

# *FireRight LT*

## Kiln Temperature Controller



*A Simple Approach*



# *AutoMate LT*

## Kiln Temperature Controller

### A Practical Approach

We've been building kiln controls for thirty years. It started with a simple electronic soak/shut-off controller sold exclusively through Crusader Kilns under the "KilnTroller" brand name. Crusader was pretty sure that this innovation would make them the leader in the kiln manufacturing industry.

It didn't.

Before long, there were three KilnTroller models; the "KilnTroller 07," "08," and "09." The KilnTroller Model 09 took off, because it provided turn-up control. Users just set a limit temperature corresponding to whatever cone they intended to fire to, and the 09 then took the kiln up to that temperature at a fixed rate of 270°F/Hour. That really didn't make sense in some ways, but it evidently worked out well for everybody, since there were few, if any, complaints about under-firings or over-firings. Some users even seemed to think that the 09 contained "brains" that somehow knew how to fire their kilns just right.



Being astute enough to see the handwriting on the wall, Crusader was sold off to the American Art Clay Company a few months before the hobby ceramics bubble burst. As sales became more difficult, AMACO convinced us that the fixed 270°F/Hr rate was a problem; that if the rate was adjustable, then the controller would be sellable to artists – for example, those doing crystalline glazes. So we gave them what they thought they wanted; the KilnTroller 09VR. As the market continued to tighten up, they thought the fact that the 09VR controlled only heat-up ramps was a problem, that if it could also control cooling cycles, then it could be sold to glass artists for use in annealing.

That led to what eventually turned into the FireRight Sr, a rather elaborate digital controller. Before the FireRight Sr was launched, AMACO decided that their kiln business had become more of a burden than a benefit. So they eliminated some lines, streamlined others, and decided to get out of the controller business altogether. That was the end of our exclusive agreement and partnership with the Crusader brand.



We sold lots of controls under our own brand name, the "FireRight" brand name, but as the market continued to contract and sales became more and more difficult, we made the same mistake, eventually winding up with a highly elaborate PC-based kiln control systems.

What's the point of this story?

It's a story about "design creep." That often happens when sales people find it difficult to satisfy management's agenda, and engineers don't know enough about sales and marketing to understand that their "baby" is not the dreamed for "better mousetrap."



Crusader and AMACO weren't the only ones. Electronic kiln controls soon began to appear all over the place, and always for the same reason – because particular kiln manufacturers feared they were being left behind. They did not appear in response to any demand from the market.

## Lessons Learned the Hard Way

These early experiences taught us three important lessons.

The first was that KilnTronics Model 09 wasn't a temperature controller; it was a "convenience machine." Its success arose from the automatic turn-up feature it provided, which eliminated the annoyance and responsibility of "switch schedules" – having to hang around and pay attention to the kilns for a few hours to get firings started off right.

The second lesson was that temperature control, *per se*, wasn't that big of a deal. After all, the accuracy of practical thermocouple temperature sensors operating upwards of 2500°F isn't that great, not to mention what engineers call "uncertainties" in the control



itself. Furthermore, at the beginning of the firing the high capacity and slow time constant of practical kilns cause wildly cycling temperatures, and towards the end of the firing, no practical kiln is able to keep up with the controller's 270°F/Hr ramp. At some point, the controller would therefore simply leave the kiln behind as it continued

to ramp its set point up to the limit temperature; then wait for the kiln to eventually catch up, shutting it down when (and if) it finally did. That probably didn't simulate conventional cone firings very well. Since cones respond to the application of heat, rather than temperature, a cone actuated control would probably have shut the kiln down much sooner, saving lots of money on electricity. Since there were few complaints, one has to conclude that firing isn't a critical matter; that one can commit lots of sins and still wind up with good results. Thinking back to the old days and pit kilns ... well, you get the picture.

Finally, we learned that marketing controls to kiln manufacturers is a tough sell. Kilns are essentially all the same; the fire brick all comes from Johns Manville, the element wire from Kanthal, and so on. The only difference is in manufacturing quality, and that doesn't always provide a significant competitive edge. Manufacturers are therefore sensitive about

differentiating themselves, and once one begins shipping kilns with a new kind of controller, the others start looking for something similar, but different. The only thing that will stop that is



buyer demand, and since kiln buyers aren't much into control sophistication anyway, the last time that happened was when Winfred P Dawson introduced the KilnSitter in the 1950's. David Bartlett had some success with a programmable microcontroller-based controller a few years ago, which he was willing to brand for various manufacturers. More recently, he has turned his attention to marketing the unit as a greenhouse controller.

