tagout procedures, attach test equipment and reapply power to test.

1. Check voltage across heating element lead wires at the limiting and regulating contactor terminals and verify against data plate.
  - A. If voltage is correct, check current draw (step 2).
  - B. If voltage is not correct, check the following:
    - 1) Voltage supply to steamer.
    - 2) Fuses or breaker blown.
    - 3) Power to contactor coils.
    - 4) Contactors not pulling in (mechanical problem).
2. Check current draw (amps) through heating element lead wires using an amp clamp meter.
 

**NOTE:** Checking current draw is the preferred method over a resistance check when an amp clamp meter is available.

  - A. If current is correct, then heating element is ok. See table for proper values.
  - B. If current is not correct, turn power switch off and disconnect power to machine.
    - 1) Install a replacement heating element.

3. If unable to check current draw, a resistance check may indicate a malfunctioning element.
  - A. Turn power switch off and disconnect power to machine.
  - B. Disconnect heating element lead wires and check the individual element resistance using a VOM.
  - C. If resistance readings are not correct, replace heating element.
4. Check steamer for proper operation.

| VOLTAGE          | KW PER ELEMENT | CURRENT PER ELEMENT | RESISTANCE PER ELEMENT (OHMS) |
|------------------|----------------|---------------------|-------------------------------|
| 208 <sup>1</sup> | 8.0            | 12.8                | 16.2                          |
| 240 <sup>1</sup> | 10.5           | 14.8                | 16.2                          |
| 480 <sup>2</sup> | 8.0            | 9.6                 | 28.8                          |
| 208 <sup>1</sup> | 8.0            | 12.8                | 16.2                          |
| 240 <sup>1</sup> | 10.5           | 14.8                | 16.2                          |
| 480 <sup>2</sup> | 8.0            | 9.6                 | 28.8                          |

<sup>1</sup> Dual voltage elements.

<sup>2</sup> 480V elements are connected in Wye configuration for 277V across each element.

**NOTE:** Values in table are nominal. Tolerance is ±10 %.

# HEAT EXCHANGER ELEMENTS AND RELAYS

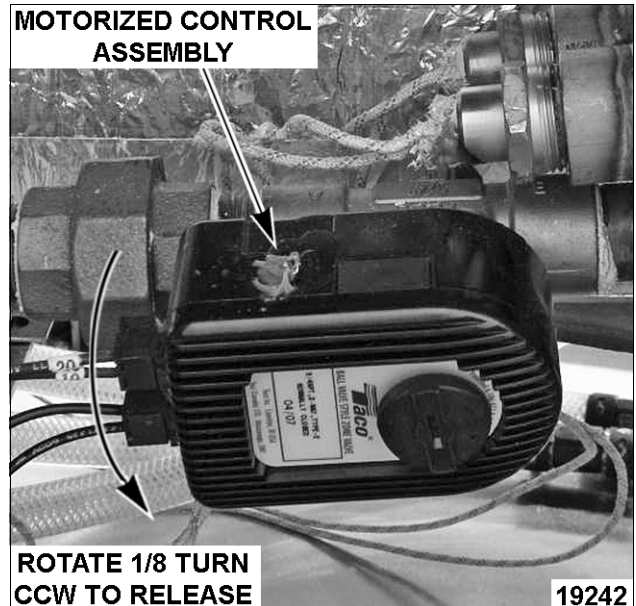
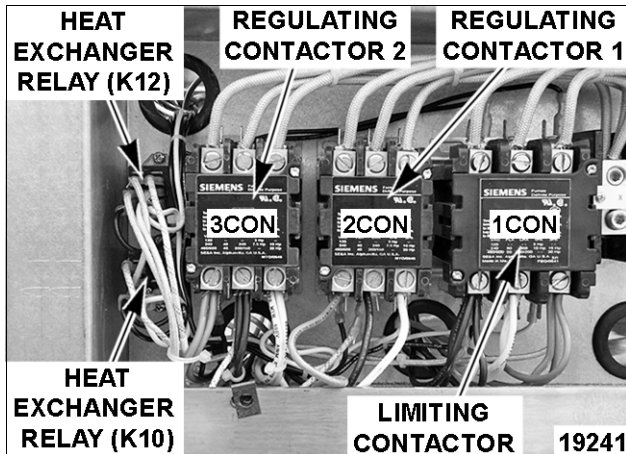


**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

## REMOVAL AND REPLACEMENT

### Heat Exchanger Elements

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove FRONT BASE PANEL and RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Note electrical connections for the heat exchanger element being replaced then disconnect lead wires from heat exchanger relay and contactor.



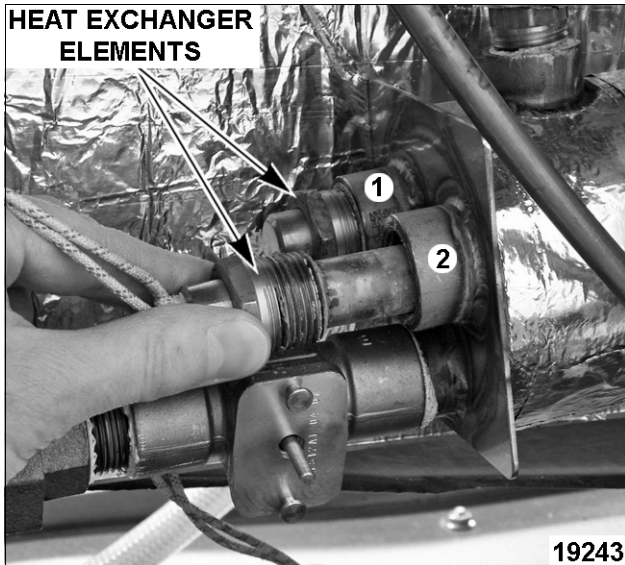
**NOTE:** When installing, align the flat on delime valve stem and the locking pins on delime valve to the motorized control assembly.

**NOTE:** The two electrical plugs on the motorized control assembly are identical. Note location of electrical wiring if disconnecting from motorized control assembly. If the electrical plugs not connected correctly, the motorized delime valve will not function.

4. Remove motorized control assembly from delime valve. Rotate the assembly CCW approximately 1/8 turn to disengage from delime valve.

5. Remove heat exchanger element from heat exchanger.

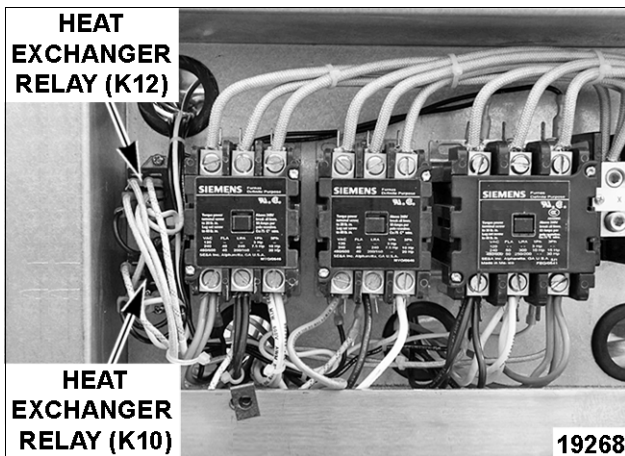
**NOTE:** To access heat exchanger element (1), remove heat exchanger element (2) and the 3/8" vent tube on vacuum relief valve (outlet side).



6. Reassemble parts removed in reverse order. Apply pipe thread sealant to threads of heat exchanger element before assembly.
7. Check steamer for proper operation and leaks around heat exchanger element.

**Heat Exchanger Relays (K10, K12)**

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Remove top screw securing cover to high voltage control box.
4. Note electrical connections for the heat exchanger relay being replaced then disconnect lead wires from relay terminals and coil.
5. Remove screws securing heat exchanger relay to high voltage control box then remove relay.



6. Reassemble parts removed in reverse order.
7. Check steamer for proper operation.

**HEAT EXCHANGER ELEMENTS DIAGNOSTIC CHECK**



**⚠ WARNING** Certain procedures in this section require electrical test or measurements while power is applied to the machine. Exercise extreme caution at all times. If test points are not easily accessible, disconnect power and follow lockout / tagout procedures, attach test equipment and reapply power to test.

1. Check voltage across heat exchanger element lead wires at the limiting and regulating contactor terminals and verify against data plate.
  - A. If voltage is correct, check current draw (step 2).
  - B. If voltage is not correct, check the following:
    - 1) Voltage supply to steamer.
    - 2) Fuses or breaker open.
    - 3) Heat exchanger relay (K10) (heat exchanger element 1) or heat exchanger relay (K12) (heat exchanger element 2).
    - 4) Power to contactor coils.
    - 5) Contactors not pulling in (mechanical problem)
2. Check current draw (amps) through heat exchanger element lead wires using an amp clamp meter.

**NOTE:** Checking current draw is the preferred method over a resistance check when an amp clamp meter is available.

- A. If current is correct, then heat exchanger element is ok. See table for proper values.
- B. If current is not correct, turn power switch off and disconnect power to machine.
  - 1) Install replacement heat exchanger element.

3. If unable to check current draw, a resistance check may indicate a malfunctioning element.
  - A. Turn power switch off and disconnect power to machine.
  - B. Disconnect heat exchanger element lead wires and check resistance using a VOM.
  - C. If resistance is not correct, replace heat exchanger element.
4. Check steamer for proper operation.

| MODEL   | VOLTAGE          | WATTS PER ELEMENT | CURRENT PER ELEMENT | RESISTANCE PER ELEMENT (OHMS) |
|---------|------------------|-------------------|---------------------|-------------------------------|
| C24EA6  | 208 <sup>1</sup> | 450               | 2.20                | 96.1                          |
|         | 240 <sup>1</sup> | 600               | 2.50                | 96.0                          |
|         | 480 <sup>2</sup> | 600               | 2.20                | 128.0                         |
| C24EA10 | 208 <sup>1</sup> | 600               | 2.90                | 72.1                          |
|         | 240 <sup>1</sup> | 800               | 3.30                | 72.0                          |
|         | 480 <sup>2</sup> | 800               | 2.90                | 95.9                          |

<sup>1</sup> Dual voltage elements.

<sup>2</sup> 480V Elements are connected in Wye configuration for 277V across each element.

**NOTE:** Values in table are nominal. Tolerance is ±10 %.

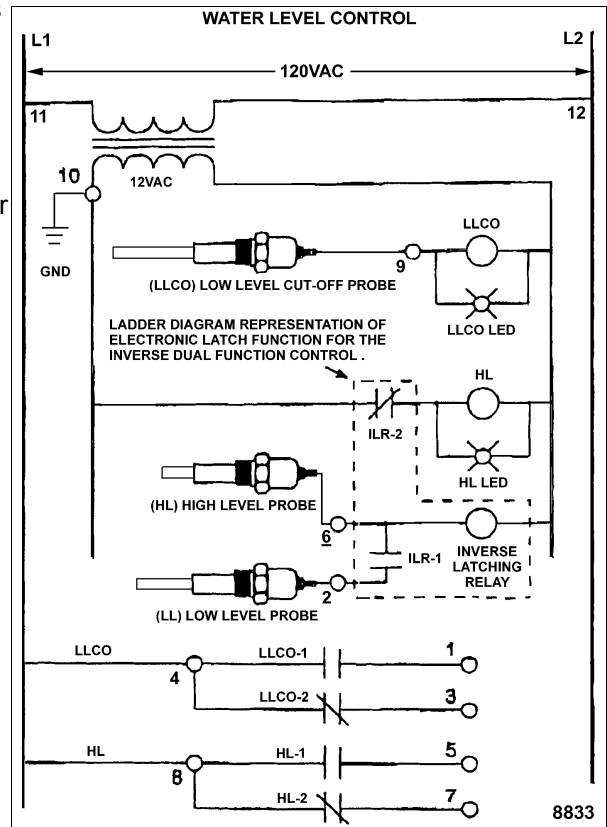
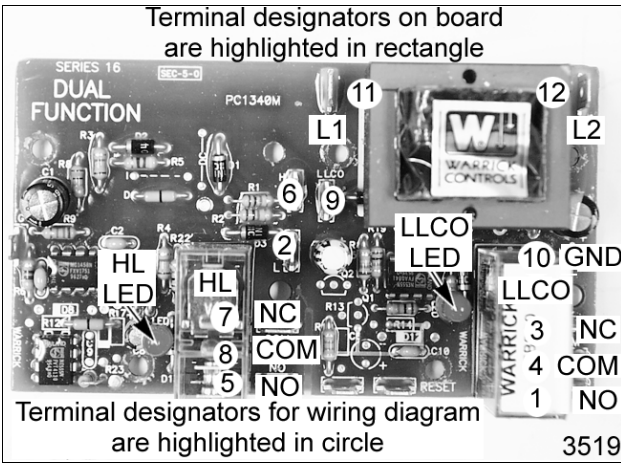


# WATER LEVEL CONTROL COMPONENTS

## WATER LEVEL CONTROL - LOW LEVEL CUT-OFF AND DIFFERENTIAL OPERATION

The steamer is equipped with three water level sensing probes (high, low and low level cut-off) and a water level control. The water level control performs two functions:

1. Provide low level cut-off protection to shut off the heat source in case the water level drops below the low level cut-off (LLCO) probe.
2. Perform as a differential level control to maintain the water level between the low and high water level probes.



The water level control (WLC) has input voltage (120VAC) across terminals 11 and 12 which powers the primary side of the transformer. On one side of the transformer secondary, power is provided to the control by a series path through chassis ground (terminal 10). The other side of the transformer secondary (12VAC) is attached to the probe that directs power to the other side of WLC relay coils (LLCO and HL) and to the inverse latching relay (ILR) electronic circuit on the WLC. As water enters the steam generator, it becomes part of the WLC circuit. When the water level in the steam generator reaches a probe, that circuit is completed.

The inverse latching relay of the WLC is de-energized, leaving the ILR-1 (N.O.) and ILR-2 (N.C.) contacts in their shelf state.

When the main power switch is turned on, power is supplied to the WLC which energizes the high level (HL) relay, closes HL-1 normally open contacts, and illuminates the HL relay LED. With the HL-1 contacts closed, the slow fill solenoid is energized and water begins filling the steam generator.

When the water level reaches the low level cut-off (LLCO) probe, the LLCO relay is energized and illuminates the LLCO LED. With the LLCO-1 contacts closed, the heat source can be energized provided the auxiliary control(s) in the heating circuit are satisfied. The LLCO relay will remain energized and its LED will stay lit until the water level in the steam generator drops below the LLCO probe.

When the water level reaches the low level (LL) probe, power to terminal 2 on the WLC is present but no switching occurs.

After the water level reaches the high level (HL) probe, the inverse latching relay of the WLC is energized and locked through the low level probe (LL) and ILR-1 contacts. With ILR-2 contacts open, HL relay is de-energized and the HL LED goes out. With the HL-1 contacts open, the slow fill solenoid is de-energized, stopping the flow of water into the steam generator.

When the water level drops below the low level (LL) probe, power is removed from the inverse latching relay, the HL relay energizes through ILR-2 and HL contacts change state. The slow fill solenoid is energized through HL-1 to refill the steam generator and the HL LED is lit. The HL relay and LED will toggle on and off during a cooking cycle as needed.

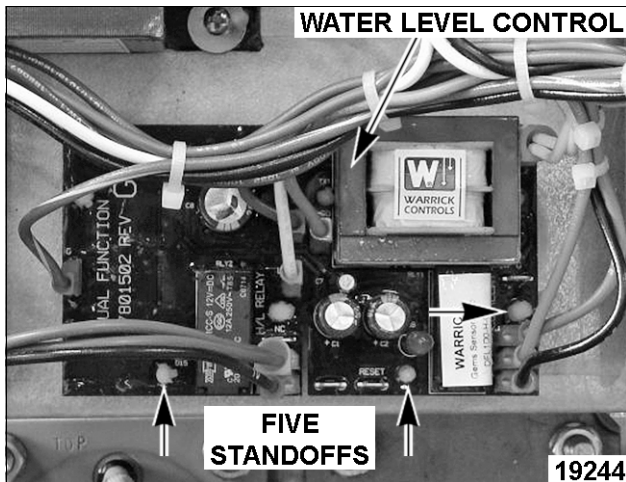
## WATER LEVEL CONTROL



**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

**NOTICE** Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

1. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
2. Squeeze tab on plastic standoffs (5) to release water level control.



3. Note electrical connections then disconnect lead wires from water level control (WLC). Refer to the machine schematic when installing water level control.
4. Reassemble parts and lead wires removed in reverse order.
5. Check steamer for proper operation.

## WATER LEVEL PROBES

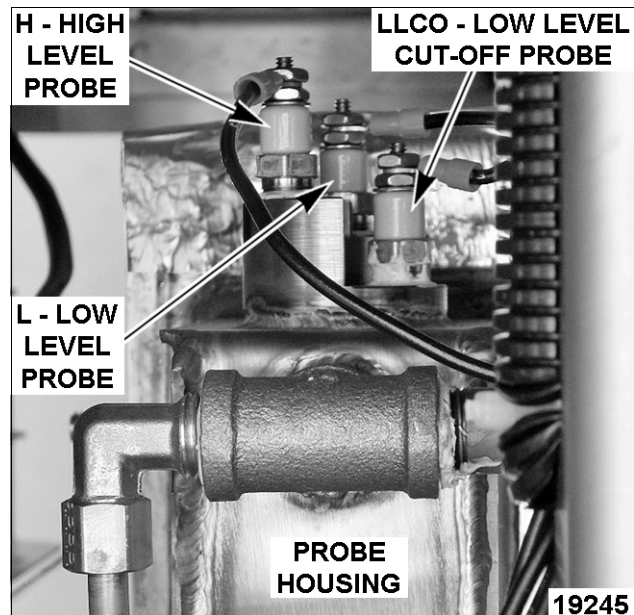


**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
2. Note locations of electrical wiring and disconnect lead wires to water level probes.

| WATER LEVEL PROBE ELECTRICAL CONNECTIONS |                |                          |
|--|----------------|--------------------------|
| Water Level Control                      | Wiring         | Water Level Probe        |
| H  | # 5 A - Blue   | H - High Level           |
| L  | # 6 B - Yellow | L - Low Level            |
| LLCO                                     | # 7 C - Red    | LLCO - Low Level Cut-Off |

3. Remove probes from probe housing.



**NOTE:** Probes should be cleaned thoroughly. Remove all accumulated deposits from insulator using a soft cloth. Do not use anything abrasive on insulators. If probes are dirty, delime steam generator after assembling.

**NOTE:** Apply pipe thread sealant to threads of probe before installation.

4. Reverse procedure to install.

**NOTE:** Perform steam generator DELIMING.

## FILTERED AND NON-FILTERED DUAL WATER SOLENOID VALVES



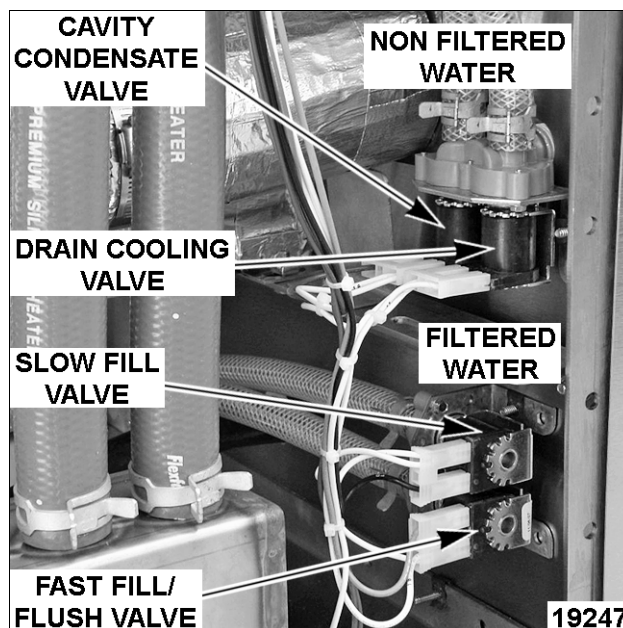
**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

**NOTE:** The filtered and non-filtered water solenoid valves are constructed as dual water valve assemblies. The two water valve assemblies used on the steamer have different flow rates and should not be interchanged.

| DUAL WATER VALVE FLOW RATES (GPM)                |   |                                       |
|--|---|---------------------------------------|
| Filtered Water<br>(Steam Generator Fill)         | <b>Fast Fill/Flush Valve<br/>(3SOL)</b>   | <b>Slow Fill Valve<br/>(4SOL)</b>     |
|  | 4.8                                       | 0.28                                  |
| Non-Filtered Water<br>(Condensate/Drain Cooling) | <b>Cavity Condensate Valve<br/>(2SOL)</b> | <b>Drain Cooling Valve<br/>(1SOL)</b> |
|  | 3.8                                       | 3.8                                   |

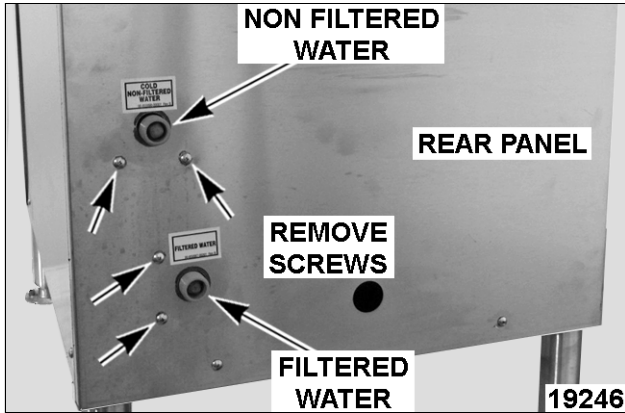
1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Disconnect incoming water to the dual water solenoid valve being replaced (filtered or non-filtered).
3. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
4. Note electrical connections then disconnect wires from solenoid valve.
5. Note hose connections then disconnect hoses from the outlet of solenoid valve.

