



**Guardian PowerVent Sequence of Operations**

**SEQUENCE OF OPERATIONS**

All voltage inputs are 120V. Neither a surge protector nor GFI circuit is recommended or required. All electrical connectors are Molex and fit one way. The word ‘control’ in this sequence will normally refer to the electronic control module on the gas valve. The control constantly monitors the water temperature via the thermistor so that the water temperature is within the user-selected temperature range. Control monitors the inputs for any fault conditions and presence of flammable vapors. If “Call for Heat” has not initiated for more than 6 hours, the control will automatically decrease the differential by 5°F. If the temperature is still not less than the set temperature minus differential, the control continues in Stand-by mode.

Tank is cold and full of water.  
 Gas supply is connected.  
 Gas valve is set to ON position.  
 Unit is plugged into a 3-prong plug. Unit is polarity sensitive.

Fill tank.  
 Connect gas.  
 Turn valve ON.  
 Must be plugged into a 3-prong wall socket. Socket must be wired polarity correct. Black wire to brass screw; white wire to silver screw.



Turn temperature dial down to LOWEST position.  
 Turn rocker switch to ON position.



Rocker switch controls all power inputs to blower motor, gas valve, and control module in gas valve. You will always have 120V at the red #3 wire.



At power ON and a demand for heat, the control performs a self-test diagnostic routine. If the self-check fails, the control locks out with a solid ON LED light.



### Guardian PowerVent Sequence of Operations

Turn temperature dial to temperature selection.

Initiates a “call for heat”.

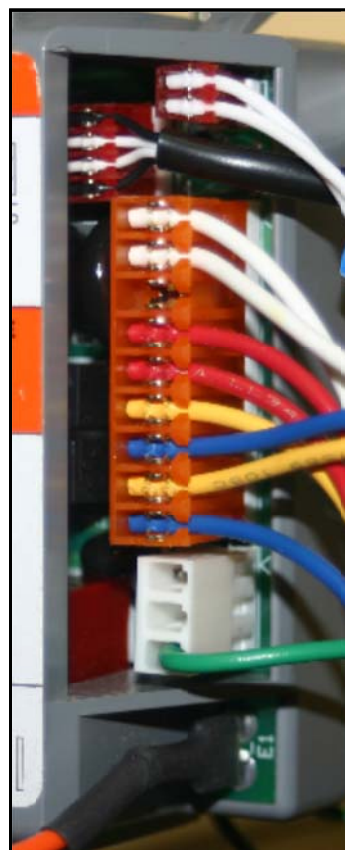


120V power is passed from the red #3 wire – thru the control – to the yellow #5 wire and to the blower motor. This is the only source of AC power for the blower motor.

The white triangle next to WARM is the 120-degree setting.

Temperature is sensed electronically by the **Thermistor** in the sensing bulb. It is the two white wires at the RED Molex connector.

(See Fig 3 on page 10.)



**(1st Safety)**

Control checks for OPEN vacuum switch.

You will have 120V at the blue #8-vacuum switch wire.

Note: The over-temp switch in the blower is wired in series. If the vent temp exceeds 180°F, then the over-temp switch will activate. LED will flash 3/3.

In normal operation, the switch is OPEN at beginning of call for heat. If no blower motor, then check:

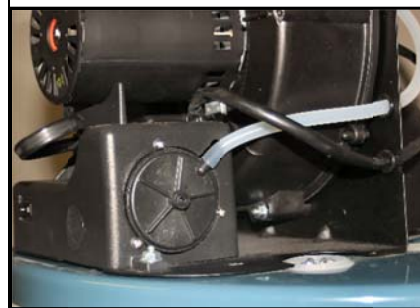
120V power at the #5 yellow wire

Vacuum switch tubing

Vacuum switch

Vent over-temperature switch is not activated

If vacuum switch has failed in the closed position, the control attempts to open the switch by cycling (turning off blower, then on) the blower motor. After 5 cycles (attempts), the control will lockout. LED code is 3/1.





### Guardian PowerVent Sequence of Operations

#### *(2nd Safety)*

Control turns on blower motor. This creates enough venting to close the vacuum safety switch.

Blower is in pre-purge stage for about 15 seconds.

You will have 120V at the yellow (#5-blower motor) wire. If you hear spark, then there is 120V power at the yellow #5 location.

In normal operation, the control checks for a closed vacuum switch within 12 seconds before starting the pre-purge time. The vacuum switch measures the vacuum created by the blower and verifies the blower is operating at speed. The control attempts to close the switch by cycling (turning off blower, then on) the blower motor. After 5 cycles (attempts), the control will lockout. LED flashed 3/3.



#### Ignition attempt

Spark ignitor begins to spark. (Orange wire)

120V voltage opens pilot vein of gas valve.

You will have 120V at the yellow #7 pilot valve wire.

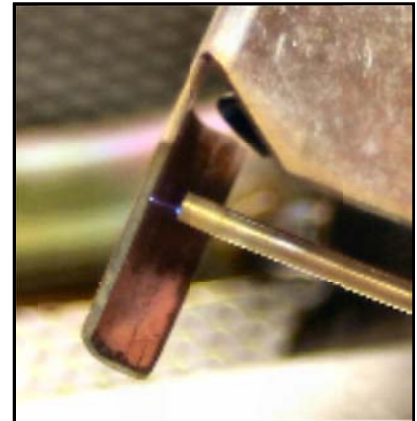


Listen for spark ignitor. Visually verify spark at the pilot electrode.

Check to make sure the valve is turned ON.

Check for voltage to the pilot valve yellow #7 wire connection.