## Life Has Gotten Too Complex

The FireRight LT is the simplest ever approach to electronic control for electric kilns. Combine it with a matching AutoMate II Automatic Kiln Switch, and you've got the same thing – a fully-automated kiln, but with three big differences!

First, you won't need an engineer to set up the control system. Nor will you need to study instructions at length in order to do it yourself. The LT/AutoMate II combination is simplicity itself.

Secondly, you get this for a price that is reasonable and sensible, compared to the cost of the kiln. These four components are all that is needed for most kilns. Here's the parts list:

FireRight LT Temp Controller	\$ 95.00
Temperature Sensor Assy	29.95
AutoMate II Kiln Switch*	69.95
50-Amp Heat Relay	<u>29.95</u>
<b>Total</b>	<b>\$224.85</b>

(\*) Optional turn-up controller – see [www.fireright.com](http://www.fireright.com) for details

This is a great value, compared to the cost of programmable digital controls.

Finally, these components are all of proven performance and reliability, with thousands of units having been put to use in the field over FireRight's thirty-years of experience building quality kiln controls. And these simple devices are not subject to electrical interference and "glitches."

## No Shame

Something wrong with “low tech?” Wouldn’t it be nice if at least some of the things you buy didn’t come with a remote?

Gosh, even our silly little humidifiers have a remote. Actually, that’s good; now that I think about it. It’s the only way we can get them to work. They too are “computerized” and the pushbutton – digital display protocol at the unit itself is so non-intuitive that one has to read the instructions every time to get the sequence exactly correct, else they won’t go.

Are you into art, or computer science?

When your kids tease you for going low tech on your kiln controls, don’t bother telling them about all the time you’re saving with your simple, easy-to-use system, how it’s almost impossible to make a mistake when setting it up, how it seems to be extraordinarily reliable, never breaking down, and how it provides better performance for hundreds of dollars less!

They won’t buy any of that. Kids go for glitz, complexity and expense.

But do ask them if they think the guys who make the high tech stuff could ever become capable of creating the beautiful things you fire in your kiln.

“High tech” is not necessarily better. When they’re older and wiser, they’ll probably finally “get it.”

## More ...

The following pages provide installation and operating information. To learn more about this simple, cost-effective kiln control scheme, please read on.

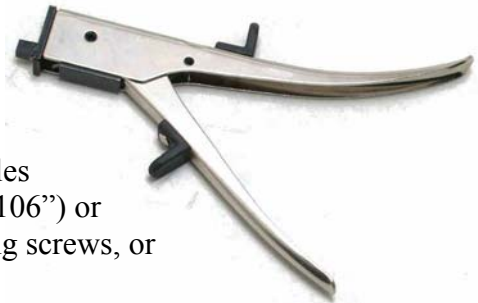
# *FireRight LT*

## Kiln Temperature Controller

### INSTALLATION, HOOK-UP and OPERATION

#### Installation

- The FireRight LT panel is ordinarily mounted on the face of the kiln's switch box (electrical enclosure). The panel is the same size as that of the AutoMate II Automatic Kiln Switch, making for an attractive installation when both controls are used. This combination of simple, practical controls provides a fully automated kiln; the AutoMate II controlling the turn-up time, and the FireRight LT shutting the kiln off at the proper temperature.
- In the interest of reliability, recognizing that heat is an enemy of electronic devices, and thinking about the fact that heat rises, choose the lowest possible position for these electronic controls if mounting them directly on the kiln. Alternatively, the control panels can be mounted on a separate wall-mounted panel and connected to the kiln-mounted DPC using regular PVC control cable (available from your local electric supply.)
- The mounting template on the following page is printed to scale, and may be used to mark the corners of the necessary cutout and the centers for four mounting screw holes.
- Switch boxes are usually made of lightweight metal or expanded metal. Use a nibbling tool (Eclipse Nibbling Tool 900-215; commonly available online for about \$12) to provide the 3-5/8" x 5-1/8" cut-out.
- Accurately mark the centers for the four screw holes with an awl or other sharply pointed tool. Use a No. 36 (.106") or 7/64" drill to provide holes for four No.6 x 1/4" self-tapping screws, or tap these holes if you prefer for 6-32 x 1/4" screws.
- For kilns drawing more than 15-amps, you must use a separate power relay to switch the heating elements on and off, since the small relay on the FireRight LT panel is not capable of handling more than 15-amps. These larger relays are called "definite purpose contactors" ("DPC").



