

SECTION 1

SEQUENCE OF OPERATION

I. GAS OVEN SEQUENCE OF OPERATION

A. Electrical Supply

Gas heated ovens operate on 208/240V, single phase. Standard incoming power configurations are:

1. 4-wire system (PS200 series, PS310/360 series, PS570, PS570S) - 2 single phase 208/240V supply (hot) lines, 1 neutral and 1 ground.
2. 3-wire system (PS360WB70, PS360EWB, PS555, PS570G, PS536) - 2 single phase 208/240V supply (hot) lines and 1 ground.

For all wiring configurations, the voltage when measured from either hot line to neutral should never exceed 130V.

B. Door Switch

Closing the control cabinet door (or machinery compartment door, as appropriate for the oven model) will close the door switch and allow the oven to operate.

Note that the electrical systems will still be “live” if the switch is open, although the oven cannot operate.

The door switch has a bypass position to enable service operation with the door opened. When the door is open, grasp the switch actuator and pull it out as far as possible. This will close the door switch and permit troubleshooting. Closing the control cabinet door will reset the switch.

1. Closing the door switch permits a circuit to go through a fuse (or circuit breaker, as appropriate for the oven model) to one side of the conveyor switch, blower motor switch, cooldown relay and heat switch.
2. Closing the door switch permits a circuit to go through the motor fuse (two 9A or 15A fuses per motor).

C. Conveyor Switch

Closing the conveyor switch permits a circuit to go to the Conveyor Speed Control Module, which:

1. Sends power to the gear motor (conveyor drive motor). The 120VAC signal to the Conveyor Speed Control Module is rectified to a 90VDC signal which is then sent to the gear motor.
2. Allows regulation of conveyor speed. Adjusting the thumbwheel (or digital pushbutton display unit, as appropriate) to the desired conveyor belt speed instructs the Conveyor Speed Control Module to regulate the output to the gear motor. This increases or decreases the conveyor speed as necessary to match the speed setting shown on the thumbwheel or display unit.

D. Blower Switch

Closing the blower switch energizes:

1. The cooling (axial) fan(s).
2. The blower motor contactor (s).

Closing this contactor starts the blower motor(s). When both blower motors are up to speed, centrifugal switches located inside the blower motors (or air switches detecting blower operation, as appropriate for the oven model) will close, setting up the heat circuit.

3. The Temperature Controller.

E. Heat Switch

Closing the heat switch completes a circuit:

1. Through the heat switch.
2. Through the blower motor centrifugal switches (or air switches, as appropriate for the oven model).
3. Through the high limit switch.
4. One circuit then goes to the:
 - a. Burner (L1).
 - b. Transformer (110V to 24V).
 - c. Motor relay coil. On a cold start the heater on this relay takes about 30 seconds to warm up before the relay will energize. This gives an additional prepurge. The relay is not used on ovens with 208/240V burner blower motors.
 - d. Burner blower motor. As the motor reaches full operating speed, the centrifugal switch (or air flow switch, as appropriate for the oven model) closes and applies voltage to the burner control. This energizes the ignitor control spark transformer and the pilot valve. The spark then lights the pilot. The flame sensor proves the presence of the pilot flame, and the ignitor control then shuts off the spark. At the same time, the main burner valve is opened. The main burner is then ignited.

If the pilot does not light within approximately 90 seconds, the oven will shut down.

The pilot and main gas valve will stay on (open) as long as the heat switch is ON and the flame is proven. If the flame goes out for any reason, the pilot will try to light for 90 seconds, and then go into automatic lockout. To relight the pilot after it has gone into automatic lockout, the burner must be turned OFF for 5 minutes and then turned ON again.

- e. For ovens with an On-Off gas regulation system (with solenoid valve): Temperature Controller terminals 4 & 5 (power for the primary relay contacts for the high flame solenoid valve).

For PS360EWB ovens with a modulating gas system and Temperature Controller P/N 32571: Temperature Controller terminals 4 & 5 (input signal to amplifier board).

For all other ovens with a modulating gas system: Temperature Controller terminals 15 & 16 (input signal to amplifier board).

In all ovens, the temperature-sensing thermocouple(s) send a millivolt signal to the temperature controller. As long as the temperature inside the oven is below the set point of the Temperature Controller, the Controller will do the following:

1. For ovens with an On-Off gas regulation system: If the temperature sensed by the thermocouple(s) is below the set point on the Temperature Controller, the Controller energizes the high flame solenoid. When the solenoid is energized, the solenoid valve permits 100% gas flow. Power to the solenoid is cut when the temperature reaches the set point, which closes the valve. This permits on-off gas flow to the burner.

When power is cut to the high flame solenoid, the burner will remain ON in the low flame mode. When the temperature drops a few degrees, the Temperature Controller will again energize the high flame solenoid, which opens the valve and restores gas flow to 100%.

An indicator on the Temperature Controller will show whether the high flame solenoid is energized (or whether the burner is activated, which is effectively the same). This indicator varies by Temperature Controller model. Refer to the instructions for the appropriate Temperature Controller for an illustration and description of this indicator.

2. For ovens with a modulating gas system: In response to the signal from the thermocouple(s), the Temperature Controller sends a 4-20mA signal to the amplifier board. The amplifier board converts this to a 0-20VDC signal which is sent to the modulating gas valve. The valve opens or closes in proportion to the signal from the amplifier board, allowing the gas flow to be regulated as required from 0-100%.

