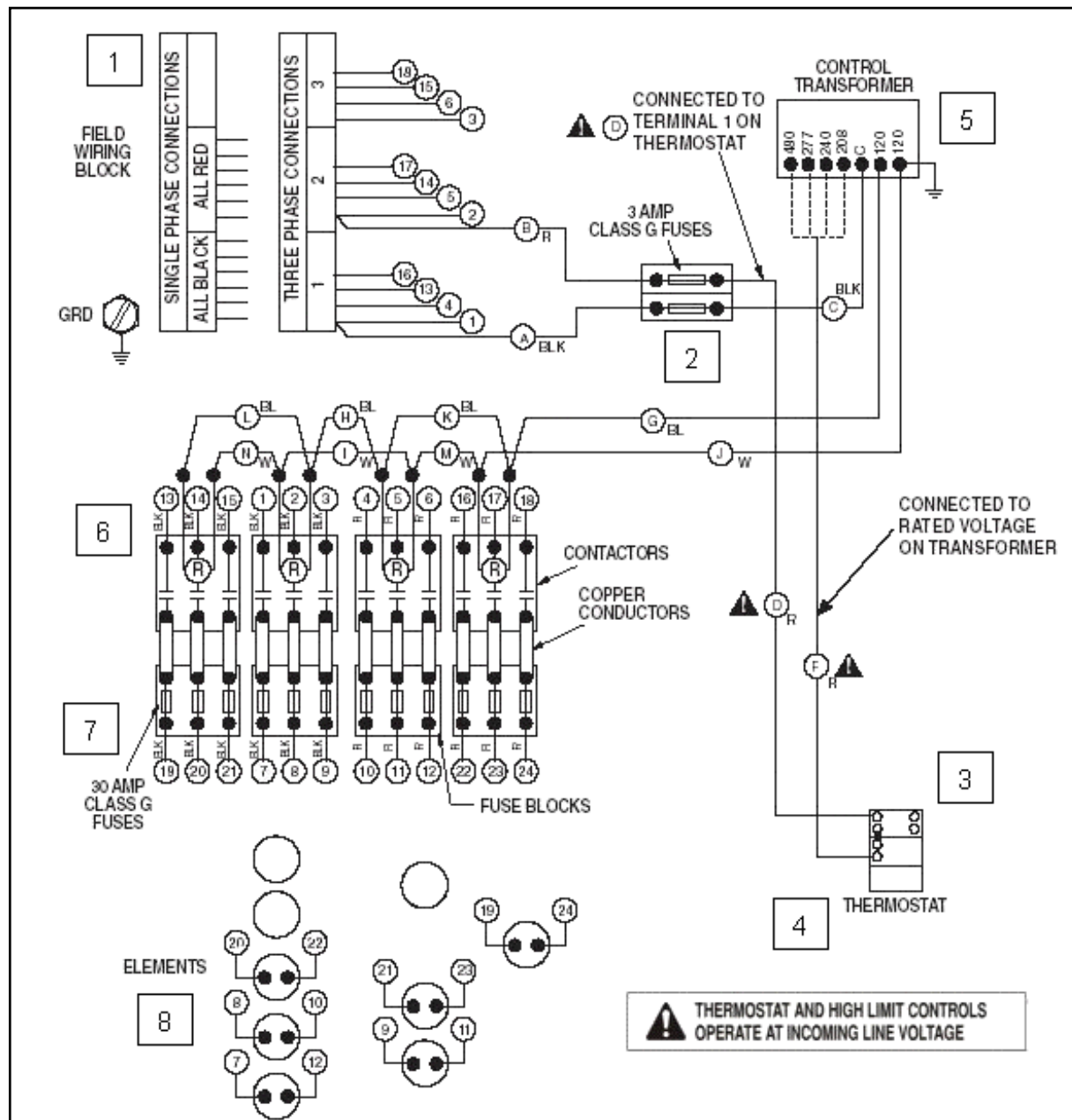




Commercial Electric Sequence of Operations
Oct 2002 to Present

The following pages reflect the Sequence of Operations for the heavy-duty commercial electric and the small volume ASME commercial electric water heaters manufactured after October 1, 2002. The change involves the routing of the wiring that produces control voltage.



Tank is cold and full of water. Line voltage is connected to the field wiring block.

NO

Fill tank to prevent dry firing of elements. Ensure line voltage connections are present.

YES

1 Line voltage is applied to the field wiring block.

NO

Check L1, L2 and L3 leg for line voltage at the field wiring block.
Replace fuse or reset breaker at service panel.

YES

2 Line voltage is routed through transformer fuse block to the thermostat.

NO

Check transformer fuse block for presence of 3 amp fuse. Replace fuse if damaged.

YES

3 Line voltage flows along the red wire from the transformer fuse to the Energy Cut Off (ECO) on the thermostat.

NO

Check red wire and black wire terminal screw location. Check blue wire and white wire location with wiring diagram.
Check transformer fuse.
Check transformer.
Rewire according to wiring diagram.
Replace fuse.
Replace transformer.

YES

ECO passes line voltage to the thermostat.

NO

Reset ECO by pushing the red reset button.
Replace thermostat.

YES

4 Thermostat demands heat . Thermostat closes and relays line voltage to the transformer tap that matches the line voltage.

NO

Check thermostat.
Replace ECO or surface mounted thermostat.

YES

On a demand for heat from the thermostat, line voltage flows to the transformer where it is converted to 120V control voltage.

NO

Note: The contactors and fuse blocks pass line voltage to the heating elements. Contactors are energized with 120V and controlled by the thermostat. Check for control voltage at the blue wire of the transformer.

YES

5 Transformer converts line voltage to 120V (also called control voltage) for use by the the contactors. Control voltage flows to contactors on blue wire.

NO

Check the position of the red wire on the transformer screw terminal pad. It should be connected to the same terminal as the line voltage. Black wire should be connected to the common (COM) terminal.

YES

6 Contactors receive 120V and actuate (close). (120 V power flow is complete at the contactor. This is the only need for control voltage.) Line voltage is relayed thru the contactors to the fuse blocks.

NO

Note: Contactors - when closed - relay line voltage through the contactor to the fuse blocks. Older model contactor has a square, black manual 'check' button. Check for line voltage at the bottom of the contactor.
Check, reset or replace contactors.

YES

7 Fuse blocks relay line voltage through a fuse and to the heating elements.	NO	Note: Each element requires two legs of the line voltage. The fuse block protects each leg to the element with its own fuse. Check and replace fuses.
YES		
8 Heating elements (all of them at the same time) receive line voltage and heat the water.	NO	Check LED panel for red lights. Note: Some models operate on a principle called staging. This involves multiple thermostats. See the section on staging. Check element if LED is not lit. If element is OK, check power to the element.
YES		
Water is heated to the thermostat setting. Call for heat ends.	NO	Thermostat is stuck closed. ECO will normally trip due to excessive heating of the water. Check and replace thermostat.
YES		
Thermostat suspends line voltage to the transformer. 120V Control voltage is suspended.	NO	Thermostat is stuck closed. ECO will normally trip due to excessive heating of the water. Check and replace thermostat.
YES		
Without 120V control voltage, contactors open and suspend line voltage to the fuse blocks and heating elements.	NO	Contactors may have 'fused' closed. If call for heat has ended, contactors should be open. No power at bottom of the contactor. Check and replace contactors
YES		
Heater is fully recovered. Water is hot. Line voltage is still present at the 'top' of the contactors.		

Table 3 - Sequence of Operations Flowchart

NOTES