Appropriate choices are as follows:



208/240v – 50-Amps  
p/n 4DD08 (\$29)\*



208/240vac – 65-Amps  
p/n 5B104 (\$109)\*

208/240vac – 75-Amps  
p/n 2CF96 (\$118)\*

(\* ) www.grainger.com item numbers and prices per November 2008.

- The contactor should be mounted on the inside face of the kiln’s switch box, if possible, to keep it as far away from the kiln’s hot face as possible. Also consider wiring convenience. The incoming power will be hooked-up to one side of the contactor, and all the heating elements to its other side.

## Hook-Up

- You will probably find that the incoming power cord is connected to the input side of a terminal block, with lead wires for the heating elements connected to its output side. In this case, you would move all the heating element lead wires to one side of the contactor, and then connect the other side of the contactor to the terminal block’s output terminals.

- It doesn’t make any difference which side of the contactor you choose as the “input” and “output” sides; it’ll work either way. Most kilns are “single-phase,” meaning that the power is carried on two “hot” wires, one black and one white, with a green ground wire. Larger kilns are sometime wired for “three-phase” power, which is connected with black, white and red “hot” wires, plus a fourth green ground wire. The large 3-pole contactor may be used with either system. For single-phase power, simply use the outside two terminals, leaving the center terminals open. For 3 $\phi$  power, use all three.

- Refer to the following wiring diagrams to make your electrical interconnections. If modifying an existing kiln, simply choose the same kind of wire originally used for hook-ups within its switchbox. Otherwise, regular 18Ga appliance or machine tool wire (or flexible PCV control cable if mounted off the kiln) is ordinarily appropriate for the connections between the FireRight LT

PORTABLE CORDAGE RECOMMENDATIONS					
Single Phase			Three Phase		
CABLE	Maximum Amps	Maximum Feet	CABLE	Maximum Amps	Maximum Feet
14/3	18	95	14/4	15	131
12/3	25	109	12/4	20	157
10/3	30	144	10/4	25	200
8/3	40	171	8/4	35	226
6/3	55	195	6/4	45	275
4/3	70	242	4/4	60	328
2/3	95	287	2/4	80	393

Type SO Portable Cordage 60°C 600V with GREEN conductor used for grounding only. Length specified for 6% maximum volt loss from minimum 208vac line.



panel and the contactor. Refer to the following table to select the appropriate wire size for the wiring to and from the contactor's large load terminals.

- The contactor has no “input” and “output” sides, until you connect your input power and heating element lead wires to it. Then notice in the wiring diagrams that the small wiring between the contactor and the AutoMate II panel must be connected to the power-input side of the contactor only, never to the side connected to the heating element lead wires.

## “Infinite” Switches – “Three-Way Switches

Practical kilns are usually provided with switches which enable the user to manually regulate the power to the heating elements in order to throttle the heat-up rate. These are sometimes simple “Low-Medium-High” switches, but are often infinitely variable switches having dials marked “0” to “10,” similar to those found on electric kitchen ranges.

When the AutoMate II Automatic Kiln Switch is included as an upgrade on kilns having such switches, they may be removed, else simply set to “High” or fully “On” and left in that position. Wiring is often easier if the switches are left on the kiln. In that case, the output lead wires from the contactor will go to these switches, rather than directly to the heating elements.



