TECHNICAL SERVICE DEPARTMENT
Technical Service Bulletin
1-800-432-8373

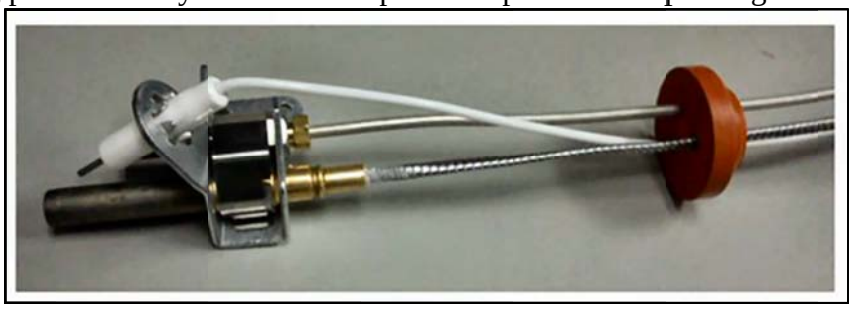
Vesta Water Heater Control System
Applies to standard atmospheric and Ultra Low NOx products

The Vesta Water Heater Control System is a low-power device designed to operate using the **millivolt output of a thermopile** placed in the pilot flame of the water heater. During operation the control measures the temperature of a dual thermistor temperature sensor mounted in an immersion well on the side of the water tank, and operates the main valve accordingly.

Users control water temperature by adjusting a set point knob on the face of the control. Fail-safe software and hardware improve safety and performance. The control also implements the water temperature high limit (ECO) function.

The Vesta Water Heater Control System consists of the following main elements:

1. Dual-servo (pilot valve and main valve) gas valve assembly with electronic control module and integrated thermistor water temperature sensor.
2. Standing pilot assembly with a thermopile and spark rod for piezo ignition lighting.



3. The Control Module is powered from the millivolt output of a thermopile placed in the pilot flame of the water heater. This voltage is converted up to DC voltage level needed to power the microcontroller.
4. The Control Module is field replaceable without draining the tank.
5. Thermopile voltage (Vtp) must be 265 mV ± 30 mV to energize the Pilot Valve solenoid which allows the by-pass button to be released
6. Main valve operation is inhibited until Thermopile voltage reaches 300 mV ± 40 mV and sufficient power has been stored to energize the Main Valve solenoid. Normal operating range is between 350 – 850 mV
7. The accuracy of temperature measurement is +/- 4°F

Mode	Description	Main Valve
Off	When the set point is in Off position, the device shuts down all outputs, closes both valves and waits for power down. LED is driven ON continuously in this mode	OFF
Pilot	Knob turned to pilot position. User pushes knob in and holds to maintain pilot gas flow. User lights pilot gas by depressing	OFF

	Piezo Igniter button to generate a spark until pilot gas lights and continues to hold in knob (to maintain pilot flame) until LED flashes (one short flash every three seconds). Control picks pilot and user may release knob. Control maintains the pilot in open position but will not open main valve with knob in Pilot position. If the knob is turned to Pilot position while the device is in Shutdown mode, the device is not allowed to restart until thermopile voltage decays below 150 mV and LED turns off.	
Normal (Operational)	Knob turned into normal set point range (VAC to VERY HOT range). Main valve opens (Run Mode) or closes (Idle Mode) in response to control algorithm that maintains water temperature at desired level. LED flashes one short flash every three seconds in Idle mode and in Run Mode.	ON or OFF depending on call for heat
Error Lockout	The main valve is turned off. The LED flashes the appropriate error code (one short flash every second, three second pause between error codes). Fatal Faults will also shut down the Pilot valve resulting in loss of power and need for manual intervention for re-lighting the pilot flame.	OFF

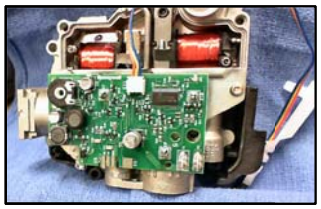
Fault Codes

VESTA LED ERROR CODE STATUS (Flashes are displayed 1 second apart and the pattern is repeated after 3 seconds)