**NOTE:** Use new band clamps when connecting hoses. See TOOLS.



**DUAL WATER VALVES SHOWN**

6. Remove screws (2) securing dual water solenoid valve to rear panel.



7. Reassemble parts removed in reverse order.
8. Verify water supply is connected to the correct dual water solenoid valve (filtered or non filtered).
9. Check steamer for leaks and proper operation.

### MOTORIZED DRAIN VALVE

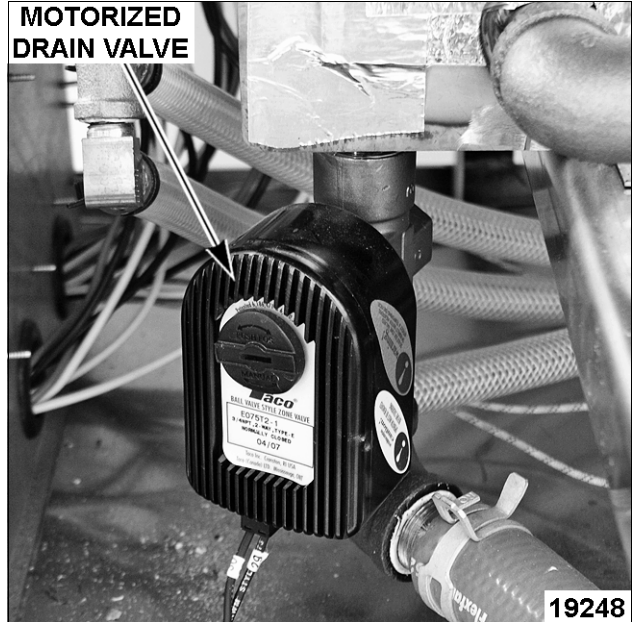


**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

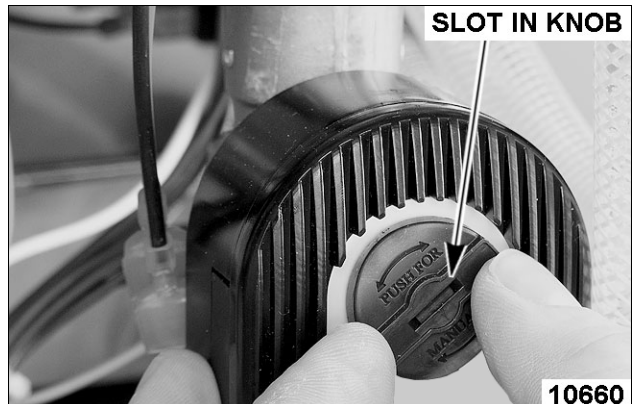
1. Turn power switch off.
  - A. Allow steamer to complete drain cycle.
  - B. If motorized drain valve has malfunctioned and the steam generator will not drain normally, refer to Drain Steam Generator Manually for draining procedure.

#### Drain Steam Generator Manually

1. Turn off water supply to steamer.
2. Disconnect power to steamer allowing time for water in steam generator to cool to 140°F before attempting to manually open drain valve.
3. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
4. Locate motorized drain valve found at the front of steam generator.



5. Push in on the manual drain override knob to disengage the gear set.
  - A. Rotate knob CW to manually open the drain valve. When the slot in knob is vertical, the drain valve is open. When the slot in knob is horizontal, the drain valve is closed.



- B. Return manual drain override knob to the closed position.

#### Removal

1. Turn off water supply to steamer.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Remove motorized control assembly from drain valve. Rotate motorized control assembly CCW approximately 1/8 turn to disengage assembly from drain valve.



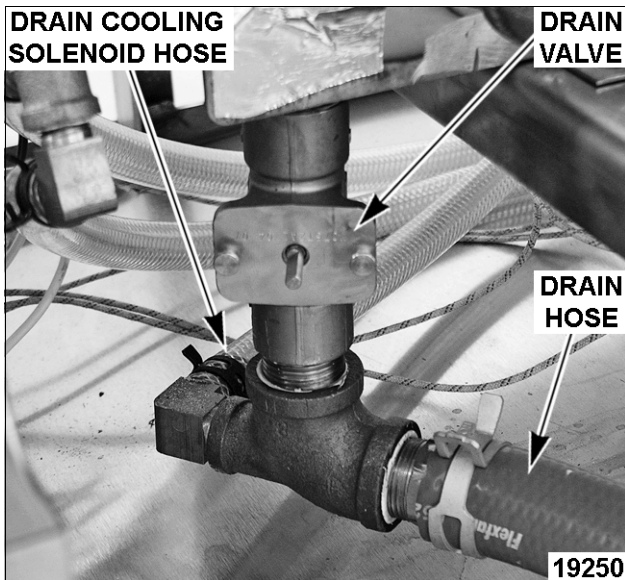
**NOTE:** When installing, align the flat on delime valve stem and the locking pins on delime valve to the motorized control assembly.

**NOTE:** The two electrical plugs on the motorized control assembly are identical. If the electrical wiring is not connected correctly, the motorized drain valve will not function.

4. Note location of electrical wiring then disconnect from motorized control assembly.
5. Disconnect drain and drain cooling hoses from pipe tee located below drain valve.

**NOTE:** Use new band clamps when connecting hoses. See TOOLS.

6. Remove drain valve from steam generator.



7. Remove pipe tee and nipple plumbing assembly from drain valve.

8. Reassemble parts removed in reverse order. Apply pipe thread sealant to pipe threads before installation.

**NOTE:** If motorized drain valve is in the open position when power is applied to the steamer with the power switch on, drain valve will not close and fill water will flow through the steam generator into the drain.

9. Verify power switch is in the off position and the motorized drain valve is closed before applying power to steamer.

**NOTE:** When power is applied and power switch is off steamer will enter a drain cycle.

10. Check steamer for proper operation and leaks around drain valve.

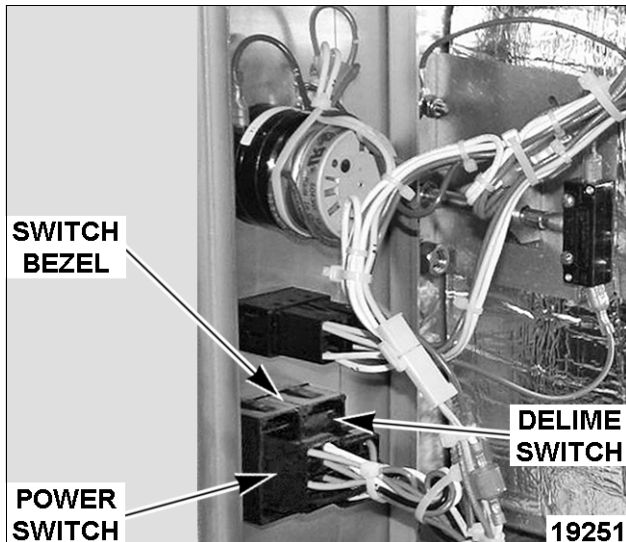
# SWITCHES, SOLENOIDS, RELAYS AND BUZZER

## POWER AND DELIME SWITCHES



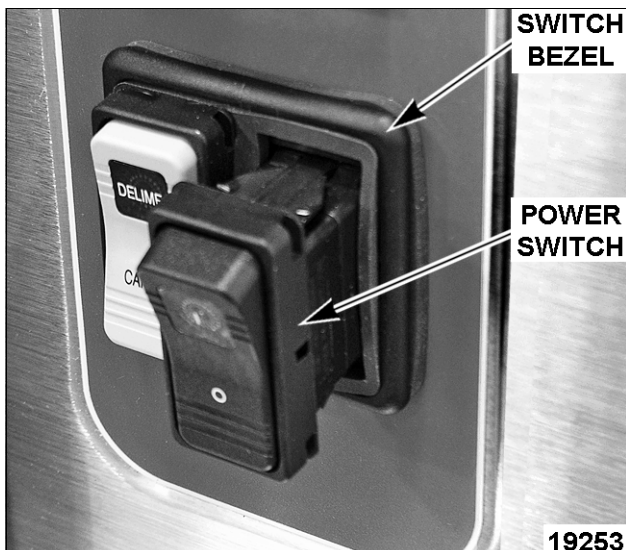
**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.
2. Locate switch on front panel.



LOWER COMPARTMENT SHOWN

3. Disconnect electrical plug from the switch being replaced.
4. Remove switch from bezel on the front panel.



**NOTE:** If replacing the switch assembly (gaskets, power and delime switches), remove the switch bezel from the front panel.

5. Reassemble parts removed in reverse order.
6. Check steamer for proper operation.

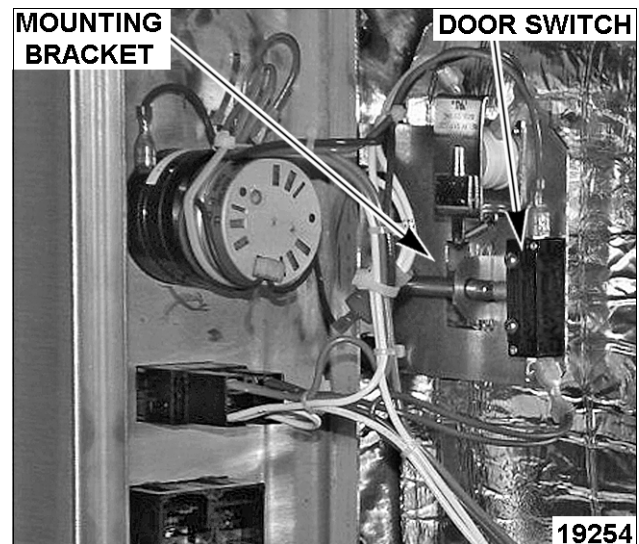
## DOOR SWITCH



**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

### Removal

1. Remove COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.
2. Open cooking compartment door.
3. Note electrical connections then disconnect lead wires from switch.

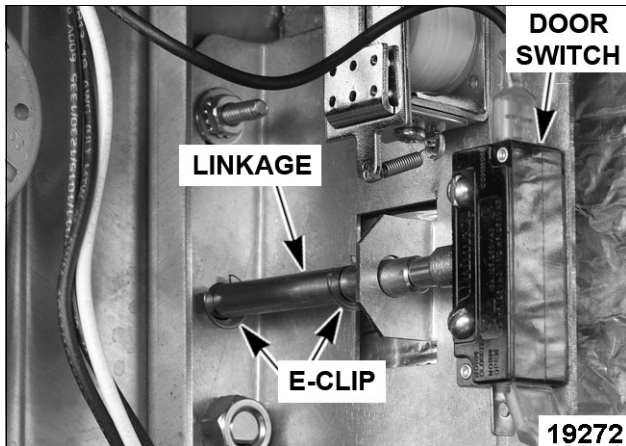


UPPER COMPARTMENT SHOWN

4. Remove switch from the door switch mounting bracket. Retain hardware.

**Installation**

1. Verify E-clip is installed on door switch linkage in groove nearest front panel.



2. Loosely install door switch onto door switch mounting bracket.
  - A. Close door.
  - B. Push switch up against switch linkage as far as possible.
  - C. Tighten switch mounting hardware.
3. Check door switch operation.
  - A. Set meter to measure resistance and place meter leads across the COMMON and NORM OPEN terminals of switch. With door closed, meter should indicate a closed circuit.
  - B. Open door. Meter should indicate an open circuit as door is opened.
4. Check steamer for proper operation.

**PRESSURE SWITCH (1PAS)**



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

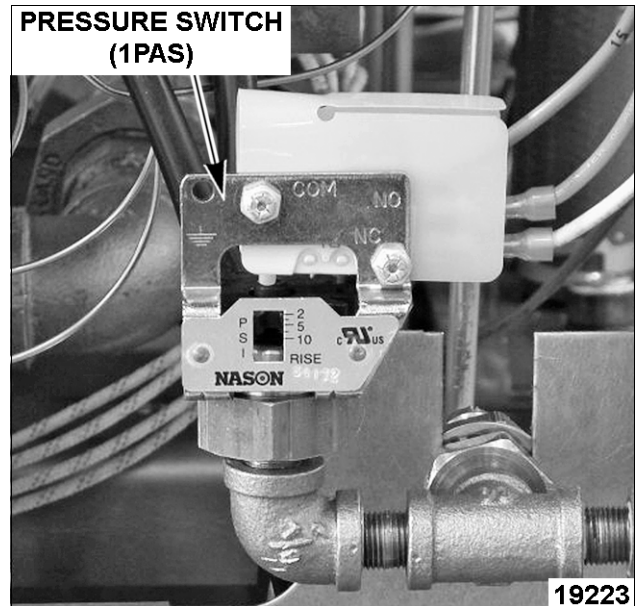


**⚠ WARNING** Certain procedures in this section require electrical test or measurements while power is applied to the machine. Exercise extreme caution at all times. If test points are not easily accessible, disconnect power and follow lockout / tagout procedures, attach test equipment and reapply power to test.

**Removal**

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.

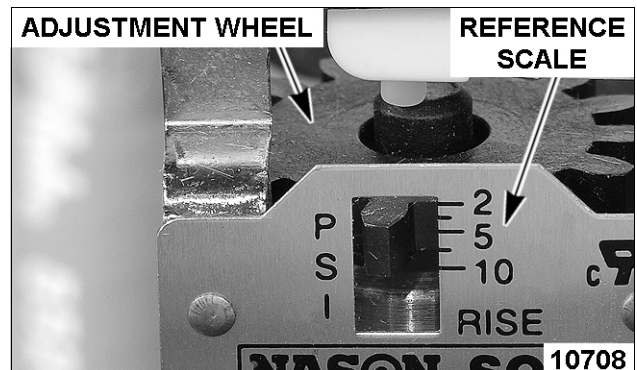
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Locate pressure switch on the left side of the switch piping assembly.



4. Disconnect electrical wiring to pressure switch.
5. Remove pressure switch from piping.
6. Reassemble parts removed in reverse order.
  - A. Apply pipe thread sealant to threads of pressure switch before installation.
  - B. Verify Mylar cover is in position covering electrical connections.

**NOTE:** Refinement of pressure switch cut-out setting is found under Adjustment. Always check and adjust pressure switch setting whenever pressure switch is being serviced.

- C. If pressure switch is being replaced, check the initial pressure switch setting using the reference scale on the pressure switch. The top surface of adjustment wheel should be aligned slightly below the 5 psi mark on pressure switch.



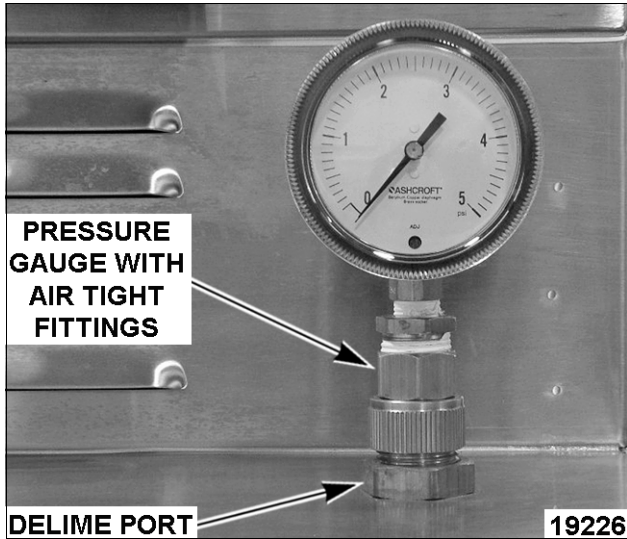
7. Perform pressure switch Check.



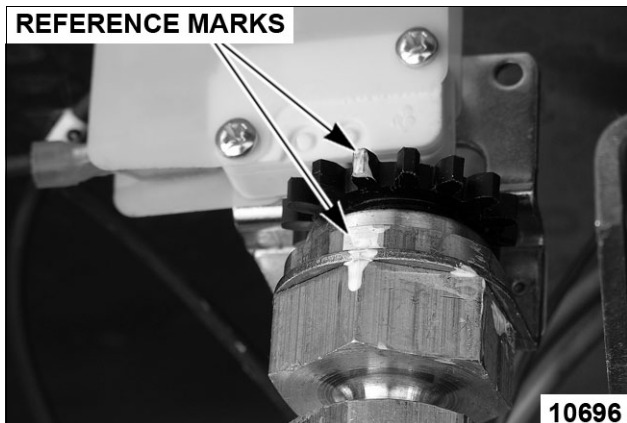
**Check**

**NOTE:** Pressure can be checked with the small air pocket that exists between the delime port cap and water level probe housing in the delime hose. Make certain that no leaks exist in the steam generator connections or pressure gauge fittings.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Remove cap from delime port and install pressure gauge.



4. Close cooking compartment doors.
5. Mark one tooth of pressure switch adjustment wheel to aid in identifying position of wheel. Make a second mark on body of pressure switch in alignment with mark on adjustment wheel.



6. Turn on machine and allow to pressurize (ready light on).
  - A. Set one cook timer for approximately 15 minutes.
  - B. Allow steamer to cycle three times for steam production to stabilize.

**NOTE:** Operating pressures will vary slightly between machine being serviced and gauge used.

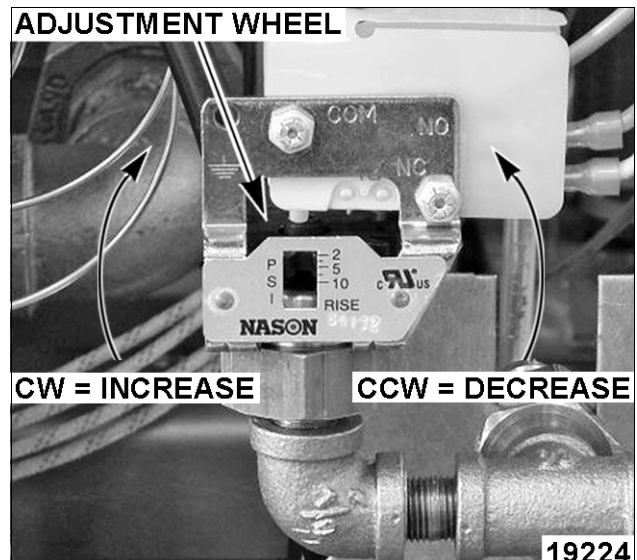
7. While observing pressure gauge, listen for contactor to release indicating that pressure switch contacts have opened. Correct range for pressure switch cut-out is between 3.5 to 3.7 psi.
  - A. Listen for switch contacts to close (contactor will energize).
  - B. Observe pressure gauge for three complete cycles to find the average cut-out pressure. Record pressure.
  - C. If pressure is outside tolerance (3.5 to 3.7 psi), adjustment is necessary. Refer to Adjustment.
  - D. If cut-out pressure is within specifications, turn power switch off. Allow time for steamer to drain.
8. Remove test gauge and reinstall delime cap.

**Adjustment**

1. Allow steam production to stabilize as outlined under Check.

**NOTE:** Make small incremental adjustments (1/8 turn of toothed adjustment wheel) when adjusting cut-out pressure.

2. Referring to cut-out pressure recorded in Check procedure, turn adjustment wheel to bring cut-out pressure into tolerance.
  - A. From looking down on pressure switch:
    - 1) Turn adjustment wheel CCW to decrease cut-out pressure.
    - 2) Turn adjustment wheel CW to increase cut-out pressure.





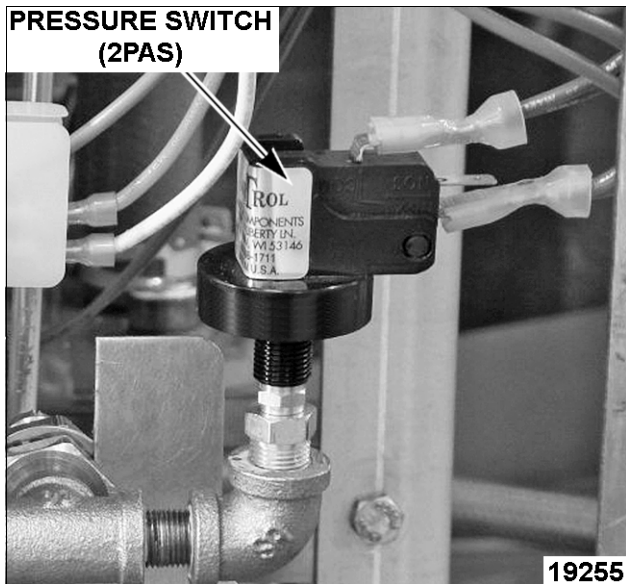
- B. Check cut-out pressure after making adjustment. Repeat Check and Adjustment as necessary until cut-out pressure is within 3.5 to 3.7 psi.