## Firing With the *FireRight LT*

Using the FireRight LT is simple. The panel has two indicators in a latching, push-button mode switch, and temperature adjustment knob with an *OFF* position

1. When not in use, the temperature adjustment knob may be turned fully counterclockwise to the *OFF* position. Since this establishes a temperature set point of 0°F, the controller's output will remain off.
2. Pressing the pushbutton switch once will cause it to latch in the *SOAK* mode. Pressing it a second time will release the latch, enabling the *SHUT-OFF* mode. With the temperature setting at *OFF* and this switch in the *SHUT-OFF* position, the green *LIMIT* light should be lit.
3. Prepared to fire by moving the control knob to the shut-off temperature appropriate for the firing. Refer to the cone charts provided at the back of this booklet for guidance, if needed.
4. When ready to fire, press the control switch to reset the controller's electronic latch-off function. The green *LIMIT* indicator will turn off, and the red *HEAT* light will come on.
5. ***IMPORTANT*** – Press the control switch a second time to release it from the *SOAK* position, allowing the controller to disable the kiln once the shut-off temperature has been achieved. Otherwise the controller will maintain the set temperature indefinitely, which will likely result in an over-firing.

You may wish to use the *SOAK* mode to “smoke out” kiln loads that are suspected of containing excess moisture.

## Service and Support

FireRight service and technical support has always been second to none. If you have questions or need quick repairs or replacements, just call or email. We are eager to hear from you, and willing to help.

**fireright**

Warner Instruments

1320 Fulton Street PO Box 604

Grand Haven MI 49417 USA

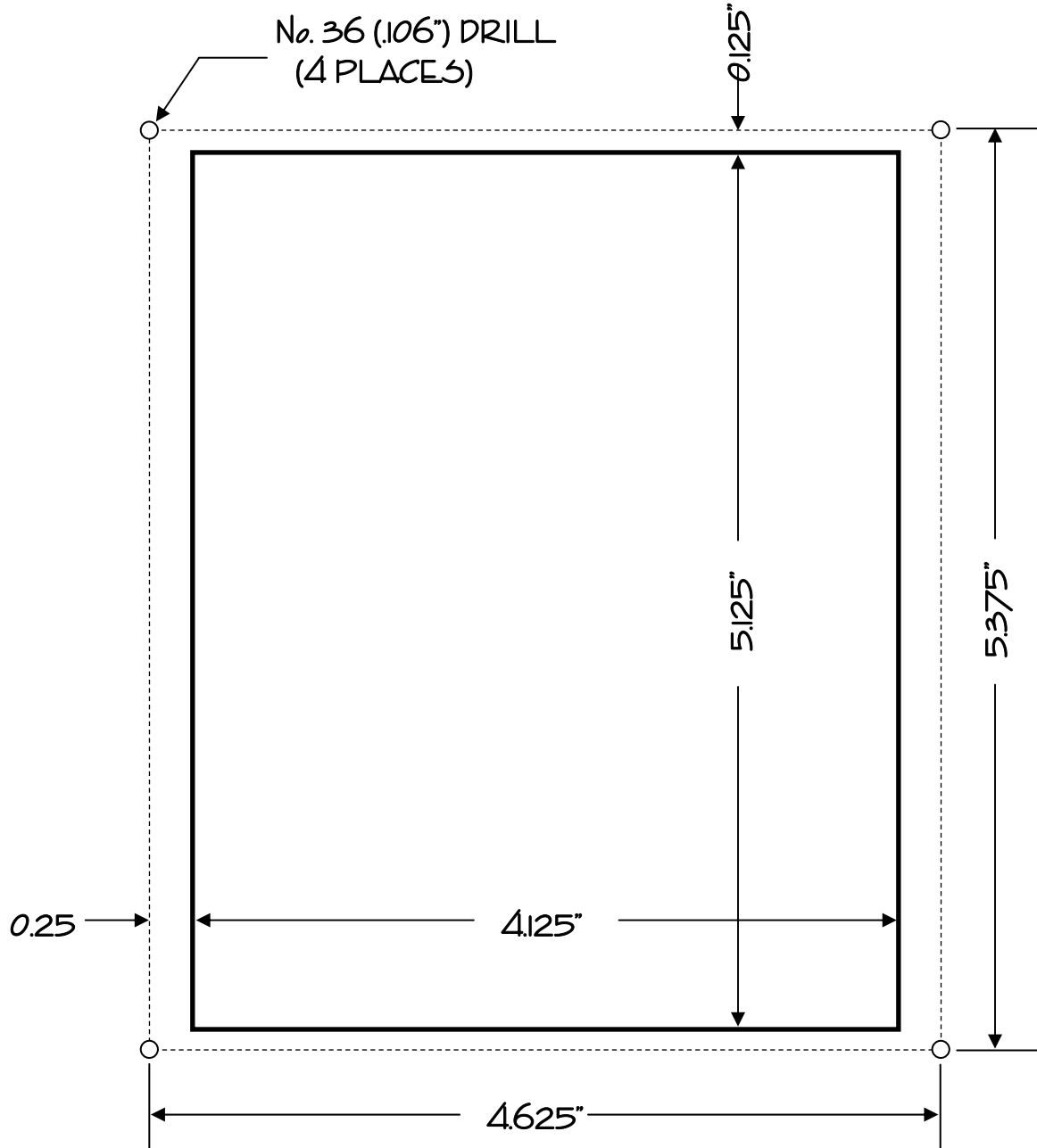
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## Kiln Temperature Controller

