SERVICE AND APPLICATION NOTES

August 27, 2014
H-14-06

Flame Rectification In All Gas Furnaces

Flame rectification is used to prove flame. The property of a gas flame permits it to act as a current path when a voltage potential and a ground potential are enveloped by the same flame. When an alternating current AC voltage potential is applied to one of two objects enveloped in a gas flame, the flame acts as an electrical conductor between the flame sensor to a grounded surface, or in this case a gas burner (figure 1).

The underlying principle of flame rectification is basic electricity and the flow of electrons. In alternating current (AC) applications, the electrons normally flow back and forth, alternating sixty times per second. An AC potential is supplied to the flame sensor. When gas is ignited the electrons flow from the flame sensor and attach to carbon particles and other electrons in the flame, flowing to the gas burner and ultimately to ground.

When the AC potential is supplied to the flame sense circuit by the integrated control, the flame sensor, burner ground, and flame work together to form a rectifier. Because there is a large difference in the size of the flame sensor area compared to the size of the grounding area (the burners) more of the AC current passes through the flame in one direction (flame rod to burner) than it does in the other direction (ground back to the flame rod). This results in a partial rectification of the AC current changing it to DC current.

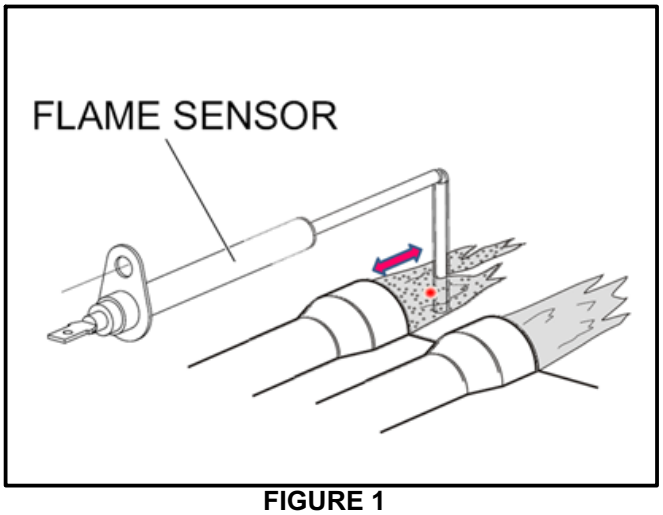

FIGURE 1

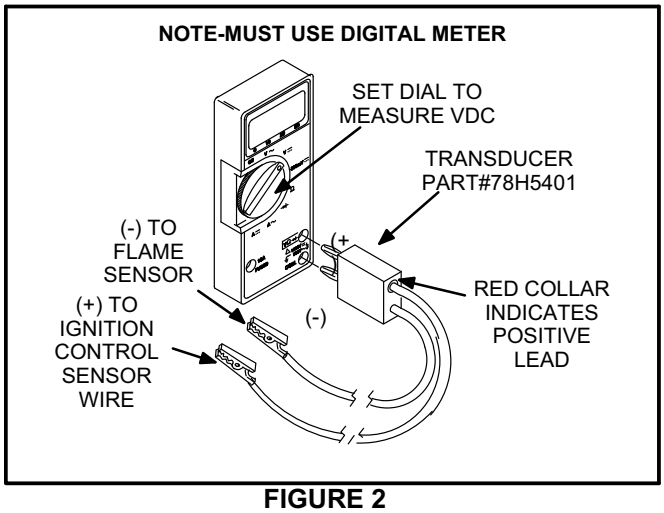

FIGURE 2

The end result is DC current flowing through the flame in one direction to ground. The load created passing through the flame to ground is so small, it is measured in microamperes, which is one millionth of an ampere. This DC current is the only type of signal that the integrated control will accept as proof of flame, as such, it is inherently a fail safe system.

To check the microamp signal:

1- Lennox integrated controls with the **seven segment display:** enter “Field Test Mode” - “Flame Sense” for the microamp signal. **Do not attempt to read the microamp signal using a meter. Control Failure could occur.**

2- All other integrated controls: Measure the flame signal with a microamp meter**.** If necessary, a transducer (Part # 78H5401) may be used in conjunction with a standard digital VOM as shown in figure 2.

NOTE - Consult the Unit Information Manual for required signal and specific information for your unit.

When troubleshooting, be aware that the factory installs a ground wire from the ground tab of the control box directly to the burner. Make sure that this wire is in place. Since the DC current is so small, it is very important that the gas burner and the flame sensor are clean so that the best electrical contact can be made. A dedicated electrical ground and proper polarity of incoming line voltage is also essential.

A gas flame contains impurities in the gas. Similarly, the air used for combustion also has impurities. Over time, these impurities become deposited on the gas burner and the flame sensor acting as insulation from the signal. Both components must be cleaned periodically in order to maintain the optimum flame signal. Use a very fine grade of steel wool to clean the flame sensor and a wire brush to clean the burner. Never use sandpaper.

The following items in combustion air can cause contaminants to build up on the flame sensor. This is not an exhaustive list but does include items commonly found in homes.

Permanent wave solutions
Chlorinated waxes and cleaners
Chlorine base swimming pool chemicals
Water softening chemicals
De-icing salts or chemicals
Carbon tetrachloride
Antistatic fabric softeners for clothes dryers
Cleaning solvents (such as perchloroethylene)
Printing inks, paint removers, varnishes, etc.
Kitty Litter
Home cleaning products
Personal care products
Pesticides
Products containing silicone
Hydrochloric acid
Cements and glues
Masonry acid washing materials
Halogen type refrigerants