## PRESSURE SWITCH (2PAS)



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Locate pressure switch on the right side of the switch piping assembly.



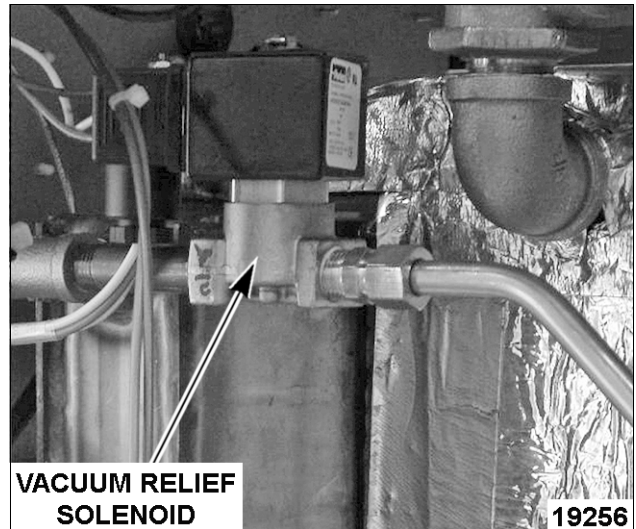
4. Disconnect electrical wiring to pressure switch.
5. Remove pressure switch from piping.
6. Reassemble parts removed in reverse order.
  - A. Apply pipe thread sealant to threads of pressure switch before installation.
7. Check steamer for proper operation.

## VACUUM RELIEF SOLENOID



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Locate vacuum relief solenoid connected to the water level probe housing and condensate coil.



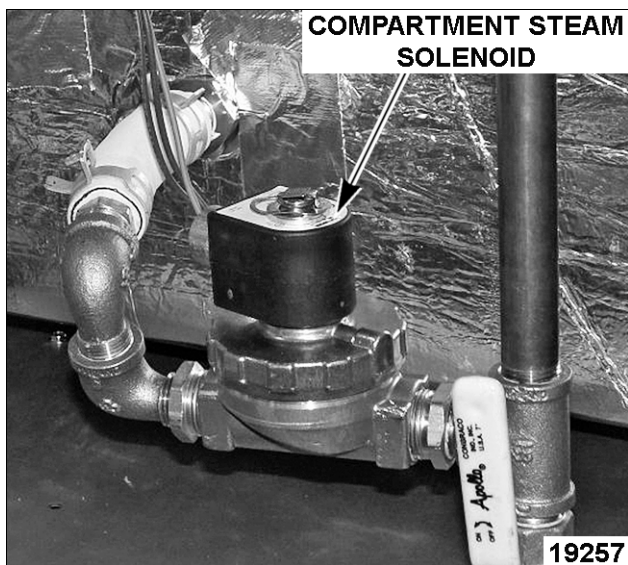
4. Disconnect electrical wiring to solenoid coil.
5. Disconnect compression fitting from the outlet side of solenoid valve.
  - A. Remove solenoid from the pipe nipple and tee connected to water level probe housing.
6. Reassemble parts removed in reverse order.
  - A. When installing solenoid valve, use two wrenches to avoid bending condensate coil tubing. Install valve with the outlet side of valve connected to the vent tubing that leads to the floor (behind drain box). Apply pipe thread sealant to pipe threads before assembly.
7. Check steamer for proper operation.

## COMPARTMENT STEAM SOLENOID



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Locate compartment steam solenoid connected to cooking compartment.



LOWER COMPARTMENT SOLENOID SHOWN

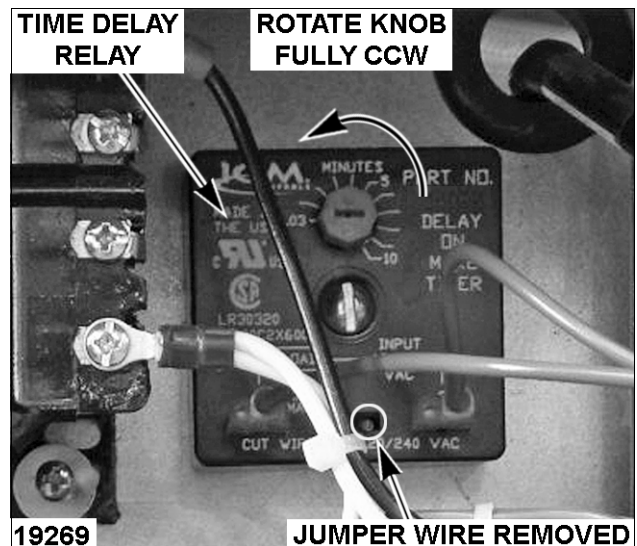
4. Disconnect electrical wiring to solenoid coil.
  5. Disconnect steam hose from the outlet side of solenoid.
- NOTE:** Use new band clamps when connecting hoses. See TOOLS.
6. Remove solenoid from steam supply manifold.
    - A. Remove pipe fittings from solenoid.
  7. Reassemble parts removed in reverse order. Apply pipe thread sealant to pipe threads before installation.
  8. Check steamer for proper operation.

## TIME DELAY RELAY



**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
2. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
3. Note electrical connections for the time delay relay then disconnect lead wires from relay.
4. Remove screw securing relay to low voltage control box then remove relay.



5. Reassemble parts removed in reverse order.
6. Check steamer for proper operation.

**NOTE:** When installing, ensure time delay knob is rotated fully CCW to the lowest setting (approx. 2 seconds). Remove jumper wire for proper operation at steamer control circuit voltage (120VAC).

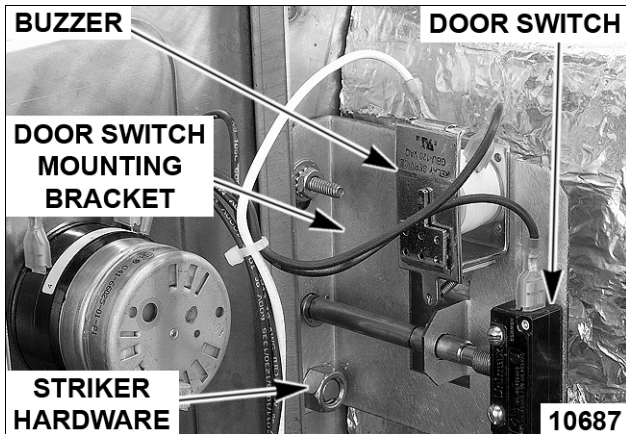
## BUZZER



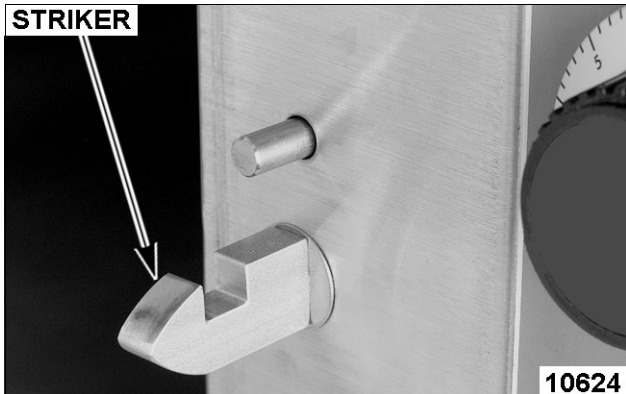
**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.
2. Locate buzzer on the door switch mounting bracket.

5. Remove remaining hardware securing door switch mounting bracket to front panel then remove door switch mounting bracket, door switch and buzzer as an assembly.
6. Remove buzzer from door switch mounting bracket.
7. Reassemble parts removed in reverse order. Perform DOOR LATCH ADJUSTMENT as outlined under DOOR.



3. Disconnect electrical wiring from the buzzer and door switch.
4. Remove door striker.



# CONTROL BOARD

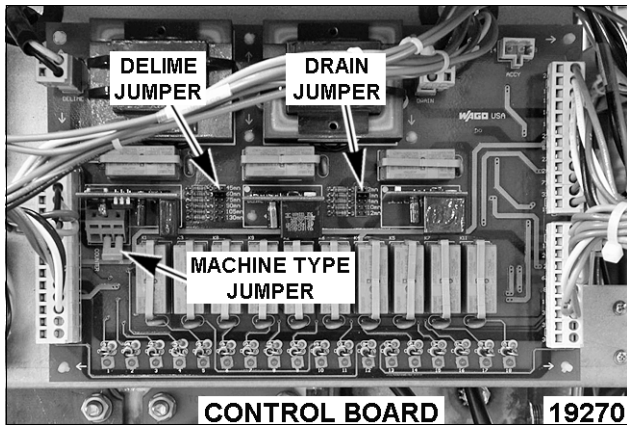


**WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

**NOTICE** Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

## REMOVAL AND REPLACEMENT

1. Remove FRONT BASE PANEL as outlined under COVERS AND PANELS.
2. Disconnect electrical connectors from control board.
3. Squeeze tab on plastic standoffs (10) to release control board.

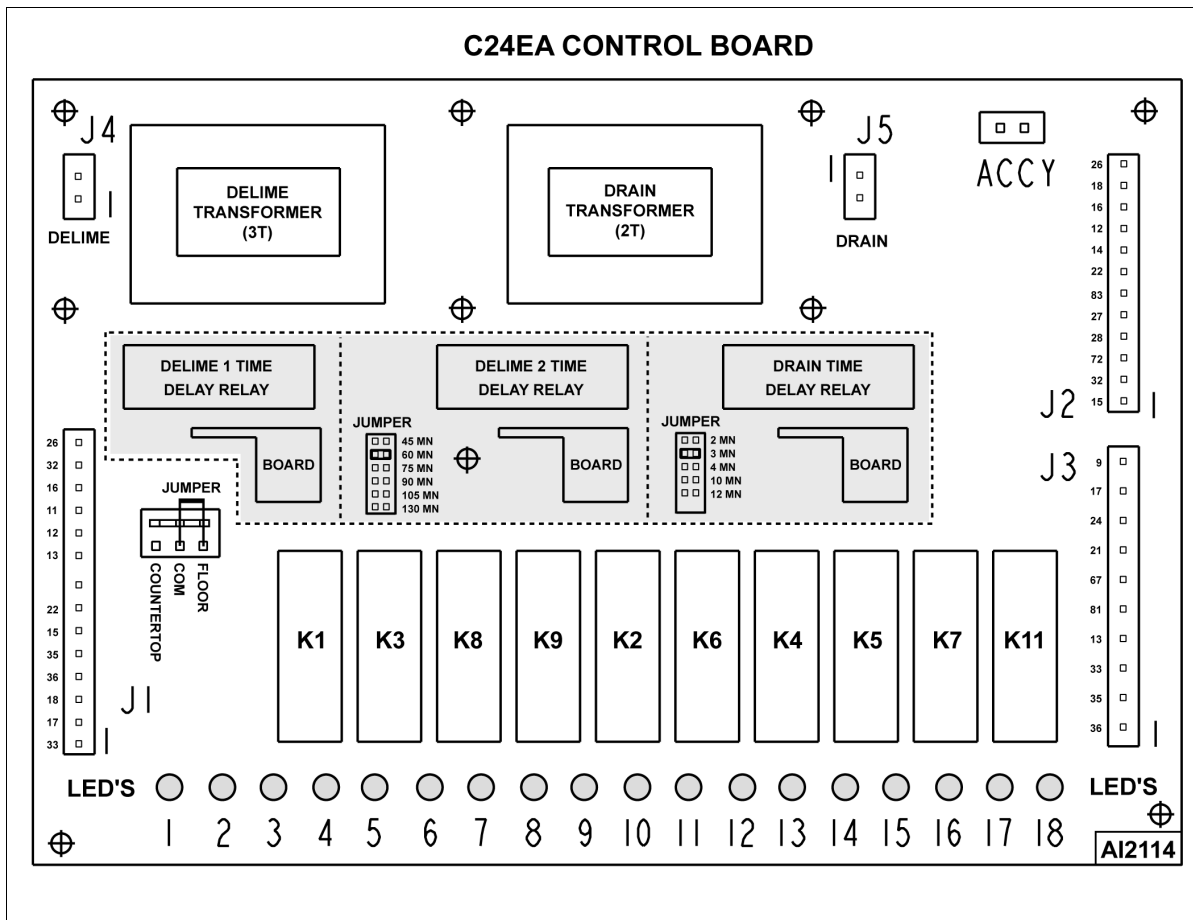


4. Reassemble parts removed in reverse order.
5. Check steamer for proper operation.

**NOTE:** When installing, ensure the board jumpers are set to factory defaults as follows: Delime time delay relay jumper set to 60 minutes; drain time delay relay jumper set to 3 minutes; and machine type set to floor model.

## LAYOUT AND LED LEGEND

The control board provides a central location for wire harness connections and power transfer through board relays (K1-K9, and K11) and time delay relays (delime 1, delime 2 and drain) to the steamer controls. Also, provides a condition or component troubleshooting indicator by utilizing eighteen LED'S on the board.



### LED LEGEND

LED ON = Condition satisfied or component energized. LED OFF = Condition not satisfied or component de-energized.

| LED | Component                                   | LED | Component                                   |
|-----|---|-----|---|
| 1   | Board powered (120VAC).                     | 10  | Drain relay (K3).                           |
| 2   | Limiting contactor (1CON).                  | 11  | Drain relay (K5).                           |
| 3   | Regulating contactor 1 (2CON). <sup>1</sup> | 12  | Vacuum relief solenoid (2SOL). <sup>4</sup> |
| 4   | Regulating contactor 2 (3CON). <sup>2</sup> | 13  | Delime 1 time delay relay powered.          |
| 5   | Relay (K1) energized.                       | 14  | Delime relay (K4).                          |
| 6   | Upper cavity relay (K8). <sup>3</sup>       | 15  | Delime relay (K2).                          |
| 7   | Lower cavity relay (K9). <sup>3</sup>       | 16  | Delime relay (K6).                          |
| 8   | Heat exchanger relay (K10).                 | 17  | Delime relay (K7).                          |
| 9   | Drain time delay relay (TDR).               | 18  | High limit relay (K11).                     |

1. Contactor will cycle heating elements to maintain steam generator pressure when one or both compartments are in use; or when idling to maintain pressure when compartments are not in use.
2. Contactor will cycle heating elements as necessary to maintain steam generator pressure when both compartments are in use.
3. K8 and K9 must be energized for heat exchanger relay (K12) to be energized. Heat exchanger element (2) is then powered.
4. Allows venting of steam generator.

## STEAM GENERATOR OPERATIONAL STATUS (LED INDICATORS)

Use the tables below to determine the operational status of a component or condition by utilizing the LED indicators on the board. The sections are divided according to their operational step.

**NOTE:** If steamer power switch is off when line voltage applied, the steamer enters a timed drain cycle then shuts off.

### Starting Conditions

- Power and water supplied to steamer.
- Power switch (1S) off.
- Delime switch (2S) off (center position).
- Steamer previously operated and drain cycle timed out.

| LED                      | STATUS |     | COMPONENT                                | DESCRIPTION   |
|--------------------------|--------|-----|--|---|
|                          | ON     | OFF |  |   |
| 1                        | X      |     | Power to control board (120V)            | Main transformer (1T) powered.  |
| 9                        | X      |     | Power to drain (TDR)                     | Relay timed out, no output to drain circuit.                                  |
| 12                       | X      |     | Vacuum relief solenoid (2SOL) energized. | Pressure switch closed (2PAS). Allows venting of steam generator during fill. |
| 13                       | X      |     | Power to delime 1 (TDR)                  | Relay timed out, no output to delime circuit.                                 |
| All other LED's are off. |        |     |  |   |

### Power Switch on

- Power light (3LT) (amber) on.
- HL LED is on. Water level control powered.
- Water fills steam generator at fast fill rate.

| LED                      | STATUS |     | COMPONENT                         | DESCRIPTION                               |
|--------------------------|--------|-----|-----------------------------------|---|
|                          | ON     | OFF |                                   |   |
| 1                        | X      |     | Same as starting conditions       |   |
| 9                        |        | X   | Power removed from drain (TDR)    | K4 relay energized. K4-6/2 contacts open. |
| 12                       | X      |     | Same as starting conditions       |   |
| 13                       |        | X   | Power removed from delime 1 (TDR) | K4 relay energized. K4-6/2 contacts open. |
| All other LED's are off. |        |     |                                   |   |

**Water Level at LLCO Probe**

- LLCO LED is on (water level control) (LED is on until water drops below LLCO probe).
- All contactors energized (steam generator begins heating).
- Water fill of the steam generator changes to slow fill rate.

| LED                      | STATUS |     | COMPONENT                                | DESCRIPTION   |
|--------------------------|--------|-----|--|---|
|                          | ON     | OFF |  |   |
| 1                        | X      |     | Same as Starting Conditions              |   |
| 2                        | X      |     | Limiting contactor (1CON) energized.     | Water level is satisfied (LLCO probe).<br>Limiting contactor (1CON) will remain energized with the water level satisfied. |
| 3                        | X      |     | Regulating contactor 1 (2CON) energized. | Pressure switch (1PAS) closed; Heating elements powered.  |
| 4                        | X      |     | Regulating contactor 2 (3CON) energized. | Pressure switch (1PAS) closed; Heating elements powered.  |
| 12                       | X      |     | Same as Starting Conditions              |   |
| All other LED's are off. |        |     |  |   |

**Water Level at Low level (L) Probe**

- Water level control no changes.
- Control Board no changes.

**Water Level at High Level (H) Probe**

- HL LED off (water level control).
- Water fill of steam generator ends (slow fill valve de-energized).

| LED                      | STATUS |     | COMPONENT                                   | DESCRIPTION   |
|--------------------------|--------|-----|---|---|
|                          | ON     | OFF |   |   |
| 1                        | X      |     | Same as Starting Conditions                 |   |
| 2                        | X      |     | Same as Water Level at LLCO Probe           |   |
| 3                        | X      |     | Same as Water Level at LLCO Probe           | Heating elements remain powered.  |
| 4                        | X      |     | Same as Water Level at LLCO Probe           | Heating elements remain powered.  |
| 12                       |        | X   | Vacuum relief solenoid (2SOL) de-energized. | Pressure switch opens (2PAS). Allows steam generator to fully pressurize. |
| All other LED's are off. |        |     |   |   |

**Steam Generator at Operating Pressure**

- Ready lights (1LT) (green) lit for the upper and lower compartments.
- All contactors de-energized (heating stops).

| LED                      | STATUS |     | COMPONENT                                   | DESCRIPTION  |
|--------------------------|--------|-----|---|--|
|                          | ON     | OFF |   |  |
| 1                        | X      |     | Same as Starting Conditions                 |  |
| 2                        | X      |     | Same as Water Level at LLCO Probe           | Limiting contactor (1CON) remains energized with the water level satisfied (LLCO probe).   |
| 3                        |        | X   | Regulating contactor 1 (2CON) de-energized. | Power removed from heating elements.<br>Contactor will cycle on/off as necessary to maintain pressure in steam generator with call for heat from pressure switch (1PAS). |
| 4                        |        | X   | Regulating contactor 2 (3CON) de-energized. | Power removed from heating elements.<br>Contactor will cycle on/off as necessary to maintain pressure in steam generator with call for heat from pressure switch (1PAS). |
| 5                        | X      |     | Relay (K1) energized.                       | Pressure switch opens (1PAS). Power to cooking compartment controls (except during delime cycle).  |
| All other LED's are off. |        |     |   |  |

**Timers Set (Upper and lower Compartments)**

- Cook lights (2LT) (red) lit and cooking compartment steam solenoids energize.
- Heat exchanger heating elements energize.
- LED 3 will cycle on/off with Regulating Contactor 1 (2CON) to maintain steam generator pressure.
- LED 4 will cycle on/off with Regulating Contactor 2 (3CON) to maintain steam generator pressure.

| LED                      | STATUS |     | COMPONENT   | DESCRIPTION  |
|--------------------------|--------|-----|---|--|
|                          | ON     | OFF |   |  |
| 1                        | X      |     | Same as Starting Conditions.  |  |
| 2                        | X      |     | Same as Water Level at LLCO Probe.  |  |
| 5                        | X      |     | Same as Steam generator at Operating Pressure.  |  |
| 6                        | X      |     | Upper cavity relay (K8) energized. <sup>3</sup>                                       | Upper compartment timer set.   |
| 7                        | X      |     | Lower cavity relay (K9) energized. <sup>3</sup>                                       | Lower compartment timer set.   |
| 8                        | X      |     | Cavity condensate solenoid (2SOL) energized.<br>Heat exchanger relay (K10) energized. | Cavity drain water is cooled.<br>Heat exchanger element (1) powered when one or both compartment timers are set. |
| All other LED's are off. |        |     |   |  |

**NOTE:** No LED is associated with heat exchanger relay (K12). Relays K8 and K9 must both be energized for heat exchanger relay (K12) to be energized. Refer to SCHEMATIC DIAGRAM.

