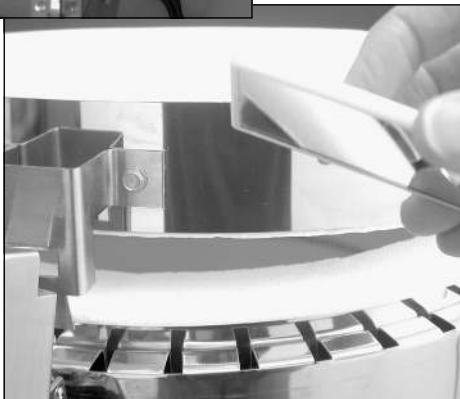
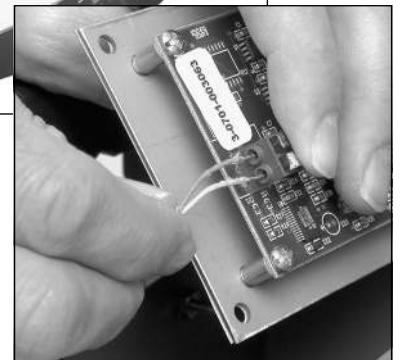
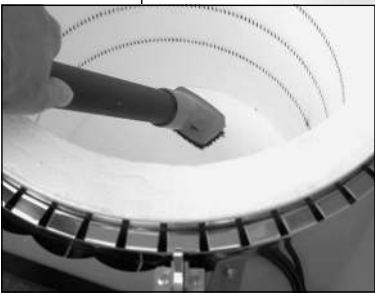
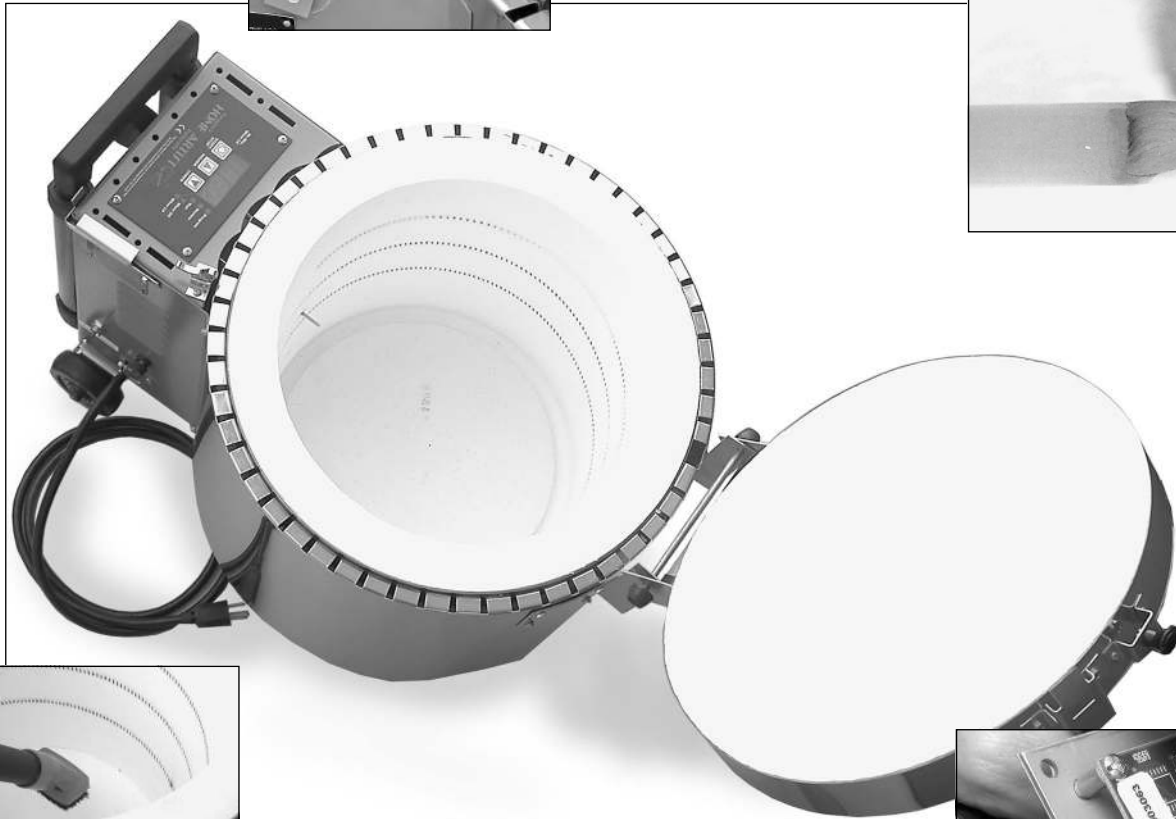
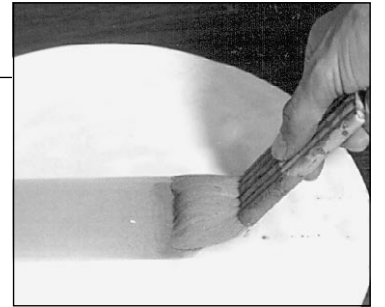


# Paragon Home Artist Kiln Instruction & Service Manual



# Introduction

Thank you for choosing the Paragon Home Artist kiln! We have designed it to give you many years of reliable service.

The kiln changes clay into ceramics, one of the hardest materials known. Ceramic ware is so durable that it is among the few surviving artifacts from ancient civilizations. With your new kiln, you can make art pieces that will last for many generations.

**Please read this manual before firing the kiln.** The manual will help you gain the most enjoyment from your Home Artist kiln and is bound to answer many questions. The manual could also save you money; failure to follow instructions can easily cause expensive damage to the kiln. This manual gives basic firing instructions for greenware clay, glaze, overglaze, china paint, and glass. Please consult your supplier for specific instructions on firing their products.

**Inspect the kiln.** When you receive your kiln, check the carton for damage (crushed, holes, etc.). Check the kiln for both interior and exterior damage. If the kiln is damaged, you can refuse the shipment and have it returned, or accept the shipment after having the driver note the damage on the Bill of Lading. Then call Paragon at 800-876-4328 or 972-288-7557 (open Monday to Thursday, 7 a.m. to 5:30 p.m. Central).

