

## Kiln Corner

# Simple Thermocouple Repairs Correcting Inaccurate Controllers on a Digital Kiln

by Arnold Howard

*In the Winter 2019 issue of Glass Patterns Quarterly™, we looked at some of the basics of thermocouple repair. In this installment, we'll review some additional considerations when checking for necessary repairs.*

If you recall from the last Kiln Corner, the thermocouple reads the kiln temperature. When the controller on a digital kiln becomes inaccurate, the problem is often a minor thermocouple error that is easy to repair. **Before following the advice in this article, be sure to disconnect the power to your kiln first.**

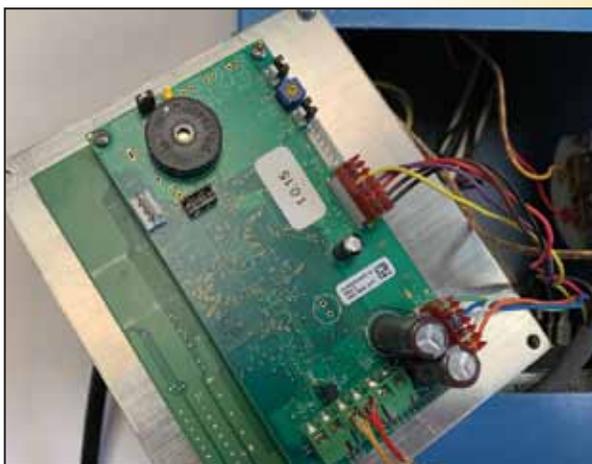
**Sheet metal in the kiln control panel can expand and move as the kiln gets hot, and in some cases this can ground the thermocouple against the steel case.** This happened recently with a 3-zone kiln. In Photo 1, the panel where the thermocouples were mounted moved upward, causing a thermocouple to touch an upper steel cover. When the thermocouple touches the steel case, the temperature reading will be lower than the actual temperature in the kiln. That is because the thermocouple produces an electric signal. Some of the signal drains out into the steel case of the kiln on contact, producing a weaker signal.

In another kiln, the thermocouple wires that were attached to the back of the controller shorted out against the case, lowering the temperature reading. See the thermocouple connection block in Photo 2. When you install a thermocouple, check the space around the thermocouple wires to make sure they cannot touch anything else.

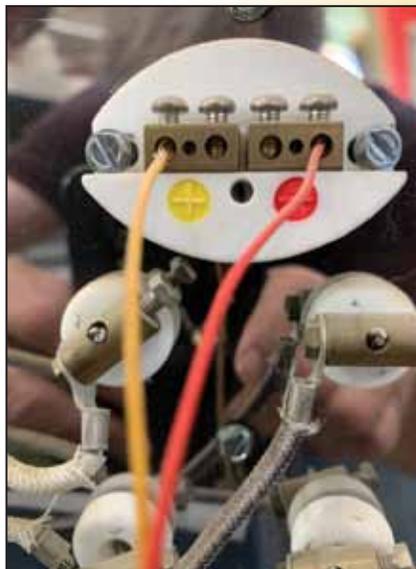


*(Photo 1) The thermocouples are mounted in the top of a kiln. The steel they were mounted on moved upward and caused a thermocouple to touch the top panel (removed for the photo). This threw off the temperature reading.*

*(Photo 2) This is the oval thermocouple connection block. The yellow and red wires go to the controller. If the four center screws, brass connection blocks, or thermocouple touch the kiln case, the temperature will lose accuracy.*



*(Photo 3) The yellow and red thermocouple wires are at the bottom of the controller in this photo. You should find a red mark on the controller where the red wire goes.*



*(Photo 4) The yellow and red thermocouple wires must be attached to the correct oval connection block screws. Notice how the block is color-coded.*

(Photo 5) Before closing the switch box on a kiln, move the thermocouple wires away from other wires as shown here.



Shelves, posts, molds, or kiln dams that are less than 1/2" from a thermocouple can alter the temperature reading. In an experiment, I drilled two thermocouple holes in a small kiln and inserted two test thermocouples. I placed posts 1/8" away from a test thermocouple and 3/4" away from the other one. The thermocouple that had posts 1/8" away registered readings that were 8°F to 16°F hotter than the thermocouple that had posts 3/4" away. That is because heat radiated from the posts.

Remove the controller, which is usually held by four corner screws. Look at the back of the circuit board where the thermocouple wires are attached. (Photo 3) Are the colored wires attached to the correct color-coded terminals? Ordinarily, putting the wires on the wrong terminals will cause the temperature reading to go down when the actual temperature goes up.

If the wires are on the wrong terminals and yet the kiln seems to fire normally, then the wires are also attached to the wrong terminals at the thermocouple connection block. (Photo 4) This will introduce an inaccuracy of about 150°F. Reattach the wires to the correct terminals.

Make sure the thermocouple-to-controller wires are away from other wires in the switch box. Relay-to-element wires that are too close to the thermocouple wires will reduce the accuracy of the temperature readings. In Photo 5, I moved the thermocouple wire away from the other wires before closing the switch box.

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Since 1977 when Arnold Howard began working at Paragon Industries, he has seen kilns evolve from switches to touch screen displays. He helped test the early glass kilns and wrote Paragon instruction manuals, newsletters, and advertisements.

Arnold has taught kiln classes at trade shows, Bullseye Glass in Portland, and in Australia and England. In September 2019, he started Howard Kilns, a repair and preventive maintenance business, to serve the Dallas-San Antonio, Texas, area. Arnold works on all brands of kilns. Feel free to contact him at [arnoldhoward@gmail.com](mailto:arnoldhoward@gmail.com).

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