**Water Refill**

- HL LED lit (water level control) (cycles with water level control circuit).
- Slow fill solenoid begins until water level reaches H (high level ) probe. HL contacts cycle with water level control circuit as water level raises and lowers between L (low level) and H (high level) probes.
- Control Board LED's no changes.



**Timers Reach Zero (Upper and lower Compartments)**

- Buzzer sounds until timer turned to off, constant or additional time is set.
- Cook lights (2LT) (red) turn off and cooking compartment steam solenoids de-energize.
- Heat exchanger heating elements de-energize.
- LED 3 and 4 will cycle as described under Timers Set (Upper and lower Compartments).

| LED                      | STATUS |     | COMPONENT   | DESCRIPTION   |
|--------------------------|--------|-----|---|---|
|                          | ON     | OFF |   |   |
| 1                        | X      |     | Same as Starting Conditions   |   |
| 2                        | X      |     | Same as Water Level at LLCO Probe.  |   |
| 5                        | X      |     | Same as Steam generator at Operating Pressure.  |   |
| 6                        |        | X   | Upper cavity relay (K8) de-energized. <sup>3</sup>  | Upper compartment timer timed out.  |
| 7                        |        | X   | Lower cavity relay (K9) energized. <sup>3</sup>   | Lower compartment timer timed out.  |
| 8                        |        | X   | Cavity condensate solenoid (2SOL) de-energized.<br>Heat exchanger relay (K10) de-energized. | Cavity drain water cooling stops.<br>Power removed from heat exchanger element (1). |
| All other LED's are off. |        |     |   |   |

**Power Switch (1S) off**

- Power light (3LT) (amber) and ready light (1LT) (green) off.
- Drain valve energized (steam generator begins draining).
- Condensate thermostat closes (1TAS) and drain cooling solenoid energized (1SOL).
- HL LED off until water drops below L (low level) probe then turns on (water level control).
- LLCO led lit until water level drops below LLCO probe (water level control). Fast fill/flush solenoid energized.
- LED 2 remains lit until water level drops below LLCO probe then turns off. Limiting contactor (1CON) de-energized.
- LED 10 remains lit during 3 minute drain cycle then turns off.

| LED | STATUS |     | COMPONENT                                | DESCRIPTION  |
|-----|--------|-----|--|--|
|     | ON     | OFF |  |  |
| 1   | X      |     | Same as Starting Conditions              |  |
| 5   |        | X   | Relay (K1) de-energized.                 | Pressure switch closed (1PAS). Power removed from cooking compartment controls.  |
| 9   | X      |     | Drain time delay relay (TDR) energized.  | Steamer turned off and 3 minute drain cycle started. Drain transformer (2T) powered. Drain valve energized and opens.                                  |
| 12  | X      |     | Vacuum relief solenoid (2SOL) energized. | Pressure switch closed (2PAS). Allows venting of steam generator during draining.  |
| 13  | X      |     | Delime 1 time delay relay powered.       | Output from delime 1 (TDR) load terminal is not active (delime 1 circuit not powered) until input voltage trigger is received during the delime cycle. |

**Drain Cycle Ends**

- LED's 1, 9, 12 and 13 remain lit.
- All other LED's are off.
- Steamer is off.

**DELIMING CYCLE STATUS  
(LED INDICATORS)**

- Conditions same as listed under STARTING CONDITIONS.
- Delime time delay relay 2 (TDR) and drain time delay relay (TDR) jumpers on the control board are set at their default times as shown on the schematic.
- Delime valve closed.
- Delime solution added to steam generator.

**NOTE:** Heat exchanger elements are not energized during delime cycle.

**Delime Switch On**

- Delime switch pressed to DELIME position (momentary on - hold 2 sec).
- Power light (3LT) (amber) on.
- Delime light (4LT) (red) on.
- HL Led is on. Water level control powered.
- Water fills steam generator at fast fill rate.

| LED                      | STATUS |     | COMPONENT                    | DESCRIPTION   |
|--------------------------|--------|-----|------------------------------|---|
|                          | ON     | OFF |                              |   |
| 1                        | X      |     | Same as starting conditions  |   |
| 12                       | X      |     | Same as starting conditions  |   |
| 13                       | X      |     | Power to delime 1 (TDR)      | Relay timed out, no output to delime circuit. LED remains lit as in Turning Steamer Off.  |
| 14                       | X      |     | Delime Relay (K4) energized. | Delime 2 (TDR) powered thru K4-6/4 closed contacts (N.O.). 120VAC output from delime 2 (TDR) load terminal for 60 minutes.<br>Power to heating circuit, power light (3LT) and WLC thru K4-5/3 closed contacts (N.O.).   |
| 15                       | X      |     | Delime Relay (K2) energized. | K2-6/4 contacts close (powers delime light)<br>K2-5/1 contacts open. Power to cooking compartment controls is locked out (no power to timers or lights).<br>Power to delime 1 (TDR) input trigger and delime 1 (TDR) is energized. 120VAC output from load terminal remains on for 3 additional minutes after power is removed from input trigger to allow heat exchanger to drain (delime valve energized). Total time 63 minutes unless canceled (delime 2 TDR default time of 60 minutes plus delime 1 TDR of 3 minutes).<br>Delime transformer (3T) powered. Delime valve energized and opens.<br>Delime valve end switch contacts close. |
| 17                       | X      |     | Delime Relay (K7) energized. | K7 powered from delime 1 (TDR) output from load terminal.<br>K7-5/1 N.C contacts open. X1 potential removed from power switch (1S).<br>K7-5/3 N.O. contacts close. Allows delime 1 (TDR) to remain powered to hold K7 energized for a delay on drop out (120VAC output from load terminal remains on) after K4-6/2 N.C. contacts open.  |
| All other LED's are off. |        |     |                              |   |

**Water Level at LLCO Probe**

- LLCO LED is on (water level control) (LED is on until water drops below LLCO probe).
- All contactors energized (steam generator begins heating).
- Water fill of the steam generator changes to slow fill rate.

| LED                      | STATUS |     | COMPONENT                                | DESCRIPTION   |
|--------------------------|--------|-----|--|---|
|                          | ON     | OFF |  |   |
| 1                        | X      |     | Same as Starting Conditions              |   |
| 2                        | X      |     | Limiting contactor (1CON) energized.     | Water level is satisfied (LLCO probe).<br>Limiting contactor (1CON) will remain energized with the water level satisfied. |
| 3                        | X      |     | Regulating contactor 1 (2CON) energized. | Pressure switch (1PAS) closed; Heating elements powered.  |
| 4                        | X      |     | Regulating contactor 2 (3CON) energized. | Pressure switch (1PAS) closed; Heating elements powered.  |
| 12                       | X      |     | Same as Starting Conditions              |   |
| 13                       | X      |     | Same as Delime Switch On                 |   |
| 14                       | X      |     | Same as Delime Switch On                 |   |
| 15                       | X      |     | Same as Delime Switch On                 |   |
| 17                       | X      |     | Same as Delime Switch On                 |   |
| All other LED's are off. |        |     |  |   |

**Water Level at Low level (L) Probe**

- Water level control no changes.
- Control Board no changes.

**Water Level at High Level (H) Probe**

- HL LED off (water level control).
- Water fill of steam generator ends (slow fill valve de-energized).

| LED                      | STATUS |     | COMPONENT                                   | DESCRIPTION   |
|--------------------------|--------|-----|---|---|
|                          | ON     | OFF |   |   |
| 1                        | X      |     | Same as Starting Conditions                 |   |
| 2                        | X      |     | Same as Water Level at LLCO Probe           |   |
| 3                        | X      |     | Same as Water Level at LLCO Probe           | Heating elements remain powered.  |
| 4                        | X      |     | Same as Water Level at LLCO Probe           | Heating elements remain powered.  |
| 12                       |        | X   | Vacuum relief solenoid (2SOL) de-energized. | Pressure switch opens (2PAS). Allows steam generator to fully pressurize. |
| 13                       | X      |     | Same as Delime Switch On                    |   |
| 14                       | X      |     | Same as Delime Switch On                    |   |
| 15                       | X      |     | Same as Delime Switch On                    |   |
| 17                       | X      |     | Same as Delime Switch On                    |   |
| All other LED's are off. |        |     |   |   |

**Steam Generator at Operating Pressure**

- All contactors de-energized (heating stops).

| LED                      | STATUS |     | COMPONENT                                   | DESCRIPTION   |
|--------------------------|--------|-----|---|---|
|                          | ON     | OFF |   |   |
| 1                        | X      |     | Same as Starting Conditions                 |   |
| 2                        | X      |     | Same as Water Level at LLCO Probe           | Limiting contactor (1CON) remains energized with the water level satisfied (LLCO probe).  |
| 3                        |        | X   | Regulating contactor 1 (2CON) de-energized. | Power removed from heating elements. Contactor will cycle on/off as necessary to maintain pressure in steam generator with call for heat from pressure switch (1PAS). |
| 4                        |        | X   | Regulating contactor 2 (3CON) de-energized. | Power removed from heating elements. Contactor will remain off for the rest of delime cycle.  |
| 5                        | X      |     | Relay (K1) energized.                       | Pressure switch opens (1PAS). With Delime Relay (K2) energized (LED 15 on), K2-5/1 contacts are open to lock out power to the cooking compartment controls.           |
| 13                       | X      |     | Same as Delime Switch On                    |   |
| 14                       | X      |     | Same as Delime Switch On                    |   |
| 15                       | X      |     | Same as Delime Switch On                    |   |
| 17                       | X      |     | Same as Delime Switch On                    |   |
| All other LED's are off. |        |     |   |   |

**Steam Generator Maintains Operating Pressure**

- Heat cycles as necessary to maintain steam generator pressure during the delime cycle.
- LED 3 will cycle on/off with Regulating Contactor 1 (2CON).
- LED's 1, 2, 5, 13, 14, 15 & 17 remain on.
- Water level maintained by water level control circuit. HL LED (water level control) will cycle on/off.

**Delime Time Reaches Zero**

- Delime light (4LT) (red) on until time expires on Delime 2 (TDR).
- Delime cycle heating ends. Limiting contactor (1CON) and regulating contactor 1 (2CON) de-energized.
- Drain cycle starts (drain TDR energized). Drain valve energized to allow steam generator to drain. Delime valve energized to allow heat exchanger to drain.
- Condensate thermostat closes (1TAS) and drain cooling solenoid energized (1SOL).
- HL LED off until water drops below L (low level) probe then turns on (water level control).
- LLCO led on until water level drops below LLCO probe (water level control). Fast fill/flush solenoid energized.
- LED 2 remains lit until water level drops below LLCO probe then turns off. Limiting contactor (1CON) de-energized.
- LED 10 remains lit during 3 minute drain cycle then turns off.

MODEL C24EA - CONTROL BOARD

| LED                      | STATUS |     | COMPONENT  | DESCRIPTION   |
|--------------------------|--------|-----|--|---|
|                          | ON     | OFF |  |   |
| 1                        | X      |     | Same as Starting Conditions  |   |
| 3                        |        | X   | Regulating contactor 1 (2CON) de-energized.  | Power removed from heating elements.  |
| 5                        |        | X   | Relay (K1) de-energized.   | Pressure switch (1PAS) contacts close.  |
| 9                        | X      |     | Drain (TDR) energized thru K4-6/2 contacts.  | 120VAC output from drain (TDR) load terminal. Drain circuit energized.  |
| 11                       | X      |     | Drain relay (K5) is energized thru delime valve end switch closed contacts (N.O.). | K5-6/4 contacts close and delime light (4LT) is lit.<br>K5-5/3 latching circuit close contacts allow LED 11 to light.   |
| 12                       | X      |     | Vacuum relief solenoid (5SOL) energized.   | Pressure switch (2PAS) contacts close. Solenoid valve opens to provide air vent and allow steam generator to drain.   |
| 13                       | X      |     | Same as Delime Switch On   |   |
| 14                       |        | X   | Delime Relay (K4) de-energized.  | K4-5/3 contacts open. Power light off.<br>K4-6/4 contacts open. Power removed from delime 2 (TDR).  |
| 15                       |        | X   | Delime Relay (K2) de-energized.  | K2-6/4 contacts open. Delime light off.<br>Power removed from delime 1 (TDR) input trigger, delime 1 (TDR) remains powered thru K7-5/3 N.O. contacts to hold delime relay (K7) energized for a delay on dropout (120VAC output from load terminal remains on). Allows heat exchanger to drain (along with steam generator during the 3 minute drain cycle time).<br>K2-5/1 contacts open. Power to cooking compartment controls no longer locked out. |
| 17                       | X      |     | Same as Delime Switch On   |   |
| All other LED's are off. |        |     |  |   |

**Delime Cycle Ends**

- LED's 1, 9, 12 and 13 remain lit.
- All other LED's are off.
- Steamer is off.

# HEAT EXCHANGER

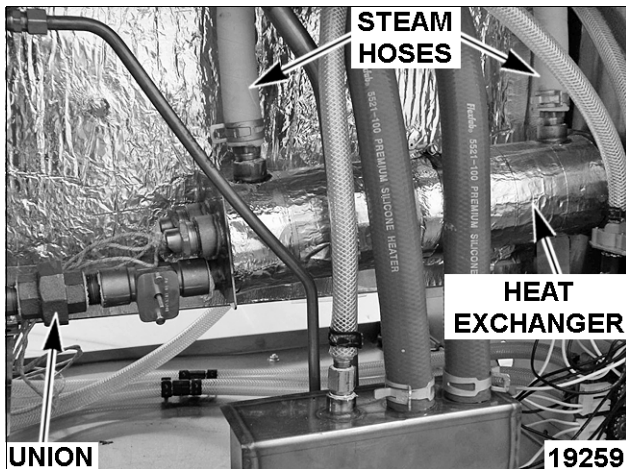


**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

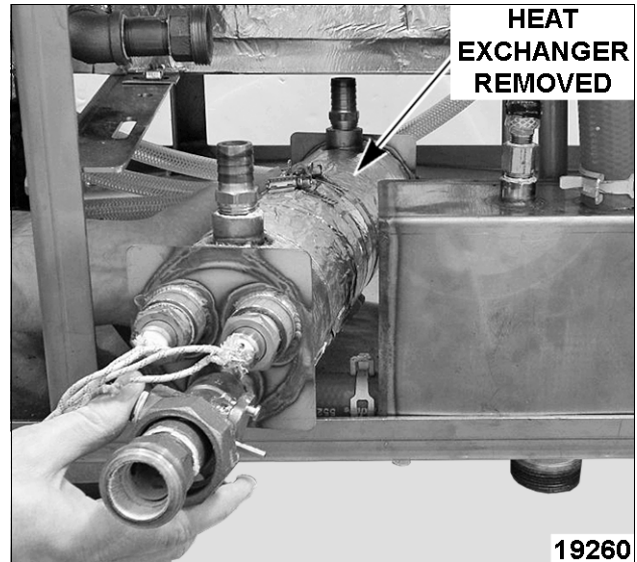
## REMOVAL AND REPLACEMENT

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove FRONT and RIGHT SIDE BASE PANELS as outlined under COVERS AND PANELS.
3. Disconnect heat exchanger element wiring as outlined under HEAT EXCHANGER ELEMENTS AND RELAYS.
4. Remove control assembly from MOTORIZED DELIME VALVE.
5. Disconnect lead wires from HEAT EXCHANGER HIGH LIMIT.
6. Disconnect steam hoses from heat exchanger and separate union.

**NOTE:** Use new band clamps when connecting hoses. See TOOLS.



7. Remove heat exchanger.
  - A. Lift heat exchanger off rear support bracket and move it away from union. Tilt front of heat exchanger down and lower it onto the bottom frame cover.
  - B. Rotate heat exchanger and remove it from steamer.



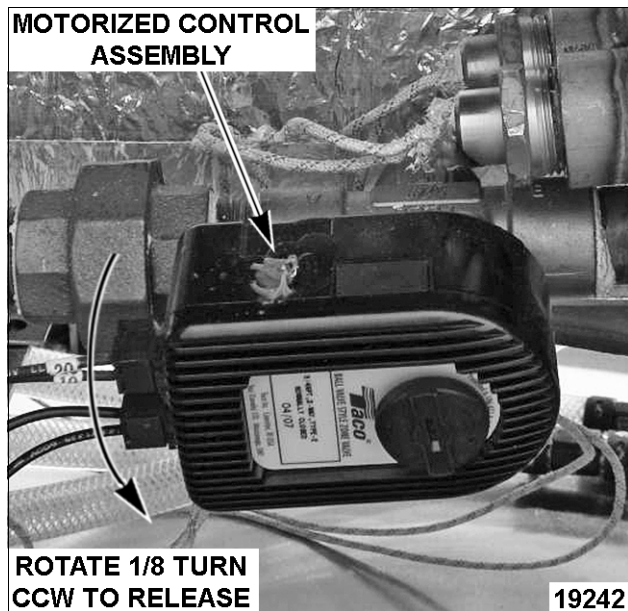
8. Remove the following parts from heat exchanger for reuse:
  - A. Heat exchanger elements.
  - B. Heat exchanger high limit.
  - C. Delime valve, pipe nipple and union.
  - D. Hose barb fittings.
9. If removed or replacing the heat exchanger, install insulation around the heat exchanger. Secure into position using high temperature aluminum foil tape.
10. Reinstall parts removed in reverse order. Apply pipe thread sealant to all pipe threads connected to the heat exchanger. Do not apply thread sealant to fill union fitting.
11. Check steamer for proper operation. Inspect all connections to the heat exchanger for leaks.

## MOTORIZED DELIME VALVE

**NOTE:** The motorized delime valve (normally closed) can be opened or closed manually by pushing in on the manual override knob on top of the valve to disengage the gear set. Rotate knob CW to open the valve (slot in knob vertical); or CCW to close the valve (slot in knob is horizontal).

### Removal

1. Turn off power to machine. Allow steamer to complete drain cycle.
  - A. Turn off water supply to steamer.
2. Remove RIGHT SIDE BASE PANEL as outlined under COVERS AND PANELS.
3. Locate motorized delime valve connected to heat exchanger.
4. Remove motorized control assembly from delime valve. Rotate motorized control assembly CCW approximately 1/8 turn to disengage assembly from valve.

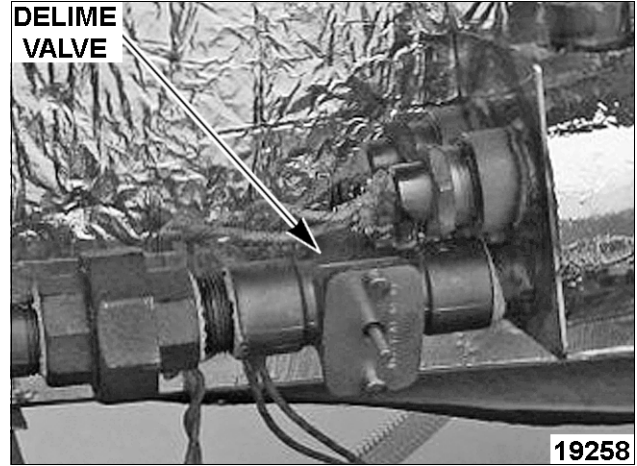


5. Note location of electrical wiring then disconnect from motorized control assembly.

**NOTE:** The two electrical plugs on the motorized control assembly are identical. If the electrical wiring is not connected correctly, the motorized delime valve will not function.

**NOTE:** When installing, align the flat on delime valve stem and the locking pins on delime valve to the motorized control assembly.

6. Separate union then remove delime valve from heat exchanger.



7. Remove pipe nipple and union from delime valve.
  8. Reassemble parts removed in reverse order. Apply pipe thread sealant to pipe threads before installation.
  9. Verify motorized delime valve is closed before applying power to steamer.
- NOTE:** When power is applied and power switch is off steamer will enter a delime cycle.
10. Check steamer for proper operation and leaks around delime valve.