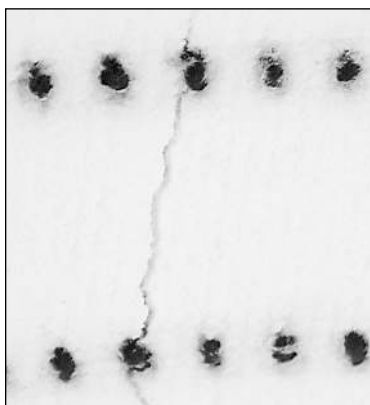
**“What is it about that meditative quiet when kids are working with clay? I teach 3rd, 4th and 5th graders in a very poor neighborhood, and even the toughest 5th grader will let down his ‘cool and tough’ act for clay.”**

**—Grace Sheese**

Check the Bill of Lading to insure that you received the correct number of packages. Note any shortages on the Bill of Lading, and have the driver sign the copy.

If there were no signs of visible kiln damage and you discover damage after the driver has left, notify the shipper immediately.

**Save the shipping carton.** It was carefully designed to provide maximum protection during shipping. Use the carton to take the kiln to seminars or on vacation, or to return the kiln to the factory for repairs.



Cracks in the firing chamber are normal. Please do not be alarmed by them.

**Cracks, clicking, discoloration.** Tremendous stresses are generated within the kiln. The ceramic fiber firing chamber actually expands and contracts with each firing. Do not be concerned if small cracks appear in the fiber. This is normal. These are surface cracks that close tightly when heated.

The paint and stainless steel wrap will eventually discolor from heat. This, again, will not affect the kiln's performance.

During firing, you will hear an intermittent, distinct clicking. This is the sound of the relay sending power to the heating element. Do not be concerned with this sound.

electrical data plate. Please record this information below and include it when ordering parts or calling your dealer or the factory about your kiln.

P/N \_\_\_\_\_ SN \_\_\_\_\_ Model \_\_\_\_\_ Volts \_\_\_\_\_



**The Electrical data plate.** Important information about your kiln is etched on its

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# Safety

## Overfiring

**The warranty on your Paragon kiln does not cover damage from overfiring, regardless of the circumstances. It is the operator's responsibility to make sure the kiln turns off at the proper time.**

## The Ceramic Fiber

**Avoid touching the firing chamber surface with sharp or pointed objects. They can damage the fiber surface. Touching the embedded heating element with sharp or pointed objects is a shock hazard.**

## Read the Manual!

**Read each page of this manual in detail before operating your kiln. Warranty does not cover damage caused by failure to follow instructions.**

## Food or Drink Surfaces

**Some decorative materials may be unsafe and toxic when used for surfaces that will be in contact with food or drink. When you make food or drink containers, select a glaze or glass that has been formulated, tested and labeled as approved for surfaces that will be in contact with food or drink. Follow the glaze or glass manufacturer's instructions exactly, without any variations.**

**The Orton Firing Institute** We encourage you to become a member of the Orton Firing Institute, where you will receive expert advice on making and firing clay. Call 614-895-2663 to join. Gain access to a wealth of experience for only a nominal annual membership fee.

## Important Safety Rules

An electric kiln is extremely safe to operate provided you follow these basic safety rules and pointers:

- Unplug kiln when not in use.
- Do not touch hot sides.
- Keep unsupervised children away.
- Place kiln on a non-combustible surface.
- Do not install closer than 12" from any wall or combustible surface.
- Fire only in a well ventilated, covered and protected area.
- Keep cordset away from hot sides of kiln.
- Do not open lid until kiln has cooled to room temperature and the switch is off.
- Keep the lid closed when kiln is not in use.
- DANGEROUS VOLTAGE: Do not touch heating elements with anything.
- Disconnect kiln before servicing.
- Do not leave kiln unattended while firing.
- Wear safety glasses when cutting glass.
- Wear firing safety glasses when looking into a hot kiln.
- Keep food away from your work area.
- Never fire tempered glass inside a kiln. It could explode.
- Avoid firing toxic materials inside the kiln.

## Additional Safety Pointers

Never leave the kiln unattended during firing. Check the kiln from time to time. Observe the normal sounds that it makes, and length of firing time. Observe the color of light around the edge of the lid.

Once you are familiar with the normal operation of your kiln, you will know when something goes wrong. If the kiln fails to shut off and becomes too hot, you will know by the length of firing time and by the color of light around the lid. Observing your kiln's normal operation is one of the most important safety precautions.

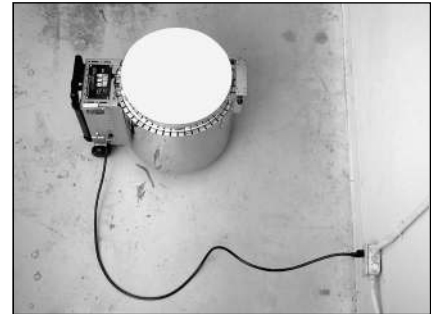
Keep the lid closed when the kiln is not in use. This keeps dust out of the kiln. Also, should someone turn on

**“My grandmother, who has taught china painting for 60 years, coached me during my first firing. I treasure the memory of that moment of my life with her.”**

the kiln while you are away, the closed lid will keep the heat safely inside the firing chamber.

Never place anything on the kiln's lid, even when the kiln is idle. If people become accustomed to placing papers and other objects on the kiln, they may forget and do that while the kiln is firing. During operation, the lid may get hot enough to burn combustible materials placed on top of it.

Remove all tripping hazards from around the kiln. Keep the kiln's supply cord out of traffic areas. Do not let the cord touch the side of the kiln, which may damage the cord. Avoid extension cords if possible.



Do not remove the ware from the kiln until the kiln has cooled to room temperature. It is possible for thermal shock to break hot ceramic pieces. The sharp edges of broken ware can injure hands.

Place the kiln no closer than 12" or more from the nearest wall. Do not let the power cord touch the hot sides of the kiln.

After firing glazed ware in your kiln, examine the shelves for glaze particles. Sharp slivers of glaze stuck to the shelf can cut hands. Before rubbing a hand over a shelf, be sure the shelf is free of glaze shards.

