

Gas Furnace Ignition Control Operation | HVAC Heating

Gas Furnace Ignition Control Operation | HVAC Heating. This furnace control board controls much of the functions of this gas furnace with few exceptions. The main control comes from the thermostat and once the thermostat tells the gas furnace control board it is time for the heat to come on the gas furnace control board takes over from there except when the thermostat is satisfied the system shuts down.

On a call for heat from the thermostat the gas furnace control board starts its sequence of operation. This article relates to the sequence of operation for electronic ignition gas furnaces. Some furnaces will vary in their sequence of operation from what is written here. However, most electronic ignition gas furnaces use this sequence of operation.

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There are gas furnaces that use various types of controls for ignition. Part of every ignition operation will include a safety check built into the logic of the board or module. The safety check is basically a series circuit that runs through several switches. Some switches are always closed. If they are open then there is a problem. An example of this is a limit switch. If a limit switch is open it open because of a high temperature or it malfunctioned. There are automatic reset switches and there are manual reset switches.

Switches that are in the safety circuit can include:

- Roll-out switches. These switches detect high heat in the burner compartment. Roll-out is when flames come out into the burner compartment. It happens when the flue is blocked in some way and there is no draft up the flue vent. Some roll-out switches are manual reset. However, you are advised not to reset a roll-out switch as roll-out means you have a serious problem. It needs the attention of a professional.
- Other limit switches include the high limit usually inside or near the heat exchanger. A limit switch on or near the blower. Additionally, it is possible to have limit switches installed in other places on or near your furnace or boiler. If you have an atmospheric natural draft boiler or furnace you could also have a limit switch on the hood where secondary air drafts into the flue. This will likely be a manual reset switch. Again, if this switch tripped you are advised to shut the system off and call a professional furnace technician.

- If your system is equipped with an [automatic vent damper](#) the vent damper has an end switch. This end switch proves that the damper is open and ready to vent the combustion gas from the furnace or boiler.
- The pressure switch for the induced draft or forced draft systems. The pressure switch proves the draft motor is on and it is working. It uses a different pressure diaphragm to detect if the fan is running and working properly, or not. All these switches are in the safety circuit of a typical electronic ignition gas furnace or boiler. It is necessary for all these switches to be closed for the control board/module to go to the next level and go for ignition. If you have a problem with any of these you will likely have a [flash code on the furnace control board](#).

Gas Furnace Ignition Control Operation | HVAC Heating - Methods and Types

There are two separate types or ways of igniting the main burner. These two methods are:

1. Direct Fire
2. Indirect Fire

This is simple. Direct fire is where the ignitor lights the main burners directly. Indirect fire involves a pilot light. The ignition control lights the pilot proves the pilot flame, and then the pilot lights the main burners. All this happens in a specific sequence. Direct fire systems include:

- [Hot Surface Ignition](#)
 - Direct spark ignition
- Indirect systems include:
- Intermittent pilot with spark ignition
 - Hot surface ignition lighting the pilot. Example.....the [Honeywell Smart Valve](#).

Gas Furnace Ignition Control Operation | HVAC Heating - Flame Sensing and Safety

Anyone of those [types of ignition electronic systems](#) controls various gas furnaces. Each one has its own method of proving the flame. This is another safety consideration done for heating safety for gas appliances. Proving the flame is very important. If this did not exist and there was no flame present the furnace would spew out raw unignited gas. This would eventually build up and a dangerous condition would exist.

This is done internally on the control board separate from the safety circuit mentioned above. All these systems are equipped with a flame sensor. If no flame is detected, the system will retry for ignition after a small span of time. After doing this 3 to 4 times (depending on the controls) the system will lockout for a longer amount of time. This prevents the dangerous buildup of combustible gas.

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- The gas furnace control board enables the **induced draft motor** and then waits for
- The pressure switch to signal that it has closed
- This completes all the safety circuits as long as no limit switches are open
- Once the control board has verified that all safety switches are closed it energizes the hot surface igniter or the intermittent pilot igniter
- If the system is equipped with hot surface ignition a small amount of delay time is experienced while the hot surface igniter heats up and then the gas valve opens and feeds gas to the main burners. If the system is equipped with the intermittent pilot the intermittent pilot valve opens on the gas valve at the same time the spark ignition begins sparking.
- The gas furnace control board verifies a flame whether the system is hot surface ignition or intermittent pilot. The gas furnace control board uses flame rectification to verify the flame is lit. With an intermittent pilot system once the flame has been verified the gas furnace control board signals the main gas valve to open to feed gas to the main burners.
- The main burner's fire for 30 seconds to 1 minute and the gas furnace control board turns the main blower on to blow air throughout the ductwork.
- After the thermostat is satisfied and the space has reached the desired temperature the gas furnace control board shuts down all gas to main burners and cycles the system down. The main blower fan continues to run for a few minutes to dissipate excess heat from the heat exchanger.
- Some gas furnace control boards even have diagnostic abilities to help an HVAC technician troubleshoot the gas furnace.