Fault Code	Status	Problem	Solution
0	Control Off / Pilot Out	None	Light Pilot
1	Normal operation	None	None
2	Thermopile Voltage Low	Low gas supply or pilot flame Thermopile weak Thermopile not in pilot flame	Verify supply and pressure Replace thermopile assy Adjust position of thermopile
3 not used	-	-	-
4	Temperature Cut-Out Limit Exceeded (190^0F)	Water too hot. If water temperature is sensed in excess of Temperature Cut-Out temperature (TCO Temperature), the control will turn off all outputs and shut down within 10 seconds.	Check water temperature. Reset control and relight heater.
5	Water Temperature Sensor Fault (open $<32^0$F or short $>212^0$F)	(1). If either of the two NTC thermistor sensors inside the water temperature sensor is disconnected (open circuit) or shorted, the control shall turn off the main valve	Replace entire gas control.

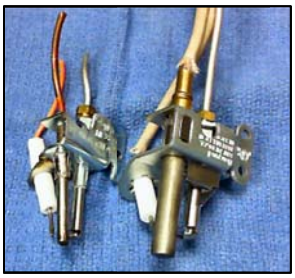
		and flash Water Temperature Sensor Fault error code. (2). If the readings from the two NTC thermistor sensors inside the water temperature sensor are not the same within typically 5°F while the water temperature is changing less than 2°F/minute, the control shall turn off main valve and flash Water Temperature Sensor Fault error code.	
6 Only used with Accessory Module	-	-	-
7	Hardware Failure	If the main valve solenoid driver circuit fails, this is detected by looking at voltage across the main valve coil. This hardware failure generates a hardware failure error code and shuts down the pilot and main valves as soon as the fault matures. *Main valve fails open *Main valve fails closed *Pilot valve fails open *Pilot valve fails closed Electronics malfunction	Replace entire gas control.
8	Flame Sense Failure		

Inside the control:



There are two solenoid valves (pilot and main valve) controlled by a computer board. The thermopile energy (~600 millivolts) is all the electricity the valve needs to operate.

Thermocouple vs Thermopile:



Notice the difference between the thermocouple on the left and the thermopile on the right. The thermopile is able to deliver more electrical energy.

Replacing the thermopile uses the same procedure as our thermocouple. Don't forget to replace the gaskets that come with the repair kits.

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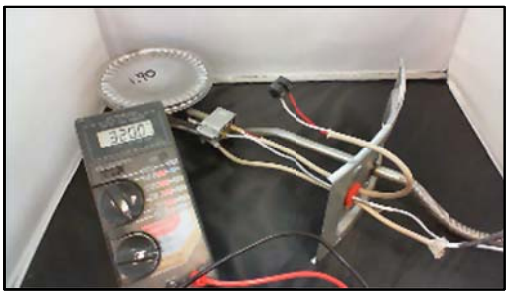
Resetting the Control:

In the case of Fault Code 4 Temperature Cut-Out Limit Exceeded (190^0F), the control may be reset using the following procedure:

Power up in PILOT per normal operating instructions
Wait for LED to flash the fault code
Turn temperature adjustment knob to VERY HOT; leave there for 10 seconds
Turn temperature adjustment knob to HOT; leave there for 10 seconds
Turn temperature adjustment knob to PILOT; leave there for 10 seconds
LED fault code will clear; control is reset.
Adjust temperature knob to not exceed 120^0F.

To check if the thermopile is shorted:



1. Remove the burner assembly from the water heater
2. Set a digital multimeter to measure continuity. (The models with a confirmation tone are best to use.)

3. Place the red probe on the red wire of the thermopile harness. The black probe on the metal body of the thermopile itself. You should receive an OPEN circuit. IF you show any continuity, then the thermopile is damaged. Replace thermopile.
4. Perform the same steps for the white wire.
5. Replace thermopile as needed. Put burner assembly back into water heater.
6. Verify pilot flame and main burner.