Fire only approved materials purchased from a knowledgeable supplier. Do not fire marbles, pieces of concrete, rocks, and other objects. Rapid heating to high temperature can cause violent reactions in many materials.

Greenware, which is unfired clay, must be bone-dry before firing. Moist greenware can explode inside the kiln, damaging the ware and the kiln. Place a piece of greenware against the inside of your wrist. If it feels cool, it is too wet to fire.

Do not fire cracked shelves. They can break during firing, damaging the ware inside the kiln. Store kiln shelves in a dry area. Moist shelves can explode inside a kiln.

If you smell burning plastic, turn the kiln off. Examine the wall outlet and supply cord for signs of burning.



Do not fire the kiln if the wall outlet is damaged by heat.

Never place extra insulation around the kiln in an attempt to conserve energy. The extra insulation can cause the wiring and the steel case to over-heat.

Keep loose-fitting clothing away from the hot kiln.

**Darcy Giesseman**

# Setting Up the Kiln

## Electrical Installation

You must plug your kiln into a circuit that no other appliance uses while the kiln is firing. Turn off the circuit breaker or unscrew the fuse for the circuit that your kiln will be plugged into. Check to see if other appliances shut off too. If that circuit powers appliances that must remain on while the kiln is firing, plug your kiln into a different circuit.



**Caution:** 120 volt kilns: avoid extension cords if possible. If you must use one, never use one smaller than 12 gauge and longer than 20 feet. Never plug it into a ceiling outlet!

Voltage fluctuation can vary firing time from as little as half to more than twice the average time. If the voltage is too low, the kiln may never reach full temperature.

The receptacle must have a separate safety grounding wire. This protects you from serious electrical shock.

## Where to Locate Your Kiln

- 1 Place your kiln in a well ventilated, covered and protected area, such as a garage or basement. If the fumes can reach a living area, install a vent hood over the kiln that ducts to the outside, or find a different location.
- 2 Remove the lawn mower, gasoline, paint, and other flammable materials from the kiln room. If you fire the kiln in a garage, park your car outside.
- 3 Provide a minimum of 12 inches' clearance between kiln and the closest wall.
- 4 Never allow the temperature of your firing room to exceed 100 - 110° F. Measure the temperature about 3 feet from the kiln. If necessary, use fans to lower room temperature. Do not fire the kiln in a small, enclosed space such as a closet.



Do not allow room temperature to exceed 100 - 110°F.

- 5 Keep the kiln away from curtains and other combustible materials.
- 6 Keep the space above the kiln clear of hanging planters and overhead shelves.
- 7 Position kiln on a level, fire-proof surface, such as a concrete floor. If you place the kiln on a concrete floor finished with linoleum tile, place a fireproof material over the tile to protect it from discoloration.
- 8 Keep unsupervised children away.
- 9 Keep the power supply cord away from the kiln case.

There is little danger of serious burn from accidental contact if you exercise the same caution you would use with an electric iron.

## Transporting the Kiln

Some people take their kilns to seminars or on vacation. The easiest way to transport the kiln is to use the original packing materials.

If you no longer have the packing materials, transport the kiln in an upright position with the lid closed. Place a thin sheet of foam cushioning between the lid and the firing chamber to prevent rubbing. Avoid subjecting the kiln to excessive vibration during travel.



A thin sheet of foam packing will prevent abrasion between the lid and firing chamber during travel.

**“Before I ever took the first ceramics class, I knew in my heart that I needed to be working with clay. It’s something that reaches back into my childhood.”**

**Sheron Roberts**

**“Centering clay has a way of putting me into that altered state where time doesn’t happen.”**

**Millie Carpenter**

# Kiln Parts

## Digital Controller

Regulate firing speed and temperature with digital accuracy. See the separate controller manual.

## Lid Latch

The latch is a reminder to keep the lid closed until the kiln has cooled to room temperature.

## Thermocouple

The thermocouple senses temperature in the firing chamber. When loading the kiln, be careful not to hit or dislodge the thermocouple.

## Ceramic Fiber Firing Chamber

Ceramic fiber is a space-age, efficient insulation. Be careful to prevent glaze and other contaminants from contacting the fiber shell.

## Collapsible Handle

Pull the handle up to move the kiln. Lower the handle before firing the kiln.

## Lid Prop

Prop the lid to vent fumes during the early stage of firing.



## On/Off Switch

Turn the switch off and unplug the kiln when not in use.

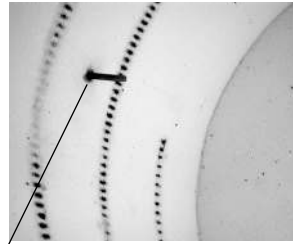
## Switch Box Fuse

The fuse protects the controller. Check the fuse if the display is blank.



## Switch Box

The electrical components are housed in the switch box.



## Embedded Heating Element

The heating element can burn out on contact with ceramic glaze, kiln wash, glass, and contaminants containing silica and silica bearing compounds.

## Case Vents

The vent slots move air through a channel between the firing chamber and outside case. This lowers the kiln's outer surface temperature.

## Ceramic Fiber Lid

Do not place anything on top of the lid, even when the kiln is not in use.

**“Working in my small studio keeps me sane and happy. I forget about everything else and am grateful to do what I do.”**

**Heidrun Schmid**

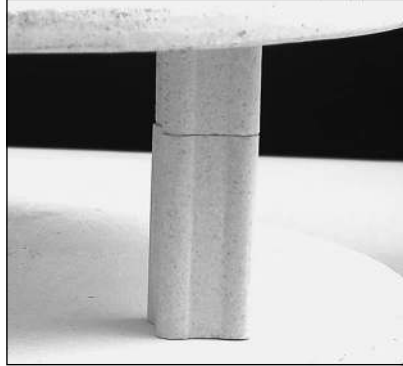
# Firing Preparation & Loading

## Shelves, Posts, Tile Setters & Stilts

These accessories can be purchased from Paragon through an authorized dealer.

### Kiln Shelves

Shelves are flat slabs of fireclay that can withstand high temperatures. Place a shelf on the kiln bottom for all firings to protect the fiber bottom. By using multiple shelves, you can stack more ware in your kiln than you could ever place on the bottom of the kiln alone. Like any other pottery, they will break if dropped.