# STEAM GENERATOR

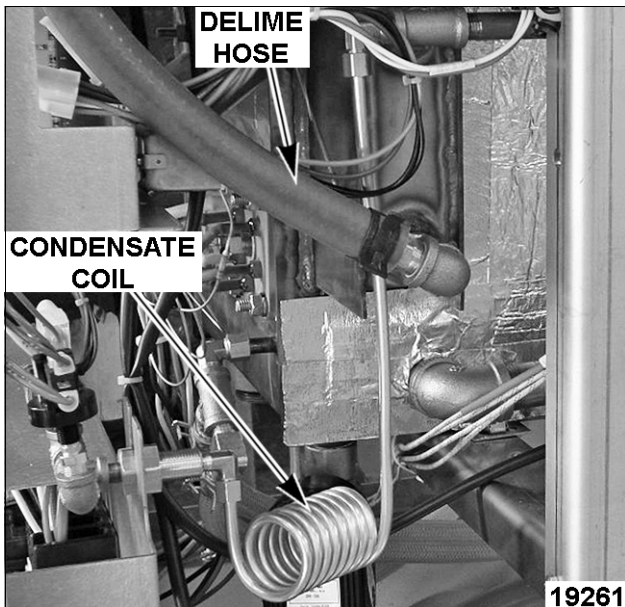


**⚠ WARNING** Disconnect the electrical power to the machine and follow lockout / tagout procedures.

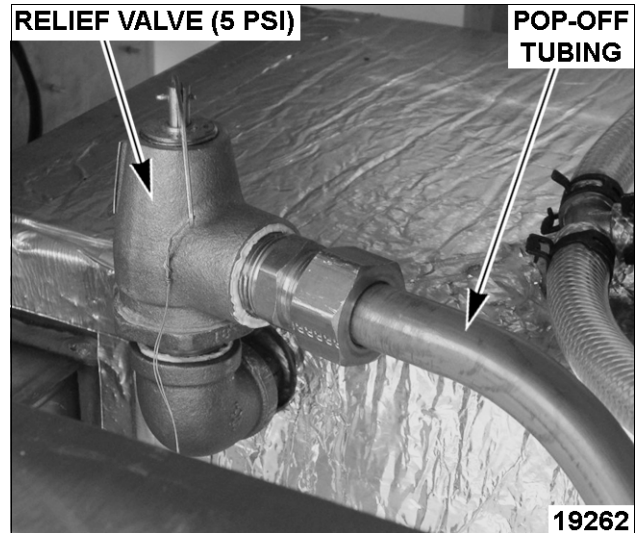
## REMOVAL AND REPLACEMENT

1. Turn off machine to drain steam generator. Allow steamer to complete drain cycle.
  - A. Turn off water supply.
2. Remove FRONT, LEFT and RIGHT SIDE BASE PANELS from generator base and COOKING COMPARTMENT RIGHT SIDE PANEL as outlined under COVERS AND PANELS.
3. Remove HEAT EXCHANGER.
4. Remove VACUUM RELIEF SOLENOID.
5. Disconnect compression fittings then remove condensate coil tubing.
6. Remove delime hose from water level probe housing.

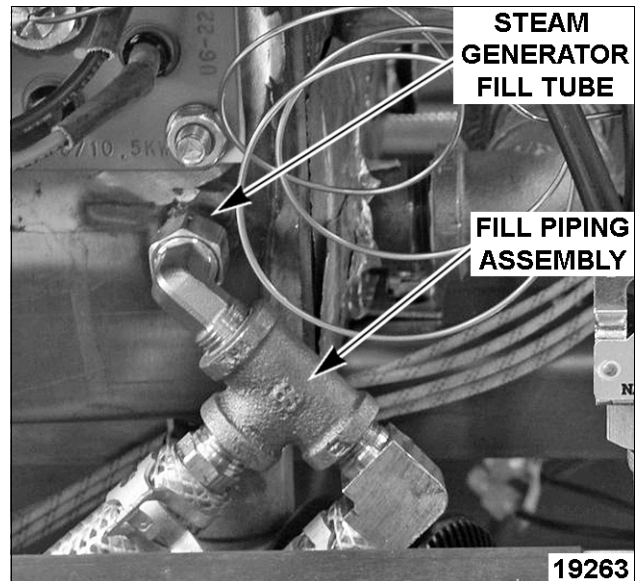
**NOTE:** Use new band clamps when connecting hoses. See TOOLS.



7. Disconnect pop-off tubing then remove relief valve from steam generator.



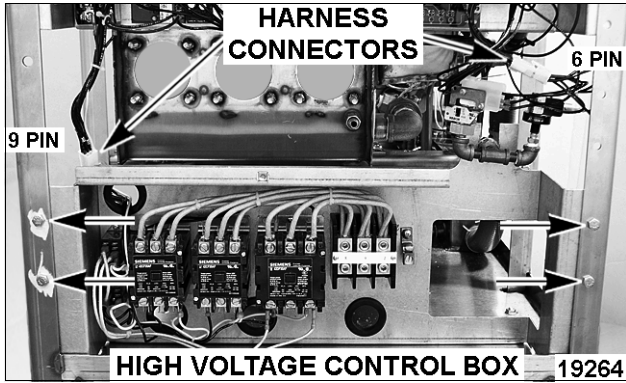
8. Disconnect compression fitting then remove the fill piping assembly from steam generator fill tube.



9. Remove MOTORIZED DRAIN VALVE.
10. Remove HEATING ELEMENTS from steam generator.
11. Remove high voltage control box from steamer.
  - A. Disconnect electrical supply connections from terminal block and ground.
  - B. Disconnect two wiring harness connectors.



- C. Remove four bolts securing high voltage control box to frame.

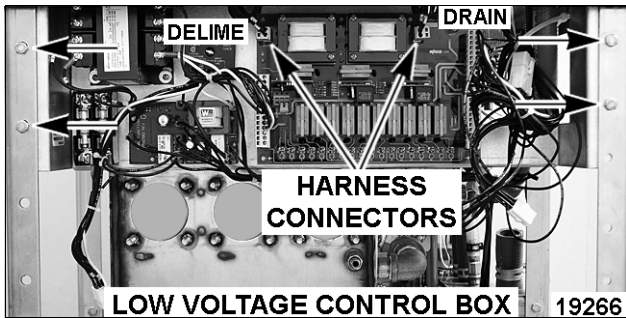


- 12. Remove low voltage control box from steamer.
  - A. Disconnect wiring harness connector leading to cooking compartment controls.



RIGHT SIDE SHOWN

- B. Disconnect delime valve and drain valve harness connectors from control board.
- C. Remove four bolts securing low voltage control box to frame.



- 13. Remove WATER LEVEL PROBES.
- 14. Remove ground wire from water level probe housing.
- 15. Remove hardware securing steam generator to frame (four places) then remove generator.

- 16. Remove the following parts from steam generator for reuse:
  - A. Drip shield (above elements).
  - B. Remaining pipe nipples, tees and elbows.
- 17. If removed or replacing steam generator, install insulation around the generator. Secure into position using high temperature aluminum foil tape.
- 18. Reinstall parts removed in reverse order. Apply pipe thread sealant to all pipe threads connected to the steam generator.
- 19. Check steamer for proper operation. Inspect all connections for leaks.

### DELIMING

Refer to the Installation & Operation manual under the MAINTENANCE section for specific instructions.

# ELECTRICAL OPERATION

## COMPONENT FUNCTION

### STEAM GENERATOR CONTROLS

|   |  |
|---|--|
| <b>Water Level Control (WLC)</b> .....          | Controls water level by monitoring conditions of the three water level probes H, L and LLCO.   |
| <b>Probe (H)</b> .....                          | High water level probe connected to internal latch relay circuit on WLC. Water must reach this level before internal latch relay is energized.   |
| <b>Probe (L)</b> .....                          | Low water level probe connected to internal latch relay circuit on WLC.  |
| <b>Probe (LLCO)</b> .....                       | Low Level Cut-Off (LLCO) probe connected to WLC. Controls power to heating and fast fill/flush solenoid.   |
| <b>Contactor, (1CON) Limiting</b> .....         | Connects one side of heating elements to power. Energized whenever WLC (LLCO) coil is energized.   |
| <b>Contactor 1, (2CON) Regulating</b> .....     | Connects heating elements to power. On constantly when one or both cooking compartment timers are set.   |
| <b>Contactor 2, (3CON) Regulating</b> .....     | Connects heating elements to power. On constantly when both cooking compartment timers are set.  |
| <b>Elements, Heating</b> .....                  | Located in steam generator. Heats water to produce steam.  |
| <b>Elements, Heat Exchanger</b> .....           | Two cartridge type heating elements located in the heat exchanger. Provides additional energy to raise the steam temperature delivered to the cooking compartments.  |
| <b>Fuse, (1FU &amp; 2FU)</b> .....              | Slow blow 3A fuse. Located on primary side of main transformer (1T). Protects control circuitry from over-currents.  |
| <b>Relay, Time Delay</b> .....                  | Controlled by delime switch for delime cycle only. Power switch must be off and delime switch pressed and held for more than 2 seconds to activate time delay relay output and start delime cycle. Time delay prevents the delime cycle from immediately starting, if the delime switch is accidentally pressed. |
| <b>Solenoid (1SOL), Drain Cooling</b> .....     | Controlled by the condensate thermostat. Mixes cold water with hot drain water from steam generator to reduce water temperature at the drain.  |
| <b>Solenoid, (2SOL) Cavity Condensate</b> ..... | Controlled by cavity relay K8 on control board. Solenoid is energized when timer is on. Mixes cold water with hot condensate water from cooking compartment to reduce water temperature at drain.  |
| <b>Solenoid (3SOL), Fast Fill/Flush</b> .....   | Initial steam generator fill. Used during last stage of drain cycle to flush drain opening free of debris.   |
| <b>Solenoid (4SOL), Slow Fill</b> .....         | Secondary steam generator fill. Energized as necessary to replenish water in steam generator.  |
| <b>Solenoid (5SOL), Vacuum Relief</b> .....     | Provides open air line to steam generator during filling and draining. When generator is draining, keeps a vacuum from developing to prevent cooking compartment flex; and allows faster draining. When generator is filling, keeps pressure from building up to allow the generator to completely fill.         |
| <b>Solenoid, Drain Valve (N.C.)</b> .....       | Controlled by delime relay K7 and delime circuit operation. When energized by 24VAC, valve opens to drain the steam generator.   |

|   |  |
|---|--|
| <b>Solenoid, Delime Valve</b> .....             | Controlled by delime relay K7 and drain circuit operation. When energized by 24VAC, valve opens to allow delimiting of the heat exchanger and elements during a delime cycle.  |
| <b>Switch (1PAS), Pressure</b> .....            | Pressure cut-out protection. Range is between 4.5 to 4.7 psi. Removes power from heating circuit if steam generator pressure rises above the pressure switch setting.  |
| <b>Switch (2PAS), Pressure</b> .....            | Vacuum and fill pressure sensing for the steam generator. When generator is draining, provides power to vacuum relief solenoid to prevent a vacuum from developing in the steamer. When generator is initially heating and pressurizes above 4" W.C. the pressure switch opens to remove power from vacuum relief solenoid to allow generator to reach operating pressure. |
| <b>Thermostat (1TAS), Condensate</b> .....      | Monitors temperature of water entering the facility drain system. Controls the drain cooling solenoid during cooking operation and drain cycle (130°F close).  |
| <b>High-Limit (2TAS), Steam Generator</b> ..... | Protects steam generator heating elements from over-temperatures. Capillary tube device (257°F cut-out; 246°F auto reset).   |
| <b>High-Limit (3TAS), Heat Exchanger</b> .....  | Protects heat exchanger elements from over-temperatures. Surface mount device (500°F cut-out; auto reset 450°F).   |
| <b>Transformer (1T), Main</b> .....             | Step down transformer from line voltage to 120VAC control circuit voltage.   |
| <b>Relay, Heat Exchanger (K10)</b> .....        | Connects heat exchanger element (1) to power. On constantly whenever one or both cooking compartment timers are set.   |
| <b>Relay, Heat Exchanger (K12)</b> .....        | Connects heat exchanger element (2) to power. On constantly whenever both cooking compartment timers are set.  |
| <b>Control Board</b> .....                      | Controls steam generator operation, draining and delimiting functions. Provides a central location for wire harness connections and power transfer thru board relays K1 thru K9 and K11 to the steamer controls. Houses 18 LED's for visual operation status and troubleshooting.  |

**NOTE:** The relay's below are mounted on the control board and are individually replaceable.

|                                      |   |
|--------------------------------------|---|
| <b>Relay (K1)</b> .....              | Controlled by pressure switch (1PAS). K1 relay is energized when the pressure switch N.O. contacts close.   |
| <b>Relay (K2), Delime</b> .....      | Controlled by delime circuit. K2 relay is energized when delime switch is turned on (momentary).  |
| <b>Relay (K3), Drain Relay</b> ..... | Controlled by drain time delay relay. K3 relay is powered when power switch is turned off and drain time delay is energized for the drain cycle.  |
| <b>Relay (K4), Delime</b> .....      | Controlled by delime circuit. K4 relay is energized when delime switch is turned on (momentary).  |
| <b>Relay (K5)</b> .....              | Controlled by delime circuit. When delime valve is energized, the delime valve end switch contacts close and K5 relay is energized.   |
| <b>Relay (K6)</b> .....              | Controlled by delime switch. K6 relay is energized when delime switch is turned to CANCEL to stop a delime cycle.   |
| <b>Relay (K7)</b> .....              | Controlled by delime circuit. K7 relay is energized when delime time delay relay 1 is energized during delime cycle.  |
| <b>Relay (K8), Cavity</b> .....      | Controlled by upper cooking compartment timer. When timer is set, K8 relay is energized and K8- 5/3 contacts close to provide power to cavity condensate solenoid and heat exchanger relay (K10). Heat exchanger element (1) energized. |

- Relay (K9), Cavity** ..... Controlled by lower cooking compartment timer. When timer is set, relay is energized and power is provided thru K8-1/5 N.C. contacts to cavity condensate solenoid and heat exchanger relay (K11). Heat exchanger element (2) energized.
- Relay (K11), High Limit** ..... Controlled by high limit thermostat (2TAS). Relay is energized if high limit thermostat opens. When high limit closes, relay remains energized thru K11-5/3 contacts until power is removed from steamer.

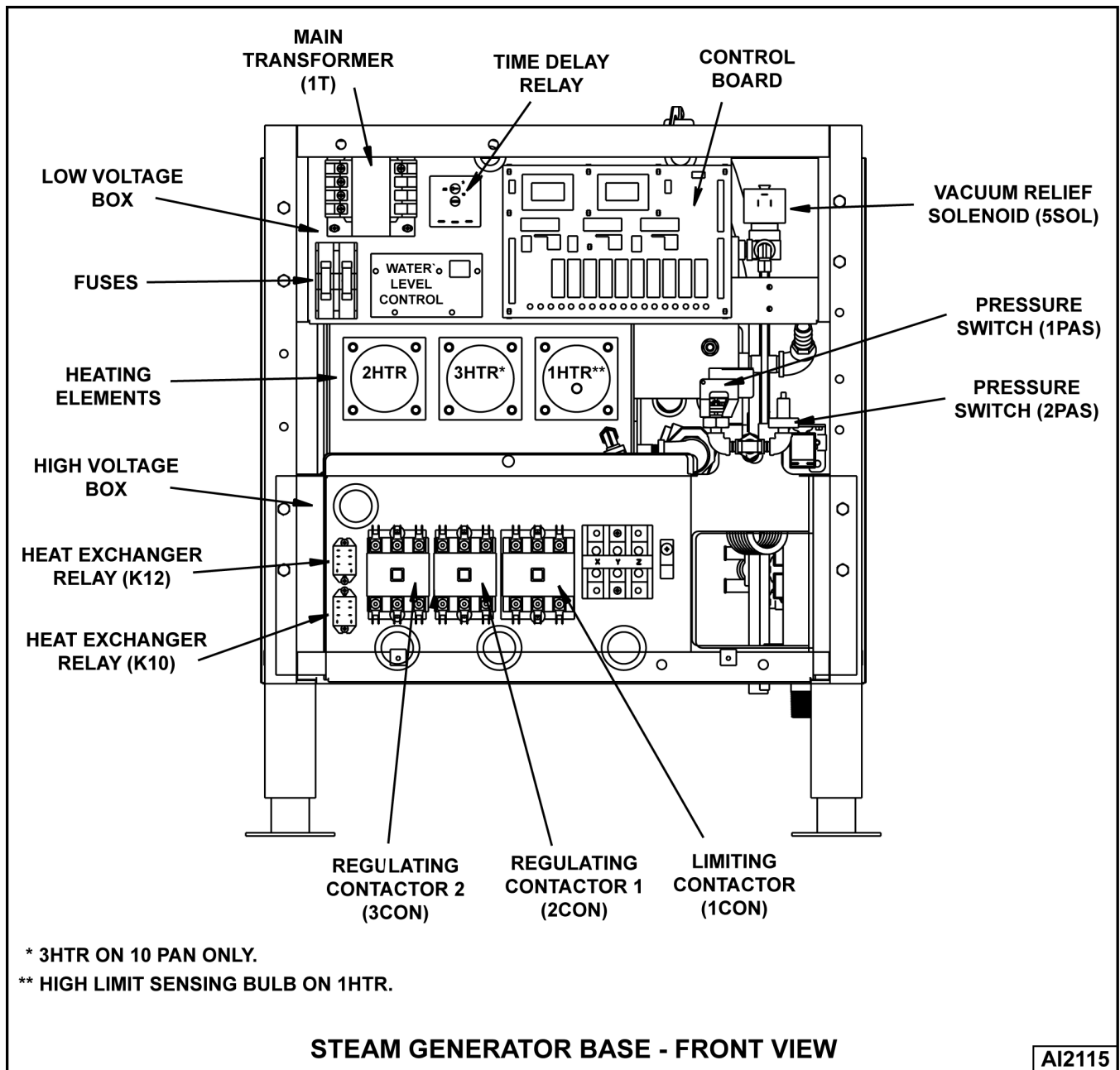
**COOKING COMPARTMENT CONTROLS**

The upper section of the steamer consists of two separate cooking compartments. Each compartment functions independently with its own set of controls. Power is supplied to the compartment controls after steam generator reaches operating pressure.

- Switch (1S), Power** ..... Controls 120VAC to steam generator control circuit in the on position. The switch must be in the off position to provide 120VAC to power delime control circuit.
- Switch (2S), Delime** ..... Controls 120VAC to initially energize delime control circuit (momentary on). Press and hold switch for approximately 2 seconds to energize external time delay relay and start delime cycle.
- Switch, Door** ..... Plunger activated switch wired in series with timer. When switch is closed and timer is set, regulating contactor(s) are energized after ready light is on (pressure switch 1PAS satisfied).
- Timer, Cooking** ..... Used to set cooking time between 0-60 minutes or select constant steam. When timer is set, energizes the steam solenoid valve to allow steam into the cooking compartment. When time expires, energizes buzzer until timer is turned off.
- Buzzer** ..... Creates audible signal when timed cook cycle is complete.
- Lamp (1LT), Ready** ..... Green (GN) colored lamp. On when door is closed and steam generator is pressurized (pressure switch 1PAS operated).
- Lamp (2LT), Cook** ..... Red (RD) colored lamp. On when door is closed and timer is set.
- Lamp (3LT), Power** ..... Amber (AM) colored lamp. On when power switch is on and steam generator high limits are closed.
- Lamp (4LT), Delime** ..... Red (RD) colored lamp. On when power switch is off and delime switch is operated.
- Solenoid, Compartment Steam** ..... When energized by timer, steam solenoid opens to allow steam into cooking compartment (normally closed valve).