An indicator on the Temperature Controller will show whether the burner is activated. This indicator varies by Temperature Controller model. Refer to the instructions for the appropriate Temperature Controller for an illustration and description of this indicator.

F. High Limit

NOTE: Most PS200-Series and PS360-series gas ovens use the high limit feature of the Temperature Controller. All other oven models use a separate High Limit Control Module. Refer to the wiring diagram for the appropriate oven model to check whether a separate High Limit Control Module is used.

The high limit relay will shut the oven burner OFF:

1. If the high limit thermocouple senses an oven temperature above 650°F.
2. If the signal from the high limit thermocouple is lost.

An indicator on the Temperature Controller will show a high limit condition. This indicator varies by Temperature Controller model. Refer to the instructions for the appropriate Temperature Controller for an illustration and description of this indicator.

G. Cooldown

NOTE: PS200VL-series ovens do not include a cooldown feature.

When the heat and blower Switches are turned OFF the cooldown relay will allow the blowers to remain ON until the oven temperature falls to 200°F (93°C).

During cooldown, the Temperature Controller will continue to show the oven temperature.

SECTION 1 - SEQUENCE OF OPERATION

II. ELECTRIC OVEN SEQUENCE OF OPERATION

A. Electrical Supply

Most electrically heated ovens operate on a 208/230/380/440V, 3 phase, 4 wire system. The fourth wire is for a 120 V neutral ground. This 120 V neutral ground eliminates the need for a control transformer. Where a neutral is not available, a 240/110V transformer is supplied.

B. Door Switch

Closing the control cabinet door (or machinery compartment door, as appropriate for the oven model) will close the door switch and allow the oven to operate.

Note that the electrical systems will still be “live” if the switch is open, although the oven cannot operate.

The door switch has a bypass position to enable service operation with the door opened. When the door is open, grasp the switch actuator and pull it out as far as possible. This will close the door switch and permit troubleshooting. Closing the control cabinet door will reset the switch.

Closing the door switch permits a circuit to go through a fuse (or circuit breaker, as appropriate for the oven model) to one side of the conveyor switch, blower motor switch and to the heat switch.

C. Conveyor Switch

Closing the conveyor switch permits a circuit to go to the Conveyor Speed Control Module, which:

1. Sends power to the gear motor (conveyor drive motor). The 120VAC signal to the Conveyor Speed Control Module is rectified to a 90VDC signal which is then sent to the gear motor.
2. Allows regulation of conveyor speed. Adjusting the thumbwheel (or digital pushbutton display unit, as appropriate) to the desired conveyor belt speed instructs the Conveyor Speed Control Module to regulate the output to the gear motor. This increases or decreases the conveyor speed as necessary to match the speed setting shown on the thumbwheel or display unit.

D. Blower Switch

Closing the blower switch energizes:

1. The cooling (axial) fan(s).
2. The blower motor contactor (s).

Closing this contactor starts the blower motor(s). When both blower motors are up to speed, centrifugal switch(es) located inside the rear end of the motor(s) (or air flow switch[es], as appropriate for the oven model) will close, setting up the heat circuit.

3. The Temperature Controller.

E. Heat Switch

Closing the heat switch completes a circuit:

1. Through the heat switch.
2. Through the blower motor centrifugal switch.
3. Through the high limit switch.
4. For ovens with on On-Off heater activation mode: To the primary relay contacts of the Temperature Controller (terminals 4 and 5 for digital controllers, terminals 5 and 6 for analog controllers).

When the temperature-sensing thermocouple(s) indicate that the oven temperature is below the set point on the Temperature Controller, the Temperature Controller will energize the contactor(s) which in turn energize the heaters.

When the oven temperature reaches the set point of the Temperature Controller, the Temperature Controller will cut power to the heaters. When the temperature drops a few degrees, the Temperature Controller will again energize the heaters.

An indicator on the Temperature Controller will show whether the Controller is calling for heat. This indicator varies by Temperature Controller model. Refer to the instructions for the appropriate Temperature Controller for an illustration and description of this indicator.

5. For ovens with a Variable Pulse heater activation system: To terminals 15 and 16 on the temperature controller. In response to the signal from the thermocouple(s), Terminals 15 and 16 send a 4-20mA signal to a controller module that contains an amplifier board and two solid state relays. The relays activate the heating elements at 100% power on a fixed cycle time, for a length of time proportional to the signal from the temperature controller.

A “HEAT ON” indicator on the Temperature Controller will light to show whether the Controller is calling for heat.

F. High Limit

NOTE: *Electric oven models use a separate High Limit Control Module.*

The High Limit relay will shut the oven burner OFF:

1. If the high limit thermocouple senses an oven temperature above 650°F.
2. If the signal from the high limit thermocouple is lost.

An indicator on the Temperature Controller will show a high limit condition. This indicator varies by Temperature Controller model. Refer to the instructions for the appropriate Temperature Controller for an illustration and description of this indicator.

G. Cooldown

When the heat and blower switches are turned OFF the cooldown relay will allow the blowers to remain ON until the oven temperature falls to 200°F (93°C).

During cooldown, the Temperature Controller will continue to show the oven temperature.