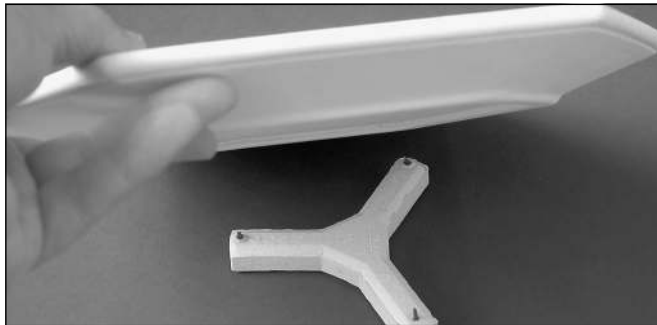


You can stack posts, but a single post is more stable.

### Kiln Posts

Posts are made from the same material as shelves. Posts support and separate the layers of shelves in a kiln. The shorter the post, the greater the stability. Posts can be stacked upon one another to achieve a greater height, but a single long post is more stable. Use 3 posts to separate shelves. Three posts are more stable than 4.

### Stilts



The stilt helps circulate air under this plate.

At high temperatures, glaze becomes molten and sticks permanently to anything it touches, such as the kiln shelf. Stilts prevent this. A stilt is a ceramic base embedded with high temperature wire. The stilt suspends glazed ware on the wire points to sep-



Straightening a stilt point.



Removing stilt marks with a stilt stone.



Cleaning stilt wire with a stilt stone.

arate the piece from the kiln shelf. Stilts also allow air to circulate around large, flat pieces.

Stilts can be used in firings up to 2000°F. They cannot be used to fire porcelain and stoneware, which fire to cone 6 - 10. At those temperatures, the wire points would embed into the clay. Stilts, however, can be used to fire overglaze onto porcelain at china painting temperatures.



Load ornaments onto a stilt post.



Triangular stilts are general purpose for cups, bowls and saucers.

Stilt points are made of a high temperature metal alloy. You can straighten metal points by bending gently with pliers. Remove glaze buildup on the points with a stilt stone or emery cloth. The oxidation of the wire can discolor the glaze at the stilt mark. Cleaning the wire points with a stilt stone solves that problem.

Stilts come in a wide variety of shapes and sizes. The



Bar stilts support longer pieces and pieces with a large hollow base.

3-point triangular stilts support bowls, plates, and cups. Bar stilts support longer pieces. Load ornaments and eggs on stilt posts.

Be careful when you remove the stilt after firing. The stilt points leave a sharp edge in

the glaze. Handle the ware carefully to avoid injury. Remove the sharp stilt marks with a stilt stone.

### Tile and Plate Setters

These are holders used to stack plates and tiles inside the kiln. Firing plates and tiles is more efficient with a tile or



The tile setter saves space inside the kiln.

plate setter than placing these items flat on the shelf. The setters not only save space in the kiln but also allow air circulation around the ware, preventing warping and breakage. The ware heats more uniformly in a setter than when placed directly onto a kiln shelf.

### Bead Rods

Bead rods are used to fire glazed ceramic beads. The rods are made from nichrome wire, which can withstand high temperatures. The beads must not be glazed inside the hole and around the edge of the hole. String the beads onto the bead rods. The beads must not touch. Suspend the bead rods between two posts.



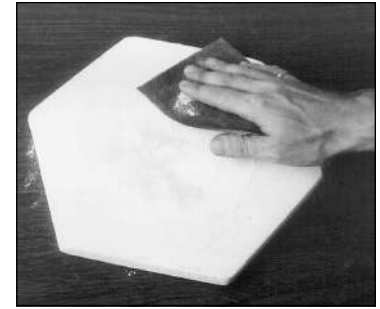
Fire glazed beads on a bead rod suspended between two posts.

## Kiln Wash and Glass Separator

Kiln wash and glass separator are mixtures of finely ground minerals that do not fuse at high temperatures. They act as a barrier against glaze and glass. The kiln shelf must be coated with kiln wash or glass separator to keep ceramic glaze and glass from sticking to it. Without a barrier, the glaze or glass would embed permanently into the shelf.

(Both glass separator and kiln wash will be referred to as “separator.”) A coat of separator will usually last for many firings. When the shelf coating begins to crack or chip, apply

a fresh coat. When recoating a shelf, remove most of the old coating with grit cloth (available from Paragon). This is an abrasive-coated mesh that allows residue to pass through. You could also use coarse sand paper. Removing the old coating gives you a smooth surface to start with. Wear a respirator when removing separator. Then recoat the shelf using the following directions.



Use grit cloth to remove most of the old separator. Then apply a fresh coat.

**Caution:** Do not apply separator to the ceramic fiber firing chamber walls, lid, or bottom. Contact with separator will destroy the heating element, which is embedded in the walls.

**1** Mix the separator with water following the directions on the bag. Stir.

**2** Use a haik brush or a soft paint brush to apply the separator to the shelf. (The haik brush is easier to use because it lays down a more even coating.)



Applying separator to the shelf.

Each time you dip your brush into the separator mixture, swirl the brush around the bottom of the container. This is because the separator settles quickly. Start the brush stroke near the center of the shelf and work toward the edges. This is to avoid a buildup of separator on the edges.

**3** Use two or three thin coats changing the direction of the brush stroke 90° with each coat. Let the separator dry for a few minutes between coats. Do not apply thick coats; they tend to flake off.

**4** Dry the shelf completely before firing.

**Note:** Remove any buildup of separator from the edges of the shelf by tracing around it with a finger. Excess separator may break off the edges and fall onto ware positioned below the shelf.

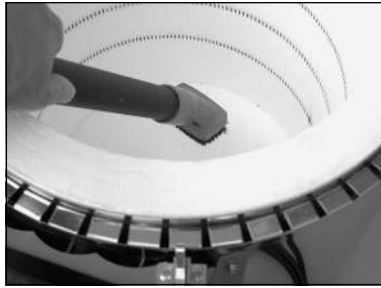
**Note:** Place pyrometric cones (pages 12 - 13) only on separator-coated shelves. But do not apply separator onto pyrometric cones. It changes the maturing temperature of the cone.