**COMPONENT LOCATION**

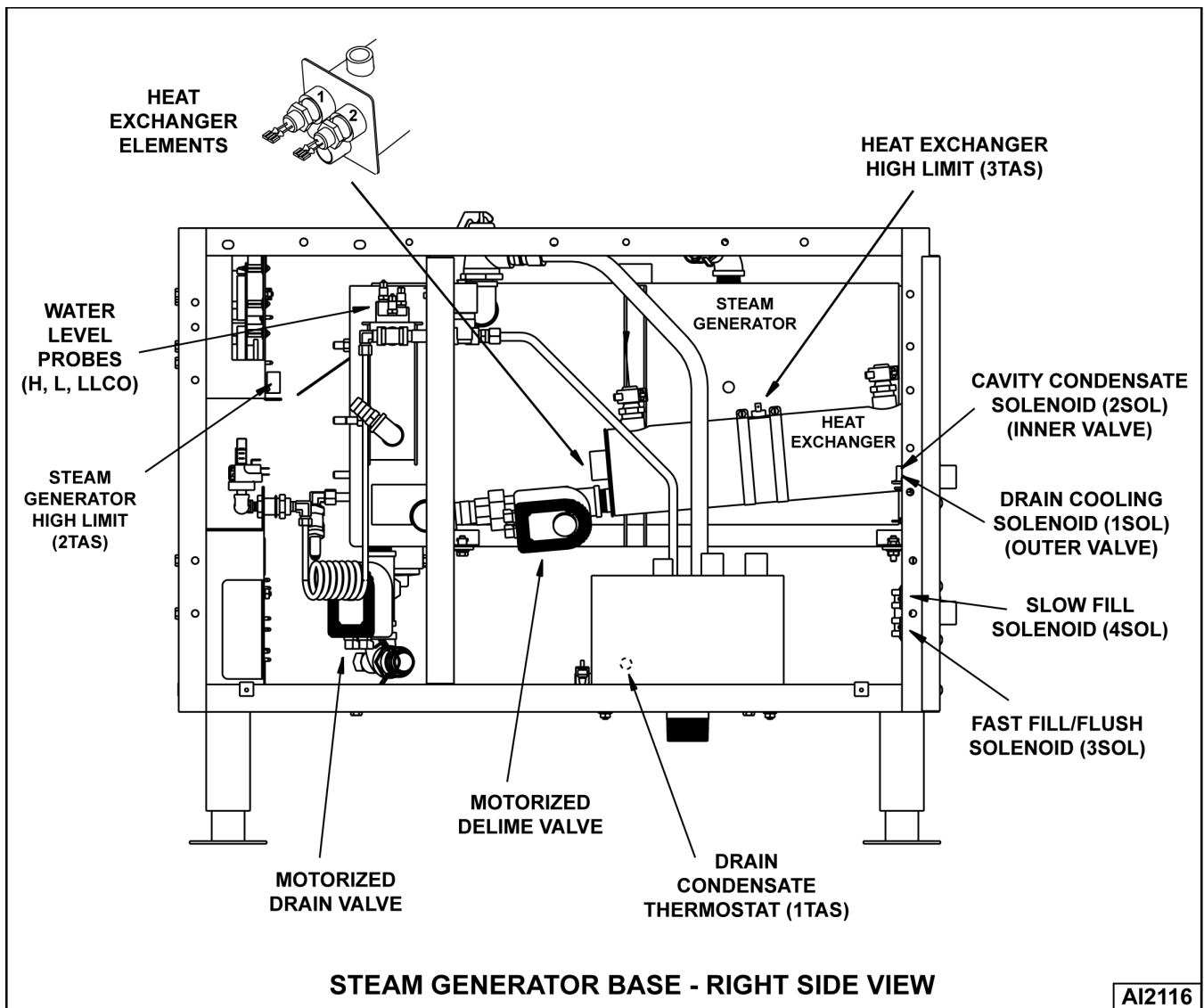
**Steam Generator Base**



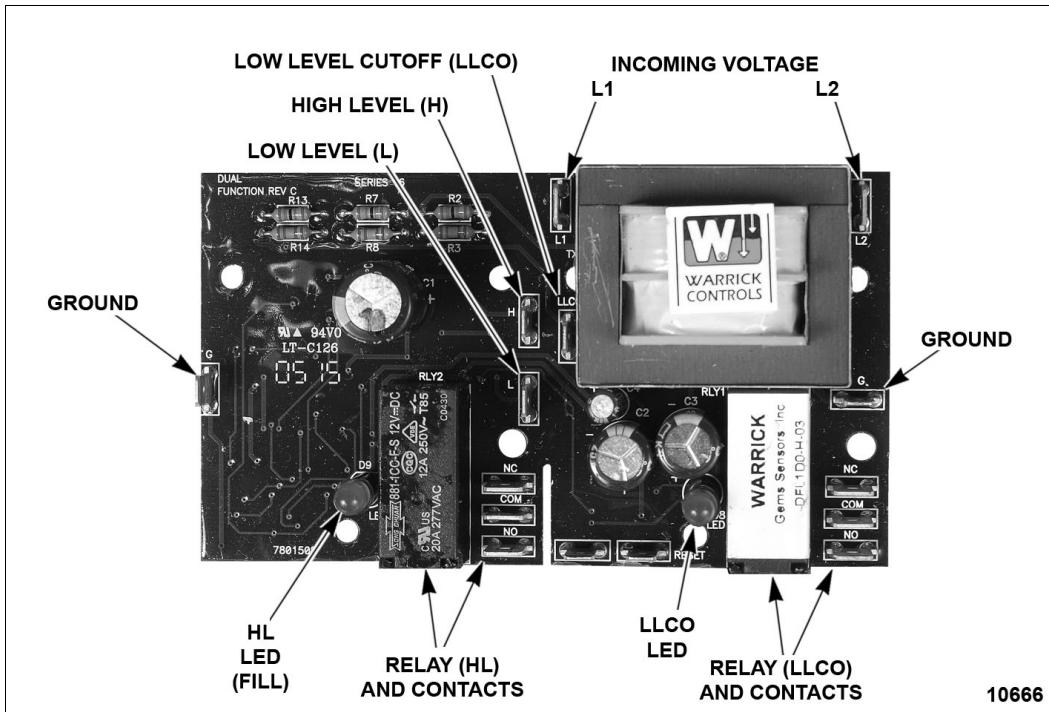
AI2115

\* 3HTR ON 10 PAN ONLY.

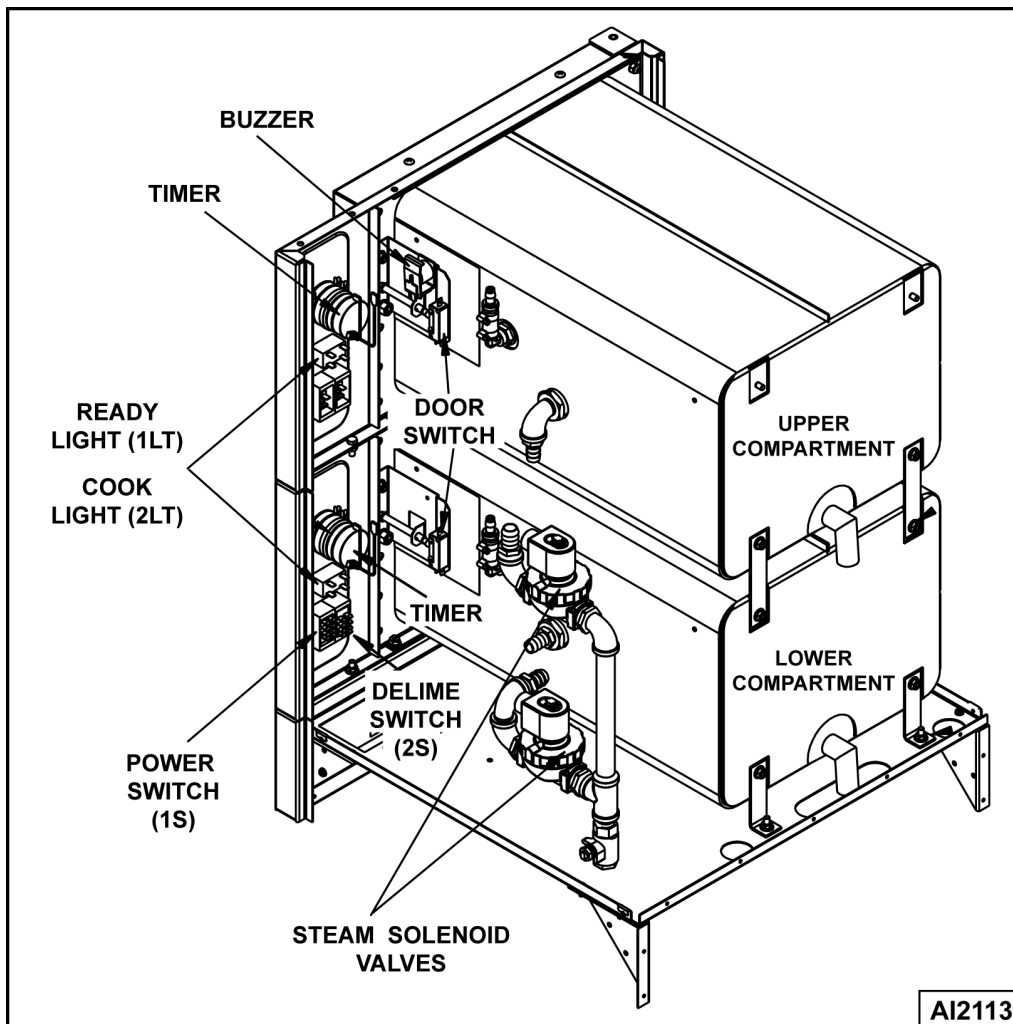
\*\* HIGH LIMIT SENSING BULB ON 1HTR.



Water Level Control



Cooking Compartment Controls



## SMART CYCLE POWER MANAGEMENT

Reduces energy use by not powering all the heating elements in steam generator and heat exchanger when the steamer is at operating pressure and one cooking compartment in use. When both cooking compartments are in use, all of the heating elements in the steam generator and heat exchanger are powered.

| Steamer     | Heating Elements |                 | Description   |
|-------------|------------------|-----------------|---|
|             | Steam Generator  | Heat Exchanger  |   |
| 6 pan       | 2                | 2               | One cooking compartment in use, only one steam generator heating element and one heat exchanger element are powered thru limiting contactor (1CON) and regulating contactor 1 (2CON).                               |
| 10 pan      | 3                | 2               | One cooking compartment in use, two steam generator heating elements and one heat exchanger element are powered thru limiting contactor (1CON) and regulating contactor 1 (2CON).                                   |
| 6 or 10 pan | As listed above  | As listed above | Two cooking compartments in use, all steam generator heating elements and both heat exchanger elements are powered thru limiting contactor (1CON), regulating contactor 1 (2CON) and regulating contactor 2 (3CON). |

## SEQUENCE OF OPERATION

Refer to the following diagrams when reviewing sequence of operation: Steam generator schematic, cooking compartment schematic and heating element wiring diagrams (for heat exchanger relay contacts K10 and K12). The control board delime time delay relay 2 (TDR) and drain time delay relay (TDR) jumpers are set at their default times as shown on the schematic.

**NOTE:** If power switch is off when service voltage is applied, steamer will enter timed drain cycle.

### Initial Fill and Pre-Heat

1. Conditions (steamer previously operated and drain cycle timed out).
  - A. Steamer connected to correct voltage.
    - 1) 120VAC potential across X1 and X2 on secondary side of main transformer.
  - B. Steamer connected to cold water supply with correct water requirements.
  - C. **LED 1 lit** (power to control board).
  - D. Power switch is off (1S).
    - 1) **LED 13 lit.** Delime 1 (TDR) on control board timed out. Time delay has no output from load terminal.
    - 2) Delime 2 (TDR) on control board timed out. Time delay has no output from load terminal.
    - 3) **LED 9 lit.** Drain (TDR) on control board timed out. Time delay has no output from load terminal.
  - E. Delime switch (2S) is off (center position).
  - F. Compartment timers off and doors open.
  - G. Condensate thermostat thermostat (1TAS) open.
  - H. Pressure switch (2PAS) closed.
    - 1) **LED 12 lit.** Vacuum relief solenoid (5SOL) energized. Solenoid valve must be open to provide air vent to allow steam generator to fill.
  - I. Steam generator high limit (2TAS) closed.
  - J. Heat exchanger high limit (3TAS) closed.



- K. Pressure switch (1PAS) closed.
- L. Drain valve closed and steam generator is empty.
- M. Delime valve closed and heat exchanger empty.
  - 1) Delime valve end switch N.O. contacts are open.
- N. Water level control (WLC) and steam generator properly grounded.
- 2. Power switch turned on (1S).
  - A. **LED 13 off.** Power removed from delime 1 (TDR) on control board.
  - B. **LED 9 off.** Power removed from drain (TDR) on control board.
  - C. X1 potential thru steam generator high limit (2TAS) and heat exchanger high limit (3TAS).
    - 1) Power light (3LT) (amber) on control panel lit.
    - 2) X1 potential to L1 of water level control (WLC) thru K3-1/5 drain relay N.C. contacts.
      - a. 120VAC across L1 and L2 of WLC.
      - b. **HL LED lit.** High level relay coil (HL) on WLC energized.
    - 3) Fast fill/flush solenoid (3SOL) energized thru WLC (LLCO) N.C. contacts. Steam generator begins fast fill.
- 3. Water level reaches Low Level Cut-Off (LLCO) probe.
  - A. **LLCO LED lit.** Low level coil relay (LLCO) on WLC energized.
  - B. LLCO N.C. contacts open. Fast fill/flush solenoid (3SOL) de-energized.
  - C. WLC (LLCO) N.O. contacts close. X1 potential thru WLC (LLCO) closed contacts and K3-6/2 N.C. drain relay contacts.
    - 1) Slow fill solenoid (4SOL) energized thru pressure switch (1PAS) N.C contacts and WLC (HL) closed contacts. Steam generator changes to slow fill.
    - 2) **LED 2 lit.** Limiting contactor (1CON) energized.
    - 3) **LED 4 lit.** Regulating contactor 2 (3CON) energized thru K1-5/1 N.C. contacts.
    - 4) Heat exchanger relay (K12) energized.
      - a. K12-5/3 N.O. contacts close.
    - 5) **LED 3 lit.** Regulating contactor 1 (2CON) energized.
  - D. Power to heating elements. Steam generator heating begins.
- 4. Water level reaches low level (L) probe.
  - A. No action as internal latching relay ILR-1 contacts on WLC are open.
- 5. Water level reaches high level (H) probe.
  - A. Internal latching relay coil (ILR) on WLC energized and locked thru the low level probe (L) and ILR-1 closed contacts.
  - B. **HL LED off.** High level (HL) coil de-energized by ILR-2 contacts opening on WLC.
    - 1) WLC (HL) contacts open. Slow fill solenoid (4SOL) de-energized.
- 6. Pressure switch (2PAS) operates (approx. 4" W.C.) and N.C. contacts open.
  - A. **LED 12 off.** Vacuum relief solenoid (5SOL) de-energized. Solenoid valve must close to allow steam generator to fully pressurize.
- 7. Steam generator up to pressure (approx. 4 psi).
  - A. Pressure switch (1PAS) operates and N.C. contacts open.
    - 1) **LED 5 lit.** Relay (K1) energized.
      - a. K1-5/3 N.O. contacts close. X1 potential thru K1-5/3 contacts and K2-5/1 N.C. contacts to cooking compartment controls.

- a) Ready lights (1LT) (green) are lit for the upper and lower compartments.
- b. K1-5/1 N.C. contacts open.
  - a) **LED 4 off.** Regulating contactor 2 (3CON) de-energized.
- 2) **LED 3 off.** Regulating contactor 1 (2CON) de-energized.
- B. Power removed from heating elements. Steam generator heating stops.

**Timers Set (Upper & Lower Compartments)**

- 1. Timers set for timed cooking and doors closed.
    - A. Upper compartment - Timer contacts 11/13 and 21/23 close.
      - 1) **LED 6 lit.** Upper cavity relay (K8) energized. K8-3/5 N.O. contacts close.
        - a. **LED 8 lit.** Cavity condensate solenoid (2SOL) energized. Compartment drain line condensate cooled.
        - b. Heat exchanger relay (K10) energized. K10-3/5 N.O. contacts close and heat exchanger element (1) begins heating.
        - c. K8-6/4 N.O. contacts close.
      - 2) Cook light (2LT) (red) lit. Steam solenoid energized (steam enters cooking compartment).
      - 3) Timer motor energized.
    - B. Lower compartment - Timer contacts 11/13 and 21/23 close.
      - 1) **LED 7 lit.** Lower cavity relay (K9) energized. K9-3/5 N.O. contacts close.
        - a. **LED 8 lit.** With upper compartment timer already set, cavity condensate solenoid (2SOL) and heat exchanger relay (K10) are energized thru K8-3/5 closed contacts.
          - a) K10-3/5 contacts close and heat exchanger element (1) begins heating.
        - b. Heat exchanger relay (K12) energized thru K8-6/4 and K9-3/5 N.O. contacts. Heat exchanger element (2) begins heating.
        - c. If lower compartment timer is the only timer set, cavity condensate solenoid (2SOL) and heat exchanger relay (K10) are energized thru K8-1/5 N.C. contacts. Compartment drain line condensate is cooled. K10-3/5 contacts close and heat exchanger element (1) is energized.
      - 2) Cook light (2LT) (red) lit. Steam solenoid energized (steam enters cooking compartment).
      - 3) Timer motor energized.
2. Steam generator pressure drops below pressure switch (1PAS) set point.
  - A. Regulating contactor 1 (2CON) and regulating contactor 2 (3CON) are energized and power the heating elements until pressure switch is satisfied. The pressure switch will cycle the heating circuit as necessary to maintain steam generator pressure.
    - 1) **LED 3** will cycle on/off with regulating contactor 1 (2CON). **LED 4** will cycle on/off with regulating contactor 2 (3CON).

**Water Refill (After Initial Fill)**

- 1. The water refill cycle will occur whenever the water level is below the low level probe and will not affect the operation of either the preheat or cook cycle.
  - A. Water level drops below low level (L) probe.
    - 1) Internal latching relay coil (ILR) on WLC de-energized. ILR-1 contacts return to N.O. condition.
    - 2) **HL LED lit.** High level coil (HL) energized by ILR-2 contacts returning to N.C. condition.
      - a. WLC (HL) contacts close. Slow fill solenoid (4SOL) energized.
  - B. Water level reaches high level (H) probe.
    - 1) Internal latching relay coil (ILR) on WLC energized and locked thru the low level probe (L) and ILR-1 closed contacts.

- 2) **HL LED off.** High level (HL) coil de-energized by ILR-2 contacts opening.
  - a. WLC (HL) contacts open. Slow fill solenoid (4SOL) de-energized.
2. Timers reach zero (Upper & Lower Compartments).
  - A. Upper compartment - Timer contacts 11/13 and 21/23 open.
    - 1) **LED 6 off.** Upper cavity relay (K8) de-energized. K8-3/5 contacts return to N.O. condition.
      - a. **LED 8 off.** Cavity condensate solenoid (2SOL) de-energized.
      - b. Heat exchanger relay (K10) de-energized. K10- 3/5 contacts return to N.O. condition and heat exchanger element (1) de-energized.
      - c. K8-6/4 contacts return to N.O. condition.
    - 2) Cook light (2LT) (red) off. Steam solenoid de-energized.
    - 3) Timer motor de-energized.
  - B. Lower compartment - Timer contacts 11/13 and 21/23 open.
    - 1) **LED 7 off.** Lower cavity relay (K9) de-energized. K9-3/5 contacts return to N.O. condition.
      - a. **LED 8 off.** With upper compartment timer expired, cavity condensate solenoid (2SOL) and heat exchanger relay (K10) are de-energized. K8-3/5 contacts are open.
        - a) K10-3/5 contacts open and heat exchanger element (1) de-energized.
      - b. Heat exchanger relay (K12) de-energized. K8-6/4 and K9-3/5 contacts return to N.O. condition. Heat exchanger element (2) de-energized.
    - 2) Cook light (2LT) (red) off. Steam solenoid de-energized.
    - 3) Timer motor de-energized.
  - C. Buzzer energized through timer N.O. contacts 11/14 (upper or lower cooking compartment timer).
    - 1) Buzzer remains energized until: Timer turned to OFF; New time or CONSTANT steam selected; Or power switch turned off.

### Turning Steamer Off

1. Timers off (upper and lower cooking compartments).
2. Power switch (1S) turned off.
  - A. Power light (3LT) (amber) on control panel off.
3. **LED 9 Lit.** Drain (TDR) energized thru K4-6/2 N.C. contacts. 120VAC output from load terminal on drain (TDR) for 3 minute (default) drain cycle time.
  - A. **LED 10 Lit.** Drain relay (K3) energized.
    - 1) K3-3/5 N.O. contacts close. **HL LED off; LLCO LED lit.** WLC remains powered.
    - 2) K3-1/5 N.C. contacts open. Prevents possible short circuit in the event power switch is turned on.
    - 3) K3-6/2 N.C. contacts open. Removes power from heating circuit and compartment controls. Ready lights (1LT) (green) are off for the upper and lower compartments.
  - B. Drain transformer (2T) powered (120/24VAC).
    - 1) 24VAC drain valve energized. Valve opens and steam generator begins draining.
4. Drain water temperature above 130°F. Condensate thermostat (1TAS) contacts close (N.O. contacts - close on temperature rise).
  - A. Drain cooling valve (1SOL) energized until drain water temperature is below 120°F.
5. Pressure switch (2PAS) N.C. contacts return to closed condition when steam generator pressure drops below 4" W.C.
  - A. **LED 12 lit.** Vacuum relief solenoid (5SOL) energized. Solenoid valve must be open to provide air vent and allow steam generator to drain.

6. **LED 13 Lit.** Power to delime 1 (TDR). Time delay relay has no output from load terminal until input trigger voltage is received by delime switch (2S) at the start of a delime cycle.
7. Water level drops below low level (L) probe.
  - A. Internal latching relay coil (ILR) on WLC de-energized. ILR-1 contacts return to N.O. condition.
  - B. **HL LED lit.** High level coil (HL) energized by ILR-2 contacts returning to N.C. condition. WLC (HL) contacts close.
8. Water drops below LLCO probe.
  - A. **LLCO LED off.** Low level relay coil (LLCO) on WLC de-energized.
    - 1) WLC (LLCO) N.C. contacts return to closed condition.
      - a. Fast fill/flush solenoid (3SOL) energized. Water flushes steam generator drain opening to clear debris.
    - 2) WLC (LLCO) N.O. contacts return to open condition.
  - B. **LED 2 off.** Limiting contactor (1CON) de-energized.
9. Drain (TDR) time elapses.
  - A. 120VAC removed from drain TDR load terminal.
    - 1) **LED 10 off.** Drain relay (K3) de-energized. K3 contacts return to normal conditions. Power removed from WLC.
    - 2) Power removed from drain transformer (2T). Drain valve de-energized and valve closes.
10. Drain water temperature below 120°F. Condensate thermostat (1TAS) contacts return to open condition. Drain cooling solenoid (1SOL) de-energized.
11. **LED's 1, 9, 12 and 13 lit.** Draining complete and steamer is off.