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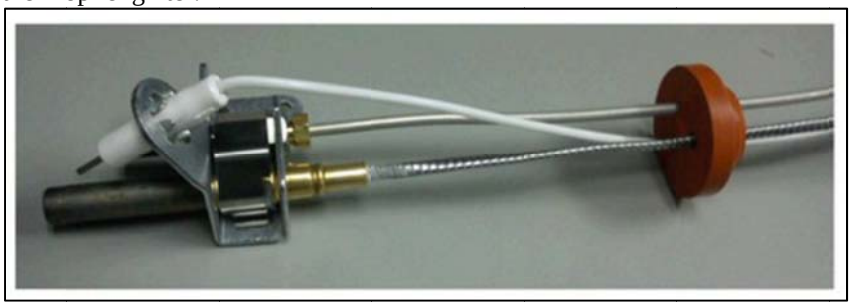
Instruction for field solution trial to ULN Vesta Valve delayed ignition noise issue

These instructions are for a field trial program to resolve noise complaint issues with the Ultra Low NOx water heaters with the VESTA gas control valve. Do not make any other adjustments to the machine (gas pressure, bending main burner supply tubes, etc.) when performing this solution. We want to make sure that only one solution step is taken so we can rate the merits of the solution. This instruction explains how to reposition the thermopile igniter.

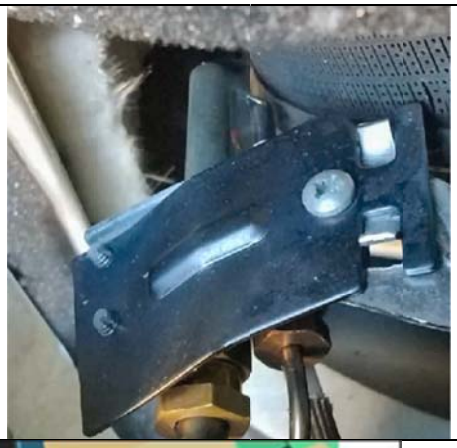
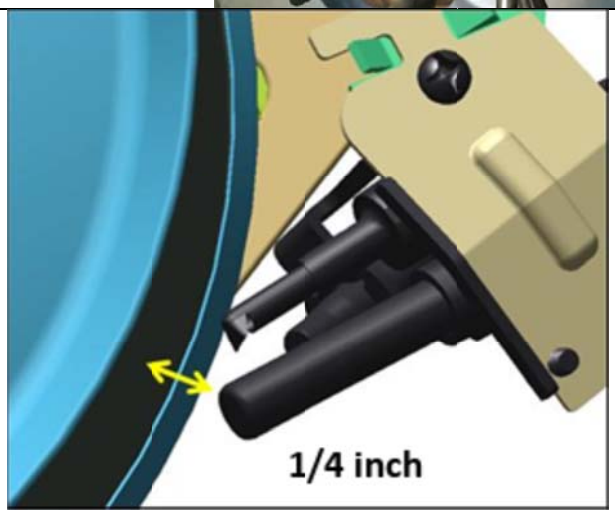


Whenever removing the burner assembly or components, always replace old gaskets with new ones. The gasket maintenance kit is SP20136 for the 40 gallon models; and SP20137 for the 50 gallon models.

If ignition pops (delayed ignition) follow these instructions…….

1. Verify this is the gas control you are working on. 2. Remove outer door.	
3. Disconnect gas valve, remove inner door, remove lower air box	
4. Remove inner door and burner assembly from the combustion chamber carefully	

Instruction for field solution trial to ULN Vesta Valve delayed ignition noise issue

5. Confirm to see if the pilot bracket is firmly attached to the burner body The single visible Phillips screw should be tight; and the small butterfly wings on the mounting bracket should be positioned as shown in this photo.	
6. Ensure that the gap between thermopile edge and burner wall surface is between 3/16 to 5/16 inch. Gap is measured from the perforated burner wall to the inside edge of the thermopile. The actual allowance is from .189 (3/16 inch) to .354 (@23/64 inch). The approximate middle of this allowance is ¼ inch. Use a ¼ inch drill bit for spacing.	
7. Next, position the top edge of the thermopile ¾ inch from the bottom of the burner lip.