If glaze or glass sticks to the shelf, scrape it off with a putty knife at a sharp angle. Wear safety glasses—sometimes chipped glaze becomes airborne. Then recoat the bare spot with more separator.



## Vacuum the Kiln Regularly

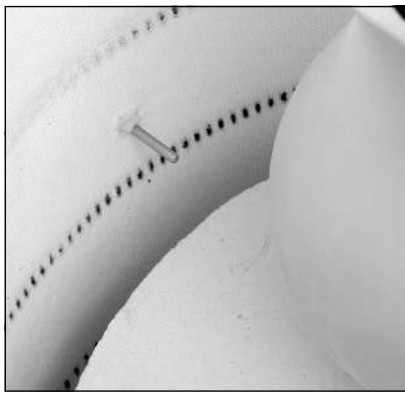
Keep the firing chamber clean. Dust falling on molten glaze leaves pinholes and other imperfections. Vacuum the kiln with the soft brush nozzle of a vacuum cleaner. Clean the inside lid surface, walls, bottom, and the underside of shelves, especially before a glaze firing. Vacuuming is one of the most important steps in firing a kiln.



Vacuum the kiln with the brush attachment of a vacuum cleaner.

## Check the Thermocouple

You will find a rod, called the thermocouple, extending into the firing chamber. The digital controller senses temperature by reading a small voltage from the thermocouple. If the tip of this rod is pushed out of the firing chamber, the kiln will assume that the firing chamber is cold. This will result in an overfire, which can damage your kiln. When loading the kiln, check that the rod extends into the firing chamber by the correct amount.



The thermocouple measures temperature inside the kiln. Keep shelves and ware at least 1" away from the thermocouple.

- A 1/8" diameter thermocouple should extend into the firing chamber 1/2" - 5/8".
- A 1/4" diameter thermocouple should extend into the firing chamber 1" or more.
- Keep shelves, posts and ware at least 1" - 1 1/2" away from the thermocouple.

## The Basics of Kiln Loading

- 1 Always place a shelf in the bottom of the kiln for every firing. This protects the ceramic fiber bottom. The shelf should be coated with kiln wash.

**Caution:** Never fire glass or glazed ware directly on the kiln's ceramic fiber bottom. Always fire these items on a shelf.



- 2 To make full use of your kiln's firing capacity, group similar sizes of ware together inside the kiln.

- 3 Place taller pieces on the top shelf.

- 4 Keep ware at least 1" away from the heating element. If the tip of a large piece of ware comes closer than 1" to the kiln wall, position that section of ware between rows of element.

- 5 For stability, stack posts so that they are directly in line with each other vertically.

- 6 Minimum spacing between shelves is 2 1/2".



Posts in each layer should be at least 1" taller than the ware. Minimum spacing between shelves is 2 1/2" as shown above.

- 7 Stack shelves so there is at least one row of element between any two shelves.

- 8 Posts used with each shelf layer should be at least 1" taller than the ware.

- 9 Keep ware and kiln shelves 1" - 1 1/2" away from the thermocouple.

- 10 If possible, load the top shelf to a height where one element row is between the top shelf and the top of the kiln.

- 11 When loading ware and shelves, do not dislodge the thermocouple.

- 12 Do not move the kiln or bump into it after you have loaded it. This could topple the ware inside.



Group similar sizes of ware together. Place taller pieces on the top shelf. Line up posts vertically.



Have at least one row of element showing above the top shelf, if possible.

# The Basics of Firing the Kiln

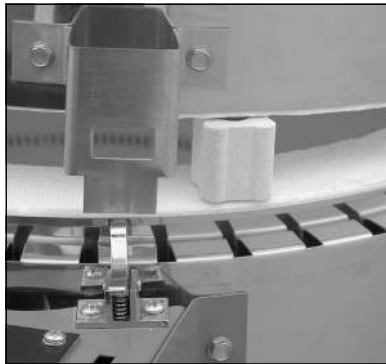
## Venting the Lid



Your Home Artist kiln is equipped with a lid prop. During the first stage of firing, raising the lid with the prop allows gases and water vapor produced by the ware to escape.

**Note:** If you do not prop the lid when firing items that release moisture, the vapor will be pushed out of the firing chamber wherever it can escape, resulting in rust to the steel case and switch box.

For lusters and overglazes, you may need additional venting. In this case, you can raise the lid an extra inch with a short ceramic post.



Do not prop the lid to rush the cooling of the ware. This can damage the ware. Never open the lid until the kiln has cooled to room temperature.

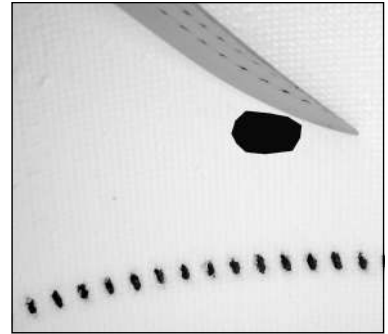
## Protecting the Heating Element

Contact with silica or silica bearing compounds, such as kiln wash, glass separator, alumina hydrate, glass, enameling powder, and ceramic glaze, will ruin the heating element. *Never fire glazed ceramic ware or glass directly on the firing chamber bottom. Use a ceramic shelf to protect the bottom from glaze drips, glass and enameling powder.*

**Caution:** Your kiln's heating element is embedded in the walls of the firing chamber. Materials such as glass and glaze, if absorbed into the fiber walls, can ruin the element. This type of damage is not covered by warranty. Prevent glass separator, kiln wash, and alumina hydrate from falling from a shelf onto the firing chamber. These materials can destroy the element.

**Note:** If a contaminant such as dripping glass or glaze embeds into the firing chamber, unplug the

kiln. Allow to cool to room temperature. Gently scrape off the contaminant with a knife, being careful not to damage the heating element. Vacuum the kiln.



Removing spattered glaze from the ceramic fiber wall with a knife. Caution: unplug kiln. Avoid disturbing the element.

