Firing a computer-controlled electric kiln
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At Augusta State, we have two computer-controlled electric kilns. They are both Skutt 1027 models. They are identical except that one was purchased several months after the other. The kiln on the left is slightly older, and the kiln in the center is slightly newer. The newer Skutt has a slight difference in its programming, which I will explain later.

The explanations I go into here are supplemental to the kiln manual. This article is not about which buttons to push (for that, read the manual or let me train you); rather it is about why you would select various programming options. WHEN IN DOUBT, JUST ASK ME – I'm happy to help.

GLAZE FIRING
Setting up a glaze firing in these kilns is quite easy. To do this, select Cone Fire mode. Enter your cone number and select slow, medium, or fast firing speed.

What is a "cone"? The cone number is a way to indicate how hot you want the kiln to go. The cone number is actually more precise than that, because it measures *heat work*. Heat work is the combination of heat and time that yields a particular result with glaze melting. For instance, if your kiln rose to 2000 degrees slowly, it would melt the glaze better than if your kiln rose to 2000 degrees more quickly. The idea is that if you specify "cone 04", the cone number will give you more precise results than if you simply specify that you want to go to a particular temperature. And in practical fact, I find that this is very true.

Please note that when talking about cone numbers in ceramics, the leading zero IS VERY IMPORTANT. This is not like regular math class, where you can drop the leading zero! For instance, cone 06 is a very different temperature than cone 6! If you think of the leading zero as operating kind of like a minus or negative sign, you'll be in good shape. For example, -4 is less than 4, so cone 04 fires to a much lower temperature than cone 4.

What firing speed should I pick? This depends on what you are firing. If all of the work in the kiln is small and rounded, with thin, even walls, fast is just fine. For complicated, thick sculpture or for delicate slab work, slow is best. Medium usually works well. If the work was in good shape after the bisque, but it cracks in the glaze firing, consider slowing down the firing speed the next time you fire something like that.

Do I need to select a soak time? Generally, no. "Soak" can be zero. However, if your glazes are pinholing too much, or if they need more time to melt, you could try a short soak. Start with 10 minutes and see if that helps. You can also try firing to the next higher cone number as an alternative.

What about preheating time? The newer kiln will ask for a preheat entry. The older kiln will not. For glazing, ignore the preheat (make sure it is zero).

BISQUE FIRING

Remember, bisque firing is the first firing you do, when the piece is still raw. This is the most delicate firing, because if you fire your piece too fast, the residual water vapor in the clay will turn to steam before it has made its way out of your piece. As you know, steam is very explosive. This is by far the commonest reason for things blowing up in the bisque kiln.

We don't use the cone fire programs for bisquing because they do not rise slowly enough in temperature for thick sculptural pieces or beginner thrown ware. Instead, we use the "ramp/hold" mode, which allows us to gain fine control over each phase of the firing.

This is the standard bisquing program that we use:

Bisque program – approximately cone 06

segment	rate of rise	high temp.	hold time
1	80 deg./hr.	180 degrees	12 hours
2	125 deg./hr.	550 degrees	10 minutes
3	150 deg./hr.	1100 degrees	20 minutes
4	200 deg./hr.	1900 degrees	0

This is User Program 1 in the Ramp/Hold mode. As you run through the program, check all these values. Someone may have changed something, and it does matter!

Notice that the kiln rises slowly to 180 degrees (all temperatures are expressed in Fahrenheit here), and it holds at 180 for 12 hours. I find that this works quite well to get all the water out of the clay before it turns to steam. However, the work must be dry to begin with. If it is almost dry, but not quite, use a different program first (User Program 2, described below).

The programming sequence will also ask for an alarm setting. You can ask the kiln to sound an alarm at a particular temperature is you wish. So far, we have no reason to do this – so the alarm stays set at 9999 (meaning the kiln will never reach the temperature where the alarm goes off).

I have tested the above program over the course of two years, and I finally have it set where almost nothing ever blows up, no matter how it is made. (Knock on wood.) Of course, if there is a piece in the kiln that encloses a large volume of air with no pinhole, that piece will probably blow up anyway.

The kiln vent on the wall should be turned on. The top peephole (only) should be open. The kiln lid should be latched shut.

Why does the program have 4 different segments? This is because, during the firing, we need to move the clay through several delicate phases. If we rush too quickly through any of them, we get explosions or cracks. The first delicate phase is getting all the water evaporated (segment 1). Segments 2 and 3 cover quartz inversion, which you can read

about in any standard ceramics textbook. In quartz inversion, the clay is undergoing chemical changes in which it is changing structure, so it is best not to blast through these phases.

The last segment controls the highest temperature of the firing, and thus the hardness of the ware when the firing is done. You could easily change this number if you want to fire to a different temperature. However, 1900 degrees F. is working quite well for us. The bisque ware is not too hard to accept glaze easily, but it is also not "punky" (too soft and easy to break).

It's worth noting that the Ramp/Hold mode allows you to control cooling if you wish. You can fire the kiln down much as you fired it up. Generally, in ceramics you would need to fire down only in unusual special situations. True crystalline glazes tend to benefit from extremely slow cooling, which may require firing down. By "crystalline", I don't mean the little jars of commercial cone 06 glaze that claim to have crystals on the bottom of the jar that you have to stir up. Those are not crystals, but small shards of prefired glass. Just fire that stuff to cone 06, like the jar says.

Do not open the kiln too early. This leads to cracking. It is safe to open most kilnloads when the temperature readout is below 200 degrees F., *and not before*.

A DRYING CYCLE

If you have loaded work into the kiln which is almost dry, but not quite, the safest thing to do (if you don't have time to just leave the work in the kiln for several days until it is completely dry before running the bisque program) is to run a drying cycle. This is the User Program 2 in Ramp/Hold mode.

Drying Program

segment	rate of rise	high temp.	hold time
2	80 degrees/hour	150 degrees F.	4 hours

Latch the kiln lid in the almost-closed position so that water vapor can escape.

If possible, leave the kiln alone for 2 to 4 hours after the drying program has finished. Carefully (make sure the kiln is off and that it is only gently warm) insert your hand into the kiln and feel the air. If it feels dry, then start the bisque cycle as outlined above. Be sure to latch the kiln lid completely shut.

ANOTHER WAY TO BISQUE

This will work only on the newer kiln (the center one) that has a preheat option in cone fire mode. Follow these instructions:

- Select cone fire mode and cone 06.
- Select a length of time to preheat. 12 hours should be very safe. This means the kiln will rise at 80 degrees an hour to 180 degrees F., then hold at 180 for 12 hours.
- Select your firing speed (slow, medium, fast).

Having a preheat option on the cone fire mode means that you can avoid getting into the more exact programming required in Ramp/Hold mode.

If you have the opportunity to fire another brand of computer/controlled electric kiln, the procedures and controls may be somewhat different. However, you should be able to apply the advice and theory given in this article to your particular kiln situation. The firing schedules that I have discussed represent my best thinking at the current time. If firing problems develop, I am always willing to reconsider my firing schedules and to tweak them.