### Deliming Cycle

**NOTE:** Allow steam generator to completely drain and the drain valve to close before adding delime solution. Refer to Installation & Operation manual for deliming procedure.

1. Power switch (1S) off and steam generator empty. LED's and components conditions are in the same state as outlined at the end of Turning Steamer Off.
2. Press delime switch (2S) to DELIME position (momentary) and hold until delime (4LT) (red) and power (3LT) (amber) lights are lit (approx. 2 seconds). Release delime switch to return to center off position.
  - A. **LED 15 lit.** Delime relay (K2) energized.
    - 1) K2-6/4 N.O. contacts close. Delime light (4LT) lit.
    - 2) Power to delime 1 (TDR) input trigger and delime 1 (TDR) is energized. **LED 13** remains lit as in Turning Steamer off. 120VAC output from load terminal remains on for 3 additional minutes after power is removed from input trigger to allow heat exchanger to drain (delime valve energized). Total time 63 minutes unless canceled (delime 2 TDR default time of 60 minutes plus delime 1 TDR of 3 minutes).
      - a. Delime transformer (3T) powered. Delime valve energized and opens (approx. 10 second delay while valve motor capacitor charges).
      - b. Delime valve end switch contacts close.
      - c. **LED 17 lit.** Delime relay (K7) energized.
        - a) K7-5/1 N.C contacts open. X1 potential removed from power switch (1S).
        - b) K7-5/3 N.O. contacts close. Allows delime 1 (TDR) to remain powered during delime cycle after K4-6/2 N.C. contacts open.
    - 3) K2-5/1 N.C. contacts open. Power to cooking compartment controls is locked out.
  - B. **LED 14 lit.** Delime relay (K4) energized thru K6-5/1 N.C contacts.
    - 1) Delime 2 (TDR) powered thru K4-6/4 closed contacts (N.O.). 120VAC output from delime 2 (TDR) load terminal for 60 minutes.

- a. Delime relay (K2) remains powered. **LED 15** remains lit from pressing delime switch (2S).
  - b. Power to heating circuit, power light (3LT) (amber) and WLC thru K4-5/3 closed contacts (N.O.).
    - a) Steam generator fills and operates as outlined in *steps 2A thru 7B* under Initial Fill and Pre-heat with this exception. After pressure switch (1PAS) is satisfied, **LED 4** will remain off and regulating contactor 2 (3CON) will remain de-energized. **LED 3** and regulating contactor 1 (2CON) will cycle on/off as necessary to maintain steam generator pressure.
3. After 60 minutes, time expires on delime 2 (TDR).
- A. **LED 15 and LED 14 off.** Delime relays (K2) and (K4) are de-energized and contacts return to normal conditions.
    - 1) Power light (3LT) (amber) off.
4. With power removed from delime 1 (TDR) input trigger (K2-6/4 contacts open), delime 1 (TDR) remains powered thru K7-5/3 N.O. contacts to hold delime relay (K7) energized for a delay on dropout (120VAC output from load terminal remains on). Allows heat exchanger to drain (delime valve energized) along with steam generator during the 3 minute (default) drain cycle time.
5. Steamer enters 3 minute drain cycle. Drain cycle operates as outlined in *steps 3 thru 8. B.* under Turning Steamer Off. Continue with sequence for remainder of delime cycle operation
- A. With drain (TDR) energized (**LED 9 lit**) (120VAC output from load terminal); and delime 1 (TDR) powered (**LED 13 lit**) and receiving voltage to input trigger terminal; and delime valve end switch contacts closed.
    - 1) Drain relay (K5) is energized thru delime valve end switch closed contacts (N.O.).
      - a. K5-6/4 contacts close and delime light (4LT) is lit.
      - b. **LED 11 lit.** K5-5/3 latching circuit contacts close.
6. After 3 minutes, time expires on drain (TDR) and the drain cycle ends. 120VAC removed from drain TDR load terminal.
- A. **LED 10 off.** Drain relay (K3) de-energized. K3 contacts return to normal conditions. Power removed from WLC.
  - B. Power removed from drain transformer (2T). Drain valve de-energized and valve closes.
    - 1) **LED 11 off.** Delime relay (K5) de-energized. Latching circuit contacts K5-5/3 return to open condition. Contacts K5-6/4 return to open condition.
      - a. Power removed from delime 1 (TDR) input trigger.
      - b. Delime light (4LT) off.
7. Drain water temperature below 120°F. Condensate thermostat (1TAS) contacts return to open condition. Drain cooling solenoid (1SOL) de-energized.
8. Time expires on delime 1 (TDR).
- A. Delime transformer (3T) is de-energized. Delime valve closes and delime valve end switch contacts return to open condition.
  - B. Delime relay (K7) de-energized. Contacts K7-5/3 and K7-5/1 return to normal condition.
9. **LED's 1, 9, 12 and 13 lit.** Draining complete and steamer is off.

### Cancel Deliming

1. Press delime switch (2S) to CANCEL position (off).
  - A. If delime valve has not opened, the steamer is ready to use (approx. 10 second delay while valve motor capacitor charges). Allows an unintended delime cycle to be canceled.
  - B. If delime valve has opened, the steamer will go thru a drain cycle before it can be turned on.
    - 1) **LED 16 lit.** Delime relay (K6) energized. K6-5/1 N.C contacts open.
      - a. Delime relay (K4) de-energized.
        - a) **LED 9 lit.** K4-6/2 return to N.C condition and drain (TDR) energized.
        - b) Drain circuit powered. Steam generator drains and shuts off as outlined under Turning Steamer Off.

**SCHEMATIC DIAGRAMS**

**LEGEND OF ELECTRICAL SYMBOLS**



TERMINAL BLOCK (TB)



TIME DELAY RELAY



FUSE (FU)



SOLENOID (SOL)



SWITCH, SPDT



DRAIN VALVE, MOTORIZED



SWITCH, N.O.



DELIME VALVE, MOTORIZED



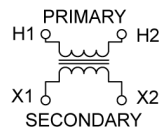
THERMOSTAT, N.O.



COIL, RELAY (K) OR CONTACTOR



PRESSURE SWITCH, N.C.



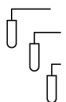
TRANSFORMER (T)



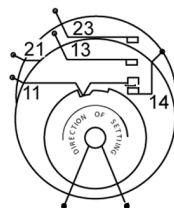
CONTACTS, N.C.



CONTACTS, N.O.



WATER PROBE ASSEMBLY



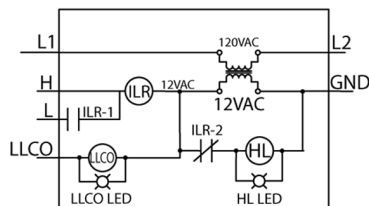
COOKING  
TIMER



LIGHT

AM = AMBER  
GN = GREEN  
RD = RED

N.C. = NORMALLY CLOSED  
N.O. = NORMALLY OPEN



WATER LEVEL  
CONTROL (WLC)

19222

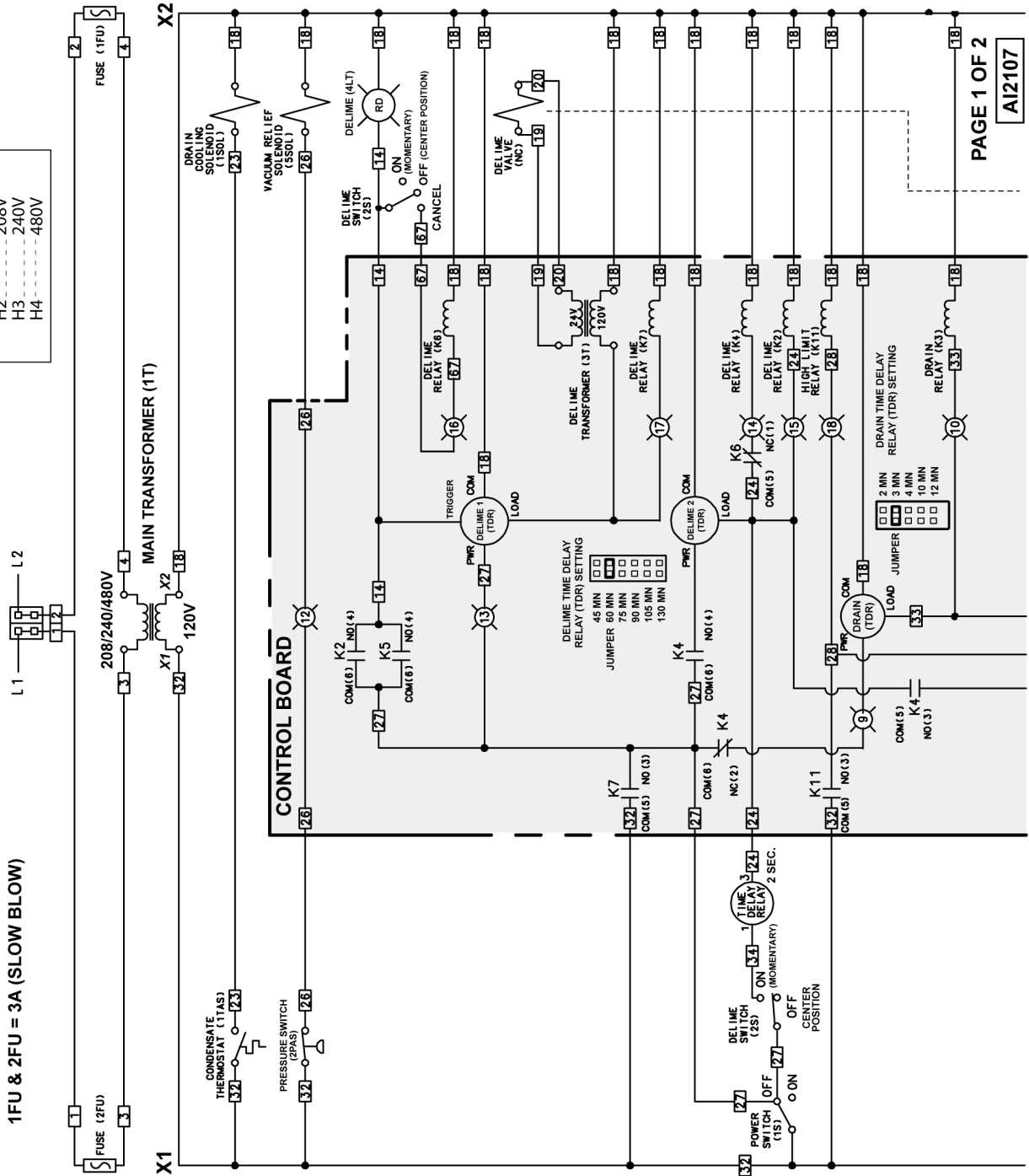
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Steam Generator Base

**MAIN TRANSFORMER CONNECTIONS**

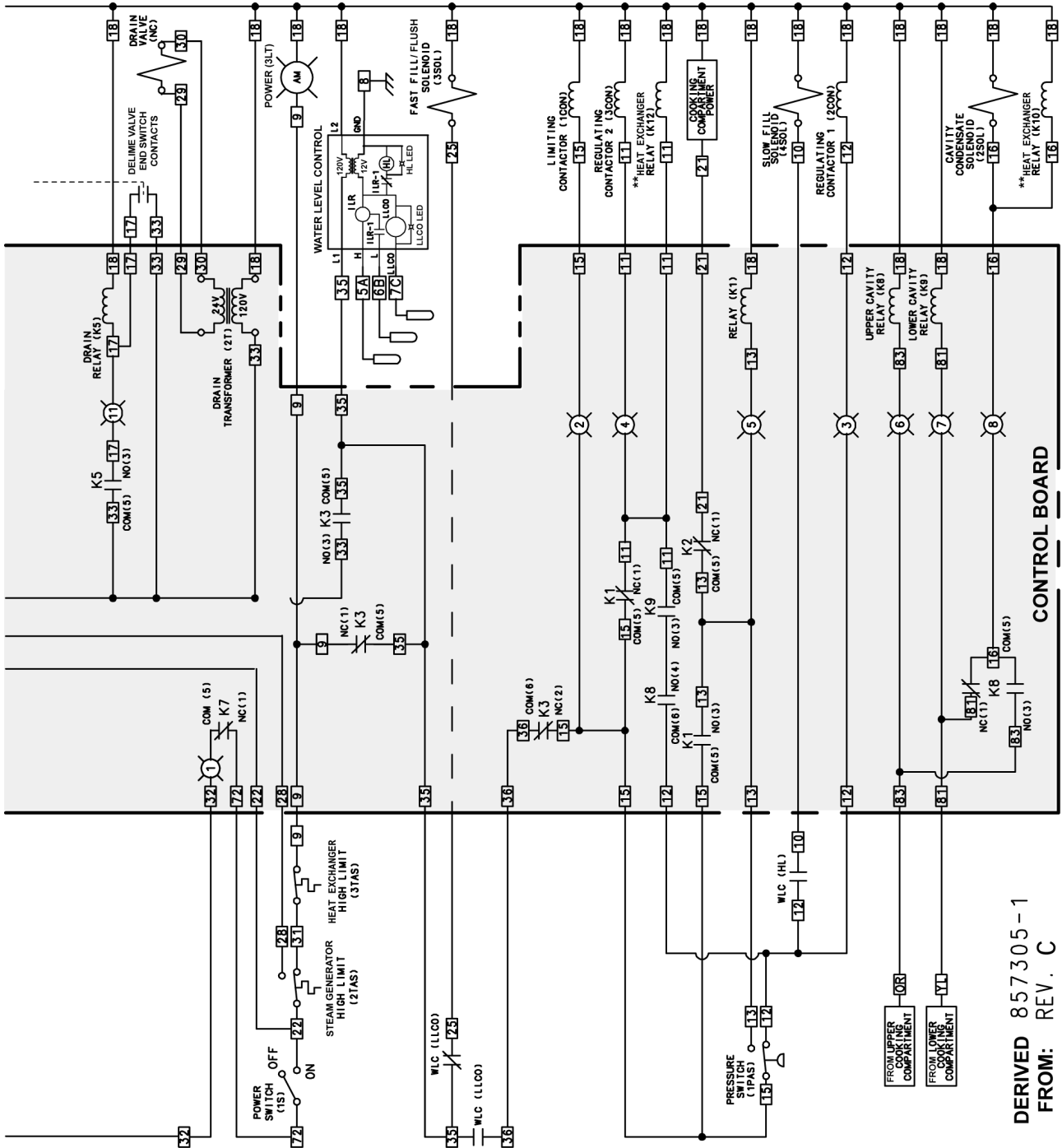
|    |     |      |
|----|-----|------|
| H1 | --- | COM  |
| H2 | --- | 208V |
| H3 | --- | 240V |
| H4 | --- | 480V |

**C24EA 6 & 10 SCHEMATIC  
208V/240V/480V**



PAGE 1 OF 2  
AI2107





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FROM: REV. C

\*\* SEE HEATING ELEMENT WIRING DIAGRAMS FOR K10 AND K12 CONTACTS PAGE 2 OF 2 AI2108

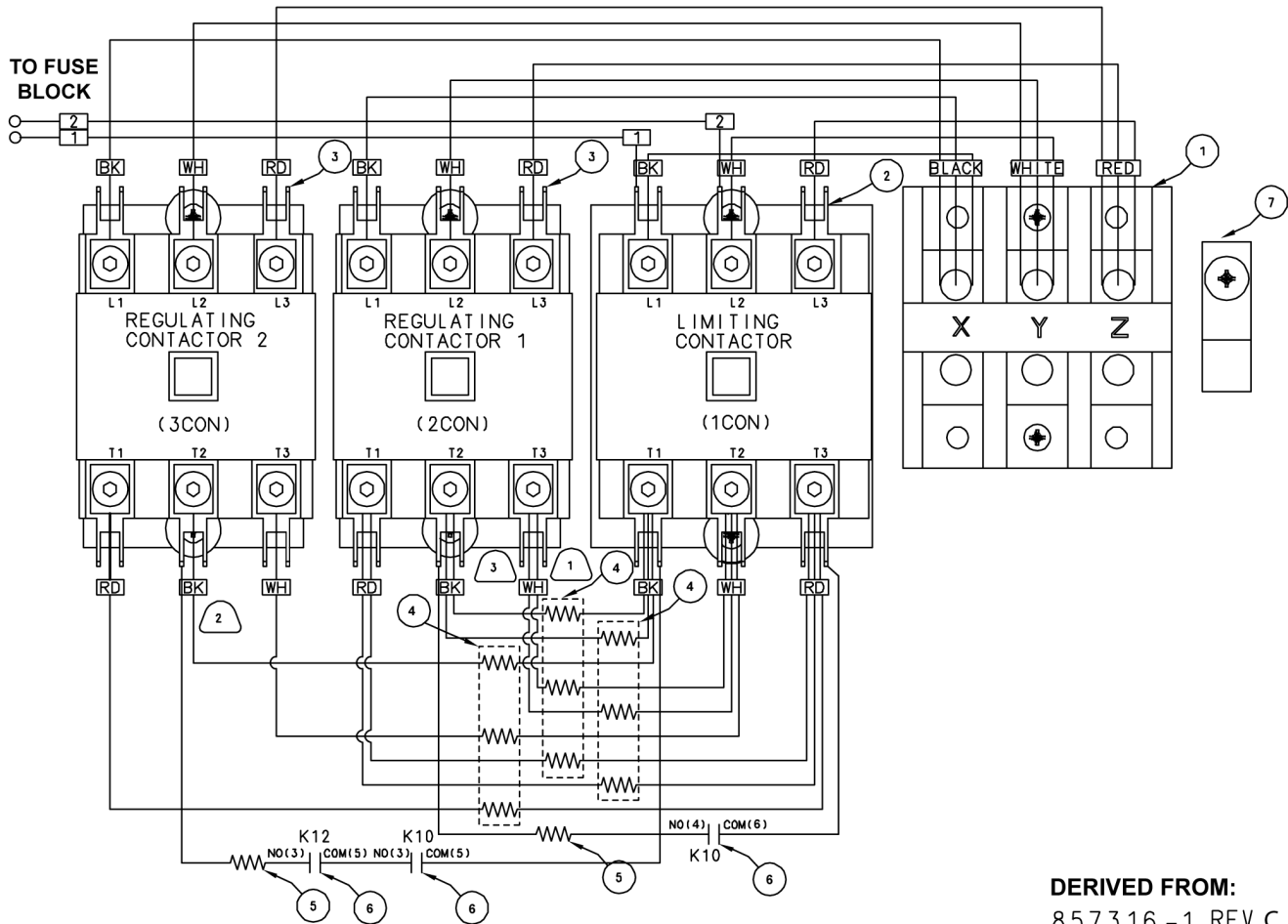
**WIRING DIAGRAMS**

**Heating Element Wiring**

**208V 3 PHASE**

SEE FIELD CONVERSION NOTES FOR 240V

| ITEM | DESCRIPTION            | QUANTITY |        |
|------|------------------------|----------|--------|
|      |                        | 6 PAN    | 10 PAN |
| 1    | TERMINAL BLOCK         | 1        | 1      |
| 2    | LIMITING CONTACTOR     | 1        | 1      |
| 3    | REGULATING CONTACTOR   | 2        | 2      |
| 4    | GENERATOR HEATING ELE. | 2        | 3      |
| 5    | HEAT EXCHANGER ELE.    | 2        | 0      |
|      | HEAT EXCHANGER ELE.    | 0        | 2      |
| 6    | RELAY                  | 2        | 2      |
| 7    | GROUND LUG             | 1        | 1      |