- Be sure to vent glazed ware by propping the lid during the first stage of firing. Glaze fumes can eventually crystallize on the firing chamber and element if the kiln is not vented.
- If you pour slip to make greenware, keep the kiln away from the pouring area. Do not allow anyone with a glaze brush near the kiln. It is easy for glaze to end up on the element.
- Keep glazed ware at least 1/2" away from the kiln walls. It is possible for glaze to bubble and splash onto the kiln during firing.
- If you smooth out glaze imperfections before loading the ware into the kiln, do it away from the kiln. The airborne glaze powder can contaminate the element.

## The Basics of Firing Clay

Do not fire plaster, plaster of paris, or polymer clay in the kiln. Do not fire anything that requires a temperature higher than 2000°F, such as stoneware and porcelain. You will probably fire mostly slip-cast earthenware clay and porcelain china blanks.

Clay is fired twice. The first firing is the greenware, or bisque, firing. The second is the glaze firing. The greenware firing hardens the raw clay so that it can accept glaze. If greenware were glazed, the moisture in the glaze would weaken the unfired clay.

**Note:** Greenware is unfired clay. Bisque is fired clay that has not yet been glazed.

## Burning Off the Carbons

Slip-cast clay is made by pouring clay into a mold, then after a short period, pouring most of the clay back out of the mold. Slip-cast ware, as a result, is hollow inside. Most slip-cast clay can be fired rapidly.



The larger and thicker the ware, the slower it must be fired. If you are in doubt about how fast to fire, then use your digital controller's slow rate. Clay contains carbon and gases that must be released during firing. Venting the lid and firing

Slip-cast ware is hollow. If the clay is solid and very thick, it will break in the kiln.

at the correct speed give gases sufficient time to escape. Firing too fast or without venting can result in these defects:

■ **Breaking** The ware can explode if water escapes too quickly.

■ **Black coring** When you break the piece, a black line appears down the center of the clay's cross section. The carbon burned out of the clay surfaces but not all the way through the cross section of the clay.



A cross-section of the fired clay shows a black line. This is carbon that did not burn out completely.

■ **Bloating** The gases escaped too rapidly, causing the clay to become bloated.

■ **Glaze bubbles and pinholes**

Carbon that did not burn out during the greenware firing is released during the glaze firing. Escaping gases rupture the glazed surface, causing bubbles and pinholes.



Pinholes from underfired bisque.

■ **Porosity** The fired ware will be weaker.

## Removing the Ware from the Kiln

Wait until the kiln cools to room temperature before removing the ware. In some cases, opening the lid too soon can cause crazing (tiny cracks in the glaze).

## Firing Log Book

Record the following information in a firing log book:

- Date
- Firing cone, speed and hold; or Ramp/Hold program
- Starting time
- When the lid was lowered from vented position
- Total firing time
- Type of pieces
- Firing results
- Ceramic firings: a sketch of the bent cone (pages 12-13)

Keeping a record of firings takes just moments. As you gain experience, you will find a wealth of information in your record book. It will

help you schedule firings, because you will know how long it takes to fire each type of ware. The log book will help you determine, for instance, if the kiln will shut off in time for an appointment you have to keep, or whether you should begin the firing when you return home.

## Preventing Overfires

**Caution:** The warranty on your Paragon kiln does not cover damage from overfiring, regardless of the circumstances. It is the operator's responsibility to make sure the kiln turns off at the proper time.

Your Home Artist kiln is equipped with a digital controller, which accurately adjusts the firing rate and shut-off temperature for the cone you program. However, it is still possible to overfire the kiln. An overfire can damage not only the ware and kiln furniture; a severe overfire can destroy the firing chamber, requiring a complete replacement.

The following guidelines will help to prevent overfirings. Please make them a habit:

- When loading the kiln, check that the thermocouple extends into the firing chamber by the correct amount. See page 9, left column.
- Ceramics: It is important to program the correct cone (pg. 12 - 13). Firing the ware too hot can melt the clay, ruining the kiln shelf. If the clay runs off the shelf, it can ruin the kiln bottom. Before firing, use Program Review to check that you have programmed the correct cone.
- Use Program Review to be sure you have not inadvertently programmed an extended hold time. This can overfire the ware.
- As a safety precaution, learn to judge temperature by the color of the firing chamber. (The color of the interior appears as a line of light at the seam between the lid and the kiln wall.) With experience, you can tell, by the color around the lid, how hot the interior is. If the controller malfunctions and the kiln becomes too hot, turn off the kiln. Indications of an overfire: the firing time is longer than usual, and the interior color is too bright.

### Color Temperature Chart

Color	Cone	Degrees F
Lowest visible red to dark red	022 to 019	885 to 1200
Dark red to cherry red	018 to 016	1200 to 1380
Cherry red to bright cherry red	015 to 014	1380 to 1500
Bright cherry red to orange	013 to 010	1500 to 1650
Orange to yellow	09 to 03	1650 to 2000
Yellow to light yellow	02 to 10	2000 to 2400

**"When you concentrate on making a pot, you have no time to dwell on your problems. I know a therapist who used clay in working with suicidal teens. She has worked wonders with these kids."**

**Mike Gordon**

## Power Failures

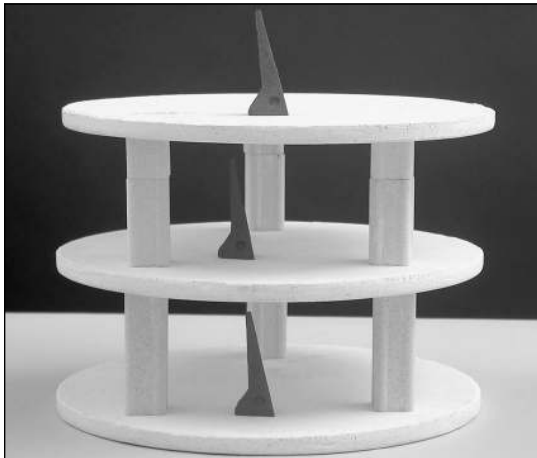
If a firing that has reached red heat is interrupted by a power failure, it is best to resume firing before the kiln cools below red heat. Press the **START** key to resume firing.



## Your First Firing

For your first firing, position only the kiln-washed shelves and an 06 cone in the kiln. Fire the kiln without ware. Fumes from clay or glaze may interfere with the formation of an oxide coating on the element during the first firing.