Visually verify pilot flame is present.





### Guardian PowerVent Sequence of Operations

**(3rd Safety)**

Flame is rectified.

Pilot lights.

After pilot flame has been recognized (rectified), the spark will stop

Main valve is energized.

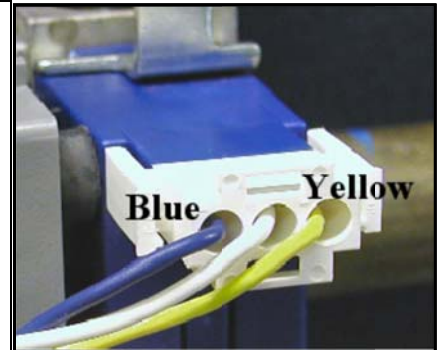
Note: There is always a flame rectification circuit check while the main burner is operating. When the main burner fails, the unit will recycle and attempt ignition.



Main valve on gas valve opens.

You will have 120V at the blue #6 main valve wire.

The “trial for ignition” will last for 75 seconds. If the control is not able to establish a pilot flame, it will initiate the inter-purge. This is a 30 second purge without spark or gas to clear the combustion chamber. Then the unit will retry for ignition. The unit will try 3 times total for ignition. If ignition fails, it will initiate a post-purge (30 seconds) to clear the combustion chamber; then go into lockout. LED flashes 1/1.





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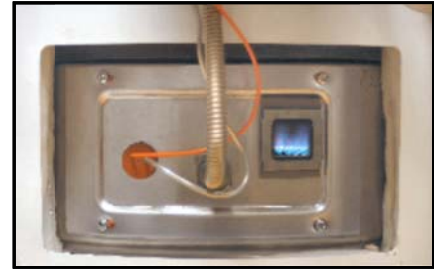
#### Main burner ignition.

The flame rectification circuit is constantly “ON” during pilot and main burner. If the control module thinks flame is suppose to be present, then the circuit constantly ‘looks’ for the presence of flame.

Check for 120V power to the main valve (blue wire) side of the gas valve.

If the unit rectifies flame for at least 10 seconds, the internal counter resets to zero.

If the flame is established and then lost, the control will turn off the main and pilot valve, execute an inter-purge (30 seconds) and then start a new trial for ignition sequence.



Water heats to thermostat setting.

#### *(4th Safety)*

Blower motor thermal safety switch is monitoring venting temperatures.

Flammable Vapor (FV) sensor is monitoring.

ECO is monitoring water temperature.

Blower motor thermal safety switch set to 180°F with automatic reset.

FV Sensor is monitoring local environment for presence of flammable vapors







**Guardian PowerVent Sequence of Operations**

Water is heated. Thermostat and control module shuts off all power to the unit. Unit is in stand-by mode.

(The electronic control checks to see if the water temp is close to the set point. If so, it will attempt to turn the main burner on. For instance, if the set point is 120<sup>o</sup>, then after 6 hours, the control module will adjust the set point back to 115<sup>o</sup> to see if it can fire off the main burner.)

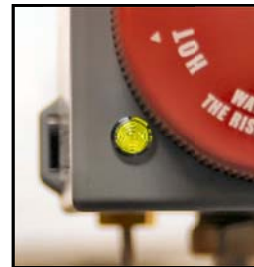
In stand-by mode, the control module constantly monitors the water temperature via the thermistor to ensure the water inside the tank is within the user-selected range.

In addition, the control will monitor the inputs to look for any other fault conditions such as a control health, false flame or faulty switches.



Unit is in Stand-by mode

Unit monitors control health and the local environment for flammable vapors as long as there is 120 VAC to the water heater.



False sensing

The blower will turn on immediately if flame is sensed when no flame should be present.

***Flame with gas valve off -***  
 If there is proof of flame for 10 seconds with the gas valve off, the control will go into lockout. The blower motor will run during lockout if there is proof of flame. If there is proof of flame for less than 10 seconds, the unit will post-purge. LED flashes 4/3.





### Guardian PowerVent Sequence of Operations

**ECO High Limit:( $>200^{\circ}F$ )**



The high limit switch opens after flame is established. That means the water in the tank got over  $200^{\circ}F$ .

The pilot valve, main valve, and spark ignition are turned off, but the blower will remain on. LED flashes 4/2.

The ECO has a one-time use.



### DIAGNOSTIC FLASH CODES

When a fault occurs within the water heater, the control will output a code using an LED. The LED will have a variety of status conditions:

- ON is defined as constantly on with no blinking patterns.
- Slow Blink is defined as a one blink per second.
- Fast blink is defined as five blinks per second.
- There will be a 1 second period between primary and secondary pattern when LED will be off. (blink-one second-blink)
- After the secondary pattern completes, there will be a 3 second period when LED will be off before patterns repeat. (blink-one second-blink - - three seconds - - blink-one second-blink)

<i>System condition</i>	<i>Primary pattern</i>	<i>Secondary pattern</i>
Stand-by mode	Slow blink	None
Call for heat present	Fast blink	None
Internal control failure/ miswiring	ON Solid	None
Ignition failure	1 blink	1 blink
Flammable vapors present	2 blinks	1 blink
Flammable Vapor Detector failure/ miswiring	2 blinks	3 blinks
Vacuum switch fails to open	3 blinks	1 blink
Vacuum switch fails to close	3 blinks	3 blinks
Line/ neutral polarity failure	4 blinks	1 blinks
ECO failure	4 blinks	2 blink
False flame	4 blinks	3 blinks
Vacation mode active	5 blinks	None