



General Ceramic Information

PYROMETRIC CONES

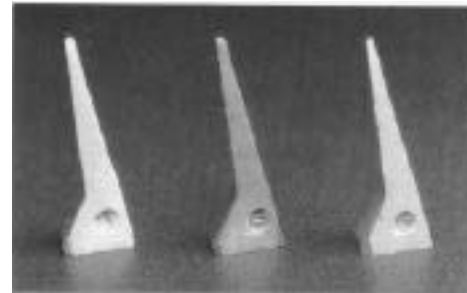
Ceramic firing to the accuracy we know today would be impossible without pyrometric cones. These long tetrahedrons of controlled composition measure the combined effects of time and temperature accomplished during a firing. Please refer to Appendix 2 which further describes the theory of heat work. The KilnMaster Controller uses the patented Orton process of time and temperature when in the Cone Fire mode. Even though you are operating a fully automatic kiln, you still need to verify the temperature on the shelf using Self-Supporting Cones.

Senior Cones are designed to be placed standing in angled holders or Commercial cone plaques or Self Supporting Orton Cones. We recommend using the Self-Supporting Cones that have a precise $8\frac{1}{2}$ angle built into the base allowing the cone to bend properly. When the cones soften and bend to the top of the base ($90\frac{1}{2}$ is perfect), the correct firing time and temperature have been reached. It is impor-

tant that the cone is standing at the proper angle (as precut at the base) for it to bend at its standard temperature.

Obviously, if you wish to monitor firing progress, Cones must be visible through a peephole.

The traditional and still the most accurate method of monitoring a firing is to use three Self-Supporting Cones: the one called the guide cone should be one number cooler than your desired firing; the firing cone should be the desired heat, and the guard cone should be one number hotter as shown below in a typical example.



As your firing nears maturity, the guide cone will bend or "drop". This alerts you to watch the firing cone. If the guard cone is not straight, the best heat work has been exceeded.

If you discover that your automatic kiln is underfiring ware, check the load in your kiln to ensure that it is evenly distributed from top to bottom. It is easy to program a 5 to 10 minute hold at the end of your Cone Fire. The hold can be preprogrammed or added at the end of a firing schedule. See Cone Fire mode for detailed instructions.

Cones are sensitive to moisture when stored and to drafts when firing. Keep them dry or invisible cracks may develop, causing early bending. If you have a cone problem, try fresh ones from another source. Place cones at least 3" back from peepholes to avoid a false response to cool air.

At high temperatures cones can be hard to see. Viewing through dark glasses can help. Try to keep ware back from cones as far as possible to avoid a cone melting into the ware.



PRECAUTIONS

The controller is a temperature control device. It is not a safety device.

The maximum operating temperature is 105½ F (41½C). This temperature refers to the room temperature and does not pertain to internal temperature of the kiln.

The minimum operating temperature is 40½ F (4½ C). See page 15 for cold kiln room recommendations.

The controller contains static-sensitive parts that may be damaged by static electricity. Use caution to avoid creating static that may damage the equipment. In areas where static electricity is common, or during dry times of the year throughout the country, touch the kiln lid handle before touching the controller to discharge the static.

Never leave the kiln unattended at the end of the firing.

LOADING: THE KEY TO CONSISTENT RESULTS

If this is the first firing of the kiln, or if you have just replaced the elements, please fire the kiln empty to Cone 04.

Careful loading will always be repaid with satisfaction. Rushed, careless loading can bring disaster to pieces you've worked on for hours.

First, never load damp ware into your kiln! Make sure it's all bone dry first.

Keep a piece of old greenware on your drying shelves. New ware should feel no cooler on your cheek or forearm than an old piece. If it does, water is still evaporating from it.

Plan your load carefully. Set out all your pieces before you start loading, and prearrange them as you would to load them. Always load slowly—dropped ware on shelves may damage the inside of your kiln.

Balance out your load by density. If half your load consists of small, heavy pieces, and half of large thin-walled pieces, don't group the small heavy pieces in one section, but mix them so there is a balance of each type throughout the kiln. See the photos at right. Don't set pieces of ware directly on the floor of the kiln. The first shelf should be 1" off the floor of the kiln. For best results ware should not be placed within 1" of the elements. If possible, place ware so that an element groove is under the shelf.

Don't place ware too close to the thermocouple. We recommend keeping ware and shelves at least 2" away.

Large flat pieces like plates that demand the full width of the kiln should have their rims positioned between two elements. We recommend placing a Self-Supporting Cone in every firing. Although you normally won't watch it go down, its condition when you unload the kiln will prove your firing was correct—or alert you to possible problems if the ware displays faults.



GREENWARE FOR BISQUE FIRING

Greenware is easier to handle and load than other ware. Greenware should be placed in the kiln in its natural position, but any large flat piece—such as a wall plaque—can go on its flat side to prevent warping. Canisters and boxes should be bisque fired with lids in place for assurance of good fit. For more efficient production, you may wish to experiment with nesting bisque, as shown below. Just remember, never strain the rims.





GLAZE FIRING

Glaze firings require that you have kiln washed the bottom of the kiln and one side of each shelf. Glaze will stick permanently if you fail to keep a good coating of kiln wash on these surfaces.

Don't let any of your pieces touch one another or the side of your kiln.

Stilts are devices used in glaze firing to elevate the fired pieces from the shelves.



There are many styles. Use those that provide the widest bearing capacity for stability. If a piece wobbles on its stilts, it may tumble during firing. Make sure you have a good solid base.

"Dry-footing" a glazed piece will eliminate the need to stilt your ware. To dry-foot, avoid glazing the base of your piece. Or you can apply wax resist to the base which will cause the glaze to puddle up, making it easy to remove with a damp sponge. Any part of the ware that will touch the shelf cannot have glaze on it.

Leave all possible breathing room between pieces for best firing uniformity. Ware should be at least 3/4" apart on the shelf or bubbles and fumes may contaminate adjoining pieces.



PORCELAIN AND STONEWARE FIRINGS

These materials differ only in purity of clays, although they appear different in color and texture. By definition, both must be fired hot enough to render the bodies waterproof (or vitreous) at which temperatures they tend to wilt.

Because the bodies become soft, they must be bisque and glaze fired resting flat on a freshly kiln washed surface, or one sprinkled with silica flour (flint). Flint must be kept out of the element grooves. Remember to vacuum the grooves periodically.

Be sure to check clearance at the top of your porcelain load with a ruler so that pieces do not touch the lid and stick to it.

To avoid distortion, pieces must either

be carefully designed or the overhangs specially supported. Figurine arms are generally supported by hollow greenware pillars, made of the same clay material. These will shrink along with the piece, which in high firings can be as much as 12 percent.

Simpler shapes such as wide plate rims are generally supported by reusable rings (setters) made of even higher firing material specifically shaped for that one article.

Both porcelain and stoneware glaze firings are dry-footed to prevent fusion to the shelves.

OVERGLAZE FIRINGS

Stilting may be helpful because it allows heat to penetrate between the ware and the slower-heating shelves. Large double-pointed stilts can be used to hold plates apart when fired on edge.

GLASS FUSING AND SAGGING FIRINGS

When firing with more than two shelves, the lower one is usually posted well off the kiln floor and the upper one is placed at least 3" above the first mold. The center of the load should fall a bit above the center of the kiln.