- 1 Clean the kiln with the brush attachment on a vacuum cleaner.
- 2 Apply kiln wash to the tops of the shelves.



During the first firing, do not fire ware. Fire only empty shelves and posts.

- 3 Load the shelves into the kiln, separating them with posts. Place an 06 cone on one or more shelves. Air must circulate around the empty shelves; they may crack if you stack them in the bottom of the kiln without posts.
- 4 Prop the lid with the lid prop.
- 5 Program the firing for an 06 cone. See the separate instructions for your digital controller. Press **START**.
- 6 Close the lid from the vented position after one hour.
- 7 After the kiln shuts off, allow the kiln to cool to room temperature before opening the lid.

**Note:** Do not be concerned about the clicking noise your kiln makes during firing. Your kiln contains a relay, which sends power to the element. The relay clicks as it cycles on and off to maintain the correct temperature.

# Firing Clay

## Pyrometric Cones

Ceramists of the past judged when the firing was completed by the color of the heat and length of firing. In 1886, a German ceramist named Seger made clay cones that bent when the ware received the proper heat work. He positioned the cones on a shelf inside the kiln. By looking through a view port in the kiln, he could see the cones bend and knew when to turn off the kiln. His cones took the guesswork out of firing.

Today we still use Seger's cones. They are small pyramids of clay and mineral oxide that soften and bend when exposed to heat. When consulting your dealer with a glaze problem, you should have a bent cone from that firing. The cone will help trouble shoot the problem. The cone lets you compare one firing to the next. If the cone bends less and less with each firing, it indicates that the thermocouple is wearing and will soon need replacement. Without cones it would be difficult to know that.



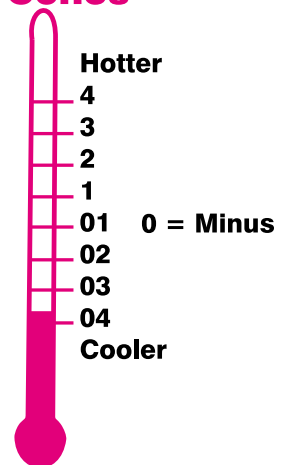
Self-supporting cones must be broken apart before use. Note that the cone number is stamped on the base.

Cones are manufactured by the Orton Ceramic Foundation and available from your distributor.

## Cone Numbers

The most confusing thing about cones is the way they are numbered. But once you understand the reason behind the numbers, the system becomes clear. Pyrometric cones are numbered from 022 through 01 and 1 through 10. Cone 022 matures at the lowest temperature, and 10 matures at the highest. Seger numbered his original cones from 1 to 20, with 1 being the lowest temperature. Later, cones of even lower temperatures were needed, so new numbers were added. The new numbers started with "0" and went from 01 to 022, with higher numbers getting progressively cooler.

### Pyrometric Cones



To avoid confusion, think of the "0" as minus. Numbers without the "0" are positive. The higher the positive number, the higher the temperature. "0" numbers are negative. The higher the negative number, the lower the temperature. With this understanding, you can quickly see that cone 5 is

hotter than 05. The number is stamped on the base of the cone. The cone number for each material is usually stated on the label by the clay or glaze manufacturer. Your supplier can also give you the cone number.

## Heat Work

Cones are rated by temperature. But it is more accurate to think of them as measuring heat work, not temperature alone. Heat work is the combined effect of time, temperature, and the atmosphere inside the kiln. All these factors affect the maturity of your ware and not just temperature. For instance, firing to a lower temperature for a longer time will produce the same maturity as firing to a higher temperature for a shorter time.

Consult your supplier for recommended firing rate. (Rapid firing is like cooking: the turkey may be done on the outside but not on the inside.)

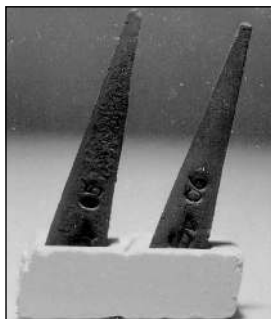
## Using Cones

Place the cone on a kiln shelf with the ware or on a blank tile. Kiln wash shelves or tile before placing cones on them. (See page 8.) You do not need to place a cone in every firing, though it is a good idea to do so. The cone slants 8 degrees from vertical and bends in the direction of the slant. Place the cone so that it will not touch nearby ware as it bends. Cones come in either standard or self-supporting. Standard large cones must be mounted in a clay or wire plaque with 2" of the cone exposed above the cone holder. Self-supporting cones stand upright without holders. We recommend self-supporting cones; they are easier to use than standard large cones.

Handle cones carefully. If dropped, they may develop cracks that could affect their performance. Age and normal humidity do not affect the accuracy of cones. However, do not use them if they become wet. For more information on pyrometric cones, see your kiln's digital controller manual.



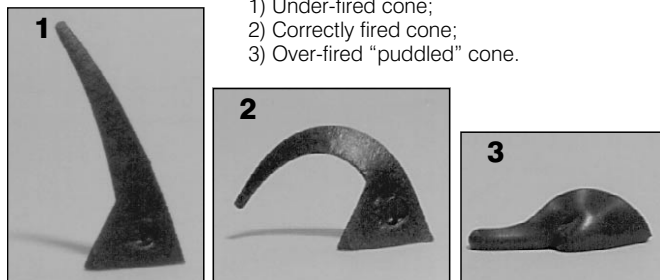
Position the cone so that it will not touch nearby ware when it bends.



Standard large cones require a clay or wire plaque to hold them upright.

### Bending results

- 1) Under-fired cone;
- 2) Correctly fired cone;
- 3) Over-fired "puddled" cone.



# Low-Fire Greenware

Clay is fired in two separate firings: the greenware firing and glaze firing. You can buy ware that has already been through the first firing. It is called bisque ware. Simply glaze the bisque and fire again. If you are firing greenware, read this section. If you are doing only glaze firings, skip to the next section, page 15.

## Drying the Clay

Greenware should be completely dry before you place it in the kiln. Moist greenware can rust the kiln and can explode if fired too fast. Some people use an infrared light bulb to dry the clay. It may be necessary to use a dehumidifier. Dry the ware evenly. A raised surface, such as a rack, will help air to circulate freely around the clay. Do not dry the clay too rapidly, especially thick pieces, or the clay will crack.