### MOUNTING TEMPLATE



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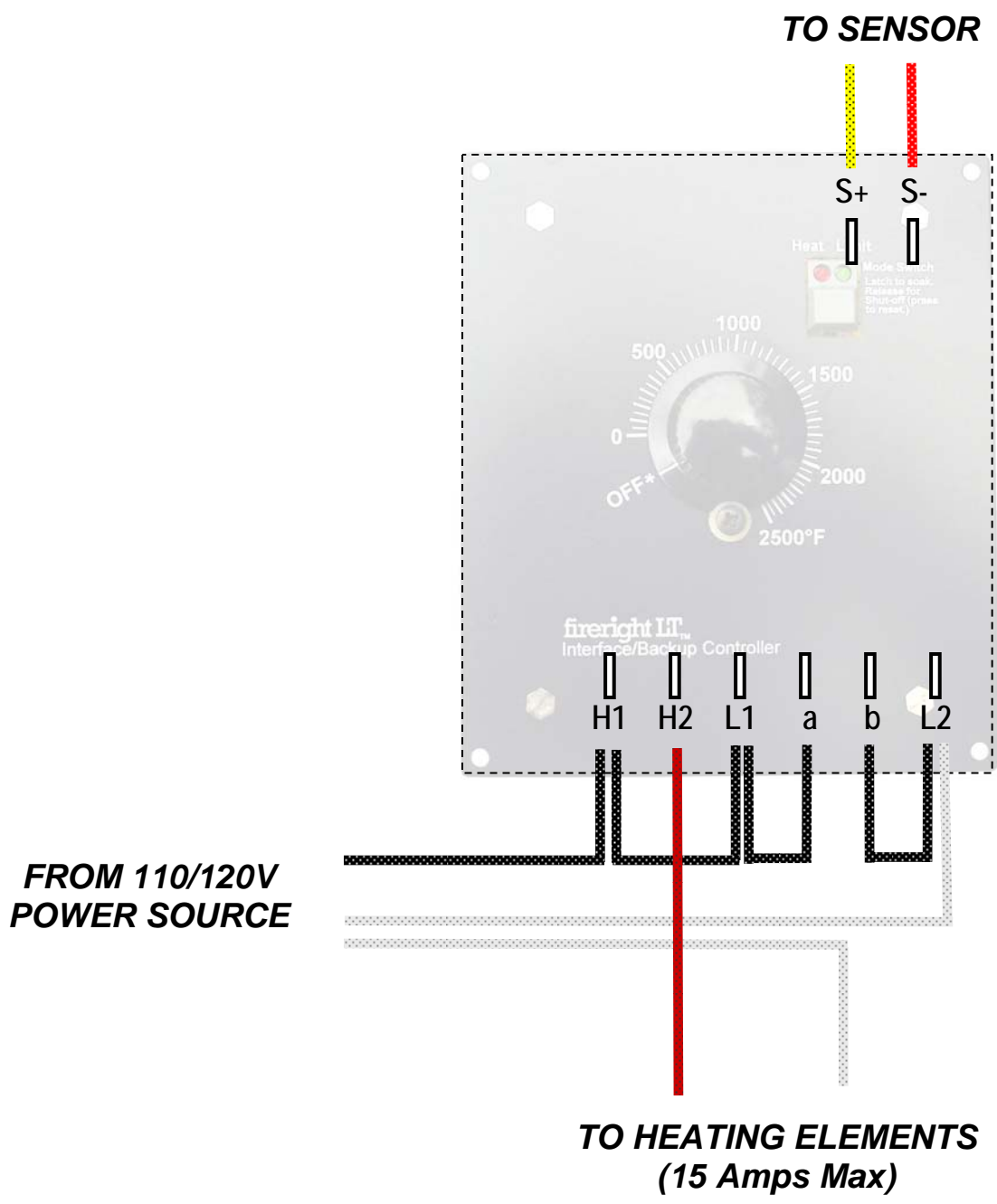
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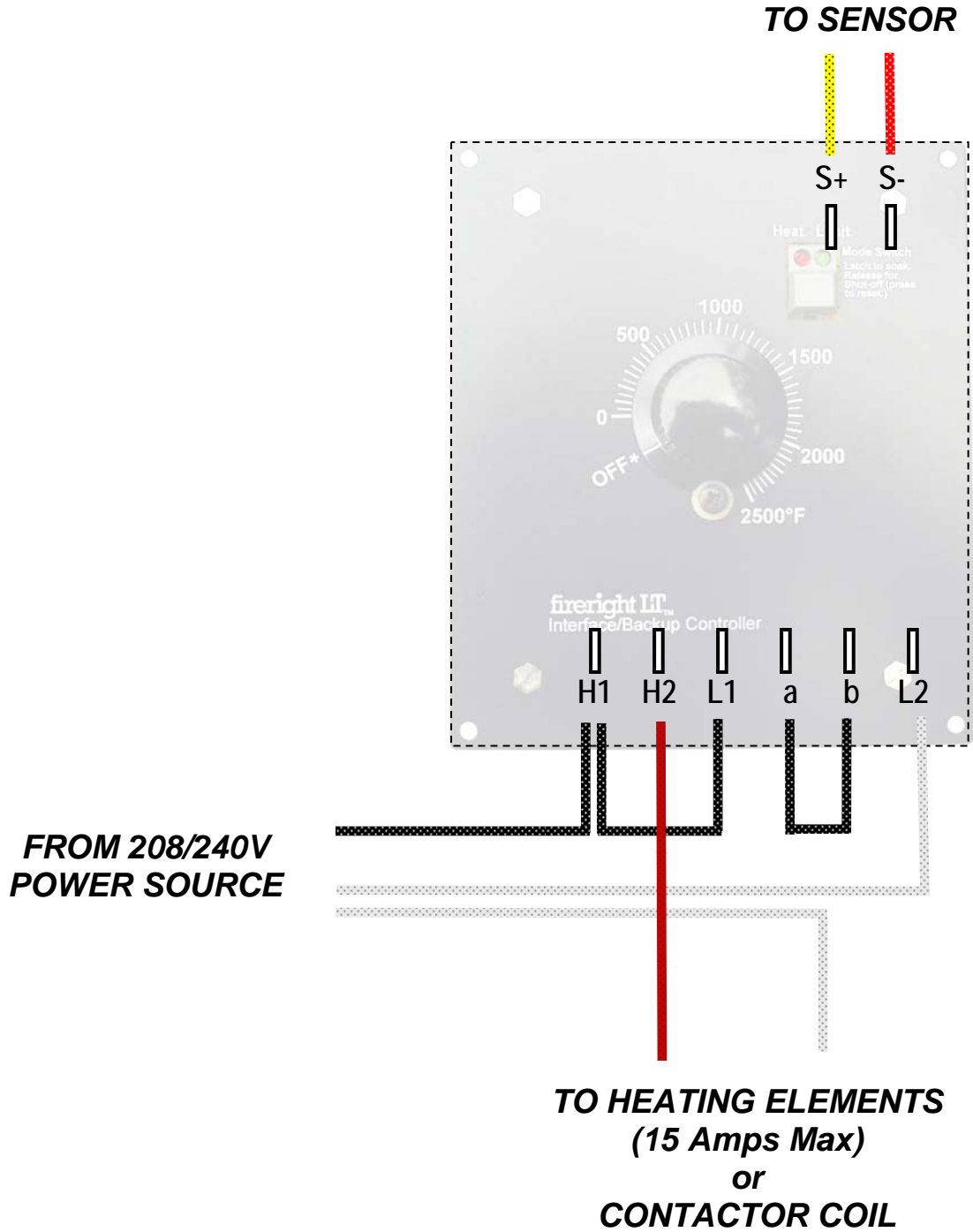
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