Are Self Diagnostic Control Boards Making Troubleshooting Obsolete?
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"Make daily deposits to your box of knowledge, soon it will have many reference cards."--Randal S. Ripley

Well September is here and although we didn't have a great summer, I don't think anyone can complain about the Labor Day weekend weather. Hopefully we will have an Indian summer but the Farmers Almanac has some bleak predictions for winter.

I love the fall and it is my favorite time of year given the great weather and full slate of football from high school, to the World Champion Giants and even the Patriots.

The fall also means that another heating season will be upon us soon and I want to use this month's column to talk about self diagnostic control boards in furnaces.

Most of today's gas furnaces have a self diagnostic control board that is the command center for the unit. These boards generally flash a given number of flashes, which represent a given problem. Some brands now come with multiple lights that are on in different configurations so that the technician won't have to count flashes and even save the last five fault codes to let a technician see a trend in failures.

I have heard many say that these modern wonders basically diagnose the problem for you but I would not classify them as the replacement for good troubleshooting skills but would say they can be a double edge sword in some instances.

Consider the technician goes to a call and sees the draft inducer motor running, counts 3 flashes on the self diagnostic board, checks the wiring diagram legend for the fault code and it states "pressure switch stuck open".

He concludes that because the draft inducer motor is running it must be a defective switch, goes to the supply house and gets another one, returns to the unit, replaces the pressure switch and this one causes the same flash code. You have just experienced why I say there is no replacement for good troubleshooting skills and self diagnostic boards can be a double edge sword in some instances.

The diagnostic code is correct, the switch is open but where the problem started is that the technician took the code literally instead of considering that the "open switch" is just the result of the actual problem.

Look at this list of things that can cause the pressure switch not to close, that have nothing to do with a bad switch:

- Pressure switch hose blocked, pinched or connected improperly
- Blocked flue and/or inlet air pipe
- Blocked or partially blocked drain system (this can also cause an ignition failure code if the water build up is after ignition)
- Weak induced draft motor or squirrel cage problem
- Loose or improperly connected wiring

Let's look at the potential causes of the failure code "furnace lockout due to excessive number of ignition "retries", usually a total of (3).

Failure to establish flame:

- No gas to burners
- Pressure switch not closing
- Bad igniter or igniter alignment
- Improper orifices
- Coated/oxidized or improperly connected flame sensor

Loss of flame after establishment:

- Interrupted gas supply or improper gas pressure
- Restriction in the flue and/or combustion air pipe
- Restricted drain that cause pressure switch to open
- Poor draft inducer performance

That is an extensive list but many can be eliminated by knowing and following the basics of troubleshooting.

Troubleshooting:

Troubleshooting is nothing more than a process of elimination that allows a technician to zero in on what is causing the failure of a given component or step in the operation of the equipment.

One of the most essential components of troubleshooting that the technician needs to know is the "*sequence of operation*" of the equipment. This knowledge of the step-by-step sequence of how the equipment starts and stops will allow the technician to much more quickly conclude what is causing the problem by establishing a "*reference point*".

If we know that the pressure switch is supposed to close and then the igniter is to come on but does not, we now have a reference point to guide us because the ignition process stopped at the igniter but we need to think & test before condemning the igniter.

If the pressure switch isn't closing, if the board is not sending power or the igniter is cracked then the igniter will not come on. To determine which is the failure we need to start going backwards.

A simple electrical check across the pressure switch will tell us if it is closing or not. If the switch is closed you will read zero volts, if the switch is open you will read the potential difference across the switch that in this case will be 24 volts.

If the switch is closed, move on to checking power to the igniter, if the switch is open, start checking what could cause that. If there is power to the igniter from the board then there is a bad connection at the plug or the igniter is most likely cracked.

We just used a simple example of troubleshooting but this example can be used time after time no matter how complex the problem is.

1. Gather as much information from the customer as you can—you never know what valuable information they can provide you with
2. What is the unit doing and what should it be doing—determine your reference point
3. Start working your way back to the problem

Obviously there is a lot of additional skills that a technician needs to know in order to be an effective troubleshooter that we can't cover in this column but if you want to learn how to troubleshoot a given heating unit, open up the installation manual and go through the sequence of operations, read through the troubleshooting charts and then try following the sequence of operations through the ladder portion of the wiring diagram(s). If you can do that then you certainly understand how the unit operates and where to look when the unit fails.