**FIELD CONVERSION NOTES**

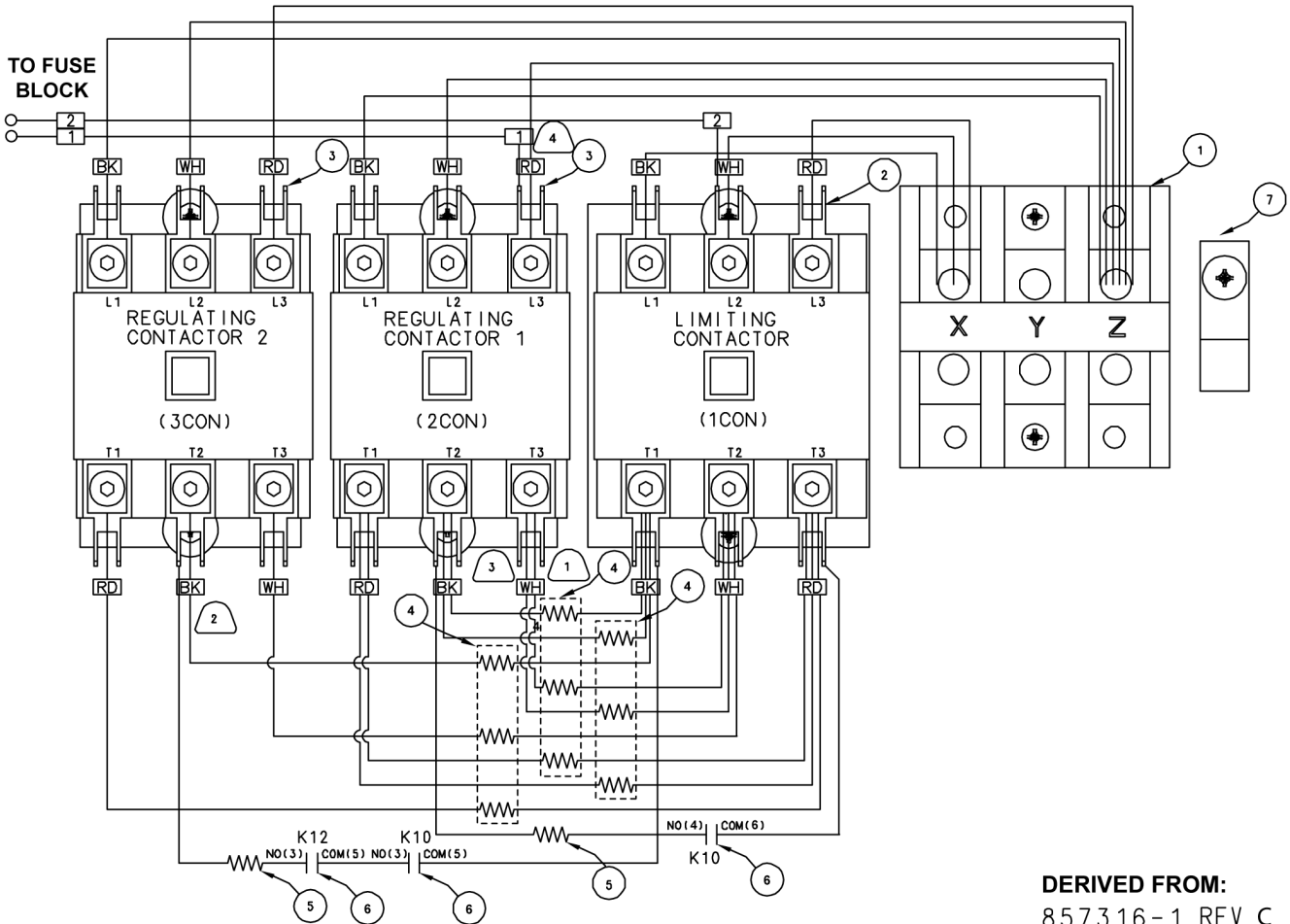
- 1 6 PAN MACHINES USE TWO GENERATOR HEATING ELEMENTS. ONE ELEMENT BETWEEN THE LIMITING CONTACTOR AND REGULATING CONTACTOR 1, IS NOT PRESENT
- 2 FOR 6 PAN MACHINES, TO CONVERT TO 240V, DISCONNECT THE BLACK ELEMENT LEAD FROM REGULATING CONTACTOR 2 AND ITS CORRESPONDING LEAD FROM THE LIMITING CONTACTOR. MOVE THE MAIN TRANSFORMER PRIMARY INPUT FROM THE H2 (208V) POSITION TO THE H3 (230V) POSITION
- 3 FOR 10 PAN MACHINES, TO CONVERT TO 240V, DISCONNECT THE BLACK ELEMENT LEAD FROM REGULATING CONTACTOR 2 AND THE WHITE ELEMENT LEAD FROM REGULATING CONTACTOR 1 AND THEIR CORRESPONDING LEADS FROM THE LIMITING CONTACTOR. MOVE THE MAIN TRANSFORMER PRIMARY INPUT WIRE #4 FROM THE H2 (208V) POSITION TO THE H3 (230V) POSITION

**A12109**

# 208V 1 PHASE

SEE FIELD CONVERSION NOTES FOR 240V

| ITEM | DESCRIPTION            | QUANTITY |        |
|------|------------------------|----------|--------|
|      |                        | 6 PAN    | 10 PAN |
| 1    | TERMINAL BLOCK         | 1        | 1      |
| 2    | LIMITING CONTACTOR     | 1        | 1      |
| 3    | REGULATING CONTACTOR   | 2        | 2      |
| 4    | GENERATOR HEATING ELE. | 2        | 3      |
| 5    | HEAT EXCHANGER ELE.    | 2        | 0      |
|      | HEAT EXCHANGER ELE.    | 0        | 2      |
| 6    | RELAY                  | 2        | 2      |
| 7    | GROUND LUG             | 1        | 1      |



DERIVED FROM:  
857316-1 REV C

### FIELD CONVERSION NOTES

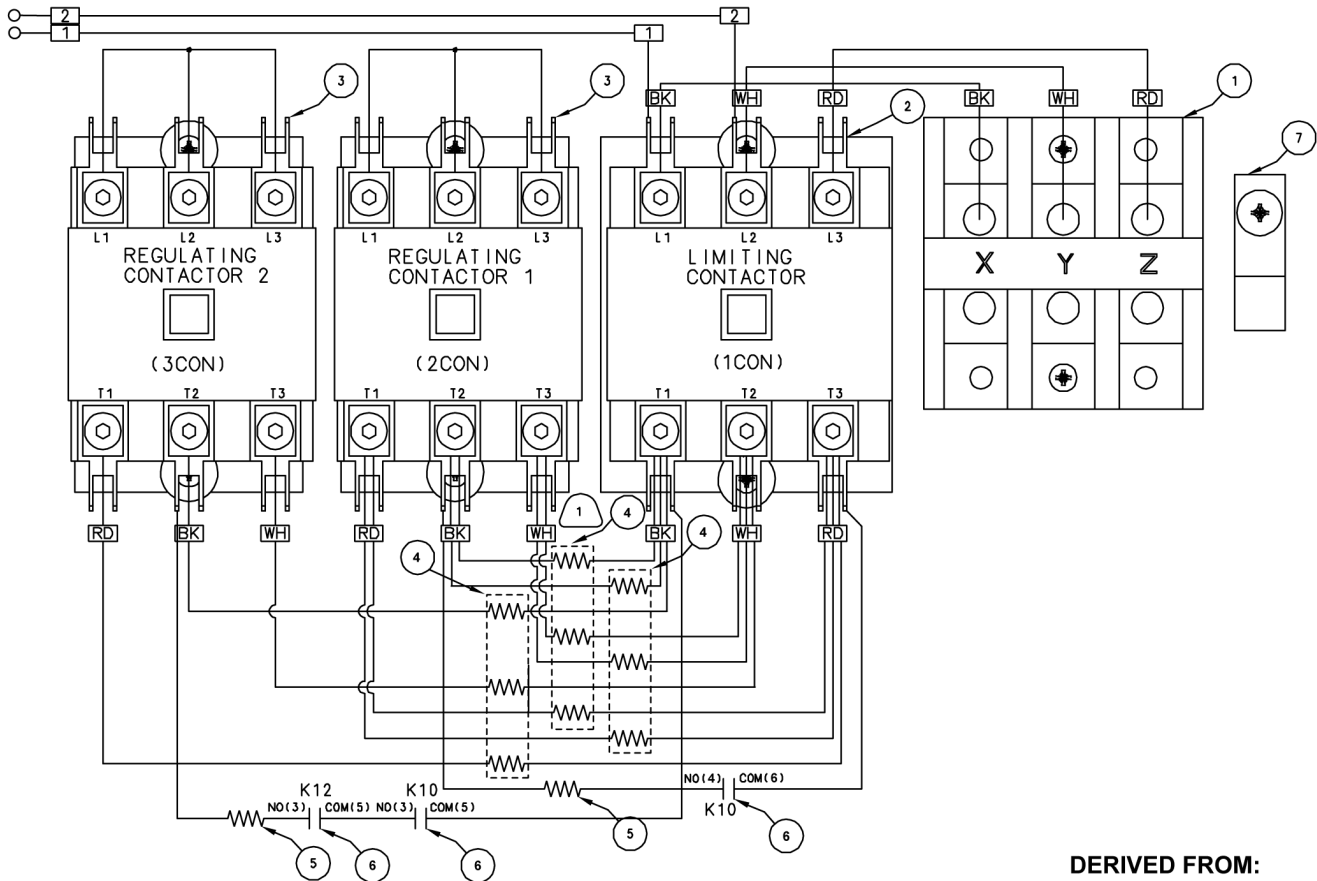
- 1 6 PAN MACHINES USE TWO GENERATOR HEATING ELEMENTS. ONE ELEMENT BETWEEN THE LIMITING CONTACTOR AND REGULATING CONTACTOR 1, IS NOT PRESENT
- 2 FOR 6 PAN MACHINES, TO CONVERT TO 240V, DISCONNECT THE BLACK ELEMENT LEAD FROM REGULATING CONTACTOR 2 AND ITS CORRESPONDING LEAD FROM THE LIMITING CONTACTOR. MOVE THE MAIN TRANSFORMER PRIMARY INPUT FROM THE H2 (208V) POSITION TO THE H3 (230V) POSITION
- 3 FOR 10 PAN MACHINES, TO CONVERT TO 240V, DISCONNECT THE BLACK ELEMENT LEAD FROM REGULATING CONTACTOR 2 AND THE WHITE ELEMENT LEAD FROM REGULATING CONTACTOR 1 AND THEIR CORRESPONDING LEADS FROM THE LIMITING CONTACTOR. MOVE THE MAIN TRANSFORMER PRIMARY INPUT WIRE #4 FROM THE H2 (208V) POSITION TO THE H3 (230V) POSITION
- 4 SINGLE PHASE MACHINES HAVE WIRE #1 ON L3 OF REGULATING CONTACTOR 1 RATHER THAN L1 OF THE LIMITING CONTACTOR

AI2110

# 480V 3 PHASE

| ITEM | DESCRIPTION            | QUANTITY |        |
|------|------------------------|----------|--------|
|      |                        | 6 PAN    | 10 PAN |
| 1    | TERMINAL BLOCK         | 1        | 1      |
| 2    | LIMITING CONTACTOR     | 1        | 1      |
| 3    | REGULATING CONTACTOR   | 2        | 2      |
| 4    | GENERATOR HEATING ELE. | 2        | 3      |
| 5    | HEAT EXCHANGER ELE.    | 2        | 0      |
|      | HEAT EXCHANGER ELE.    | 0        | 2      |
| 6    | RELAY                  | 2        | 2      |
| 7    | GROUND LUG             | 1        | 1      |

TO FUSE  
BLOCK



DERIVED FROM:  
857316 - 2 REV C

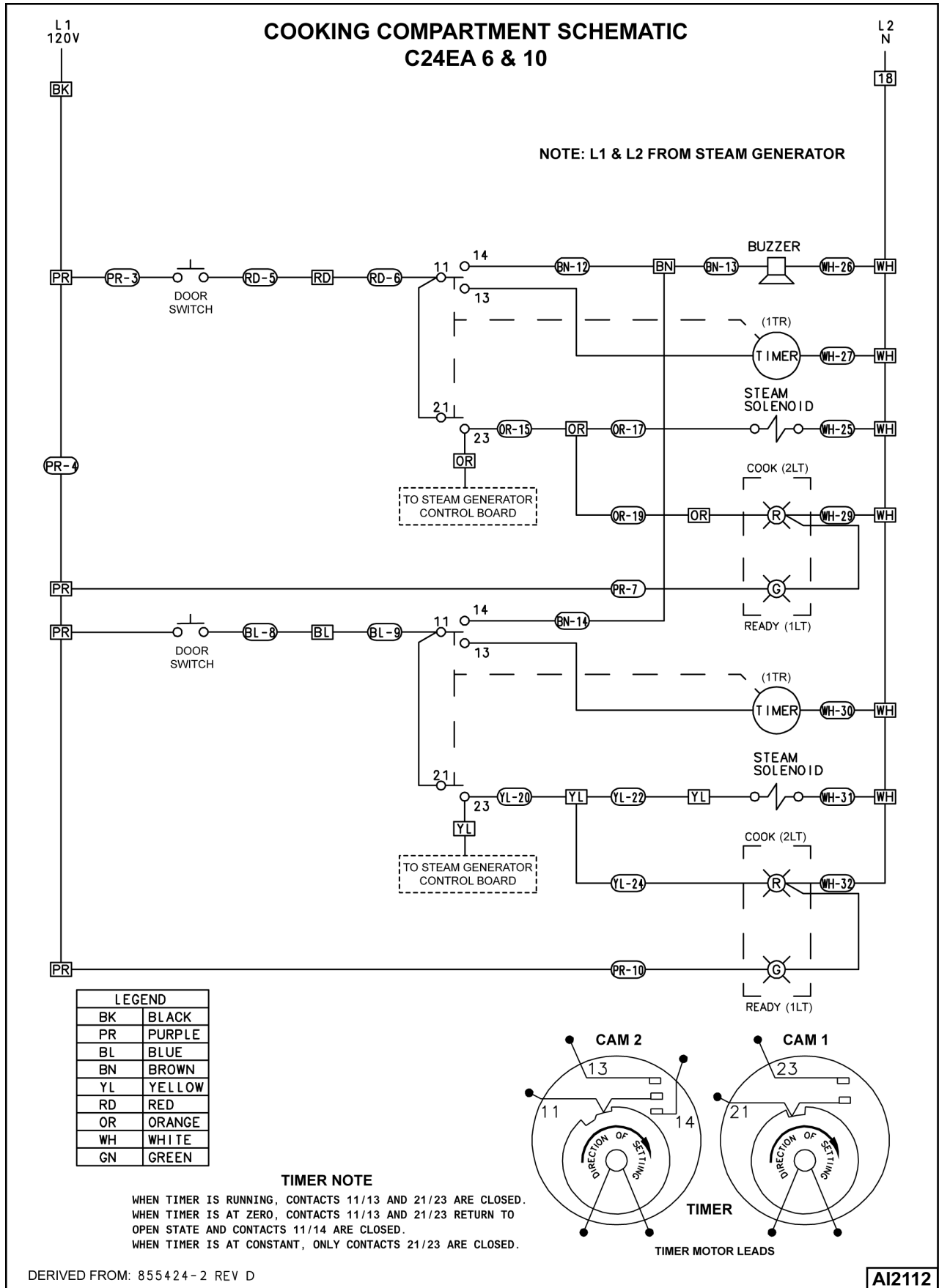
**FIELD CONVERSION NOTE**



6 PAN MACHINES USE TWO GENERATOR HEATING ELEMENTS. ONE ELEMENT BETWEEN THE LIMITING CONTACTOR AND REGULATING CONTACTOR 1, IS NOT PRESENT

**A12111**

Cooking Compartment



# TROUBLESHOOTING

Before performing any of the troubleshooting checks listed below, remove the front generator base panel and check the LED'S on the control board for the status of the condition or component in the operating sequence. By utilizing the troubleshooting LED'S, the Service Technician can easily determine if a component is functioning properly or in need of repair. Refer to CONTROL BOARD.

| SYMPTOM   | POSSIBLE CAUSES   |
|---|---|
| Drain water not being cooled properly.  | <ol style="list-style-type: none"> <li>1. Water supply off or supply pressure incorrect.</li> <li>2. Condensate thermostat (1TAS) malfunction.</li> <li>3. Drain cooling solenoid (1SOL) malfunction (clogged).</li> <li>4. Cavity condensate solenoid (2SOL) not receiving power.               <ol style="list-style-type: none"> <li>A. Timer malfunction (upper or lower compartment).</li> <li>B. Control board upper cavity relay (K8); or lower cavity relay (K9) malfunction.</li> </ol> </li> <li>5. Cavity condensate solenoid (2SOL) malfunction (clogged).</li> </ol> |
| Heat coming on without water in steam generator.                              | <ol style="list-style-type: none"> <li>1. Lime scale build-up on water level probes (shorted to ground).</li> <li>2. Contactor malfunction.</li> <li>3. WLC- LLCO contacts stuck closed. Water level control (WLC) malfunction.</li> </ol>  |
| Excessive time for steam generator to reach operating pressure (over 25 min). | <ol style="list-style-type: none"> <li>1. Supply voltage incorrect.</li> <li>2. Heating elements not wired correctly.</li> <li>3. Contactor(s) malfunction.</li> <li>4. Steam generator not filled. See Symptom - Steam generator not filling or is slow to fill.</li> <li>5. Pressure switch (2PAS) malfunction (not opening).</li> <li>6. Vacuum relief solenoid (5SOL) energized or stuck open (steam generator continues to vent and release pressure).</li> <li>7. Cooking compartment steam solenoid stuck open (steam inside compartment with timer off).</li> </ol>       |
| Steamer leaks water.  | <ol style="list-style-type: none"> <li>1. Loose connections in water, steam or drain lines.</li> </ol>  |
| Water running out of drain during fill.                                       | <ol style="list-style-type: none"> <li>1. Drain valve (motorized) stuck open.</li> <li>2. Control board malfunction (drain TDR).</li> <li>3. Condensate thermostat (1TAS) malfunction.</li> </ol>   |
| Steam generator water level too high.   | <ol style="list-style-type: none"> <li>1. Slow fill solenoid (4SOL) or fast fill/flush solenoid (3SOL) does not shut off.</li> <li>2. Lime scale build-up on high level probe (open circuit).</li> <li>3. Water level control malfunction.</li> </ol>   |

MODEL C24EA - TROUBLESHOOTING

| SYMPTOM   | POSSIBLE CAUSES   |
|---|---|
| Steamer will not heat.  | <ol style="list-style-type: none"> <li>1. Check incoming voltage.</li> <li>2. Steam generator not filled. See Symptom - Steam generator not filling or is slow to fill.</li> <li>3. Power switch (1S) malfunction.</li> <li>4. Steam generator high limit (2TAS) open.</li> <li>5. Heat exchanger high limit (3TAS) open.</li> <li>6. WLC-LLCO normally open contacts not closed. Water level control (WLC) malfunction.</li> <li>7. Control board drain relay (K3) malfunction.</li> <li>8. Limiting (1CON) contactor malfunction.</li> <li>9. Pressure switch (1PAS) not adjusted properly or malfunction.</li> <li>10. Regulating contactor 1 (2CON) malfunction.</li> <li>11. Relay (K1) malfunction.</li> <li>12. Regulating contactor 2 (3CON) malfunction.</li> <li>13. Heating element(s) inoperative.</li> <li>14. Water too pure for probes to properly conduct electricity.</li> </ol>   |
| Steam generator not filling or is slow to fill.               | <ol style="list-style-type: none"> <li>1. Water supply off, supply pressure incorrect or filtering system clogged.</li> <li>2. Water level control not receiving power. Control board drain relay (K3) malfunction.</li> <li>3. WLC-LLCO normally closed contacts are open (no power to fast fill/flush solenoid 3SOL). Water level control (WLC) malfunction.</li> <li>4. Fast fill/flush solenoid (3SOL) clogged or malfunction.</li> <li>5. WLC-HL normally open contacts are not closing (no power to slow fill solenoid 4SOL). Water level control (WLC) malfunction.</li> <li>6. Slow fill solenoid (4SOL) clogged or malfunction.</li> <li>7. Drain valve (motorized) stuck open.</li> <li>8. Pressure switch (2PAS) malfunction (not closed).</li> <li>9. Vacuum relief solenoid (5SOL) opening is clogged (not allowing steam generator to vent).</li> <li>10. Lime scale build-up on water level probes (shorted to ground).</li> <li>11. Water level control (WLC) malfunction.</li> </ol> |
| Steam leaks around door.                                      | <ol style="list-style-type: none"> <li>1. Worn or damaged door gasket.</li> <li>2. Drain line obstructed or not to an open gap drain.</li> </ol>  |
| Water leaks around door.                                      | <ol style="list-style-type: none"> <li>1. Steamer not level.</li> <li>2. Drain line obstructed or not to an open gap drain.</li> <li>3. Worn or gasket Door gasket damaged.</li> </ol>  |
| Steam generated inside cooking compartment when timer is off. | <ol style="list-style-type: none"> <li>1. Compartment steam solenoid stuck open.</li> <li>2. Timer malfunction.</li> </ol>  |
| Timer motor does not run                                      | <ol style="list-style-type: none"> <li>1. Door open or door switch malfunction.</li> <li>2. Timer malfunction.</li> </ol>   |
| Door not closing properly.                                    | <ol style="list-style-type: none"> <li>1. Door latch assembly.</li> <li>2. Striker adjustment.</li> </ol>   |
| Door won't open.  | <ol style="list-style-type: none"> <li>1. Latch won't release. See DOOR LATCH ADJUSTMENT.</li> </ol>  |
| Buzzer not operating.   | <ol style="list-style-type: none"> <li>1. Timer malfunction.</li> <li>2. Buzzer malfunction.</li> </ol>   |

**- NOTES -**