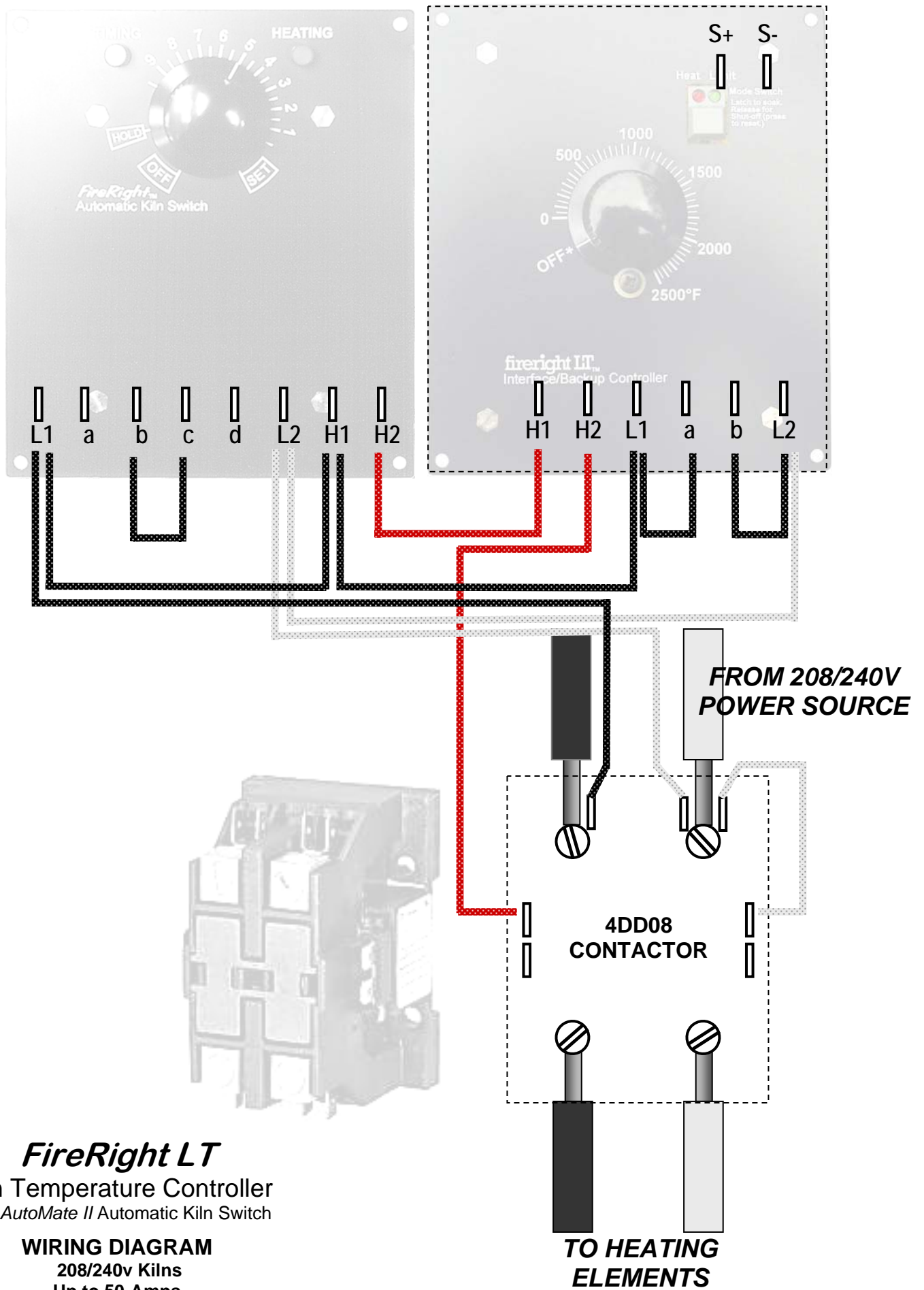




***FireRight LT***  
 Kiln Temperature Controller  
**WIRING DIAGRAM**  
 110/120v Kilns



***FireRight LT***  
 Kiln Temperature Controller  
**WIRING DIAGRAM**  
 208/240v Kilns



**FireRight LT**  
 Kiln Temperature Controller  
 with AutoMate II Automatic Kiln Switch

**WIRING DIAGRAM**  
 208/240v Kilns  
 Up to 50-Amps







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Grand Haven MI 49417 USA  
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