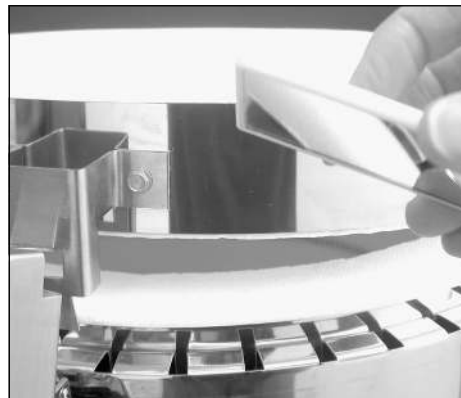
- 1 Give the greenware enough time to dry. Drying time depends on humidity.
- 2 Touch the greenware to the inside of the wrist or to the cheek. If it feels warm, it is usually dry. *Dry longer if it feels cool.* (Note that in humid areas, even damp greenware can feel warm. The humidity causes the moisture in the greenware to stop evaporating.)
- 3 If you live in a humid area and the greenware is still moist after an extended drying time, load it into the kiln. Prop the lid with the lid prop. Fire to 200°F/93°C at a rate of 100°F/55°C in Ramp-Hold mode. Maintain 200°F/93°C hold until the greenware dries completely—usually 2 hours of hold time. (See the separate controller instruction manual.)

**Caution:** Do not fire the greenware higher than 200°F/93°C until it has completely dried.

## Testing for Dryness with a Mirror

Hold a mirror above the propped lid for a few seconds where hot air from the kiln will move across the mirror's surface. If the mirror fogs, the greenware is still releasing moisture. Keep the lid propped and hold 200°F/93°C until the mirror no longer fogs.

The mirror must be at room temperature for this test. The mirror fogs when moisture in the hot air condenses on the cooler mirror. If you hold the mirror too long near the kiln, the mirror will heat up and will no longer fog when moisture hits it. So hold it at the lid for only several seconds at a time.



## Loading and Firing Low-Fire Greenware

Low-fire greenware has a firing range from cone 06 to 02. The greenware must be bone dry before firing. Otherwise, it will crack or even explode during firing. Check for dryness by touching to cheek or the inside of a wrist. Ware will be cold if not dry. Another indicator of moisture is patches of darker color in the clay.

Handle greenware carefully. Cradle the pieces from the bottom. Do not lift by a rim. Low-fire greenware pieces do not stick together during firing. Therefore, greenware may be stacked so that it touches each other. Place small items around larger ones. You can also place light greenware pieces inside larger ones. This is called nesting. Be sure that



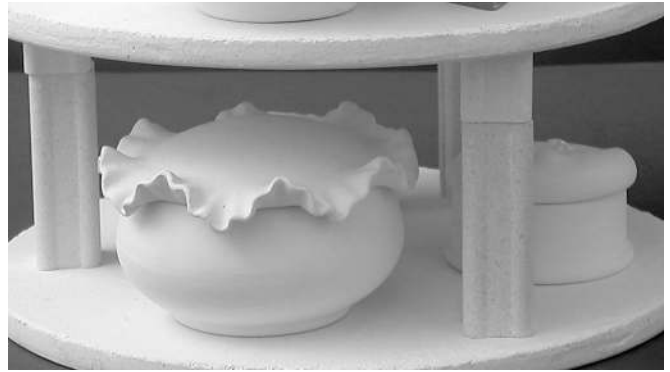
"Nested" greenware must not be loaded too tightly.

there is plenty of room for expansion inside the larger pieces. Pack nested pieces lightly so that heat can still circulate freely around each piece. Black rings in the fired ware indicate that the nested pieces were packed too tightly to burn off all the carbon.

Greenware does not need stilts. Fire ware in the position in which it will be used when finished, except for large pieces with flat, vertical surfaces such as wall plaques and clocks. These should be fired flat to prevent warping. Pieces to be used together, such as a box with its lid, should be fired in place to ensure a good fit. You can also stack mugs and bowls rim to rim.



Fire greenware box and lid together to ensure a good fit.



Lids and bowls are fired together in the greenware firing.

Low-fire greenware firing is simple. Just be certain the greenware is fired to the pyrometric cone recommended by the clay supplier. If the greenware is not fired hot enough, the piece will absorb moisture after it has been glaze-fired, causing the glazed surface to crack. This is called "crazing" and is most often due to underfired greenware. To help eliminate crazing, fire greenware at least one cone hotter than glaze, and even hotter if glaze can still be applied easily to the hard bisque. While glaze may be applied to greenware and fired once, separate firings produce better quality, so we do not recommend single firing of greenware and glaze.

Allow the kiln to cool to room temperature before opening the lid.

## Greenware and Glazed Ware In the Same Firing

The clay is fired in two separate firings: the greenware, or bisque, firing, and the glaze firing. Greenware should not be fired in the same load as glazed ware. Not only do the two types of ware mature at different temperatures, but gases from the greenware can discolor the glaze and also cause glaze bubbles.

If you must fire greenware and glaze pieces in the same load, place the glazed pieces in the bottom of the kiln and the greenware pieces on a shelf above.

**"The profound experience of working with clay is to have a three dimensional image in your head, and then have it come out through your hands."**

**Marie Gibbons**

## Low-Fire Glaze

Your hands must be clean when touching glazed ware. Oil and hand lotion will leave finger prints. If you scrape off or damage the color during handling, you can usually repair it by applying more glaze over the damaged spot before firing.

The difference between loading greenware and glazed ware is that glazed pieces must not touch each other, the floor, or a shelf in your kiln during firing. If this happens, they will be permanently bonded together and ruined by the melted glaze.

The natural expansion and contraction of the ceramic fiber during each firing generates tremendous stresses within the firing chamber. As a result, fine grains of dust may form on the firing chamber and should be removed before each firing. Vacuum the walls, bottom and inside surface of the lid with the soft brush nozzle attachment of a vacuum cleaner.

Glaze and clay must expand and contract at the same rate. If the glaze shrinks more than the clay, the glaze will “craze,” forming small cracks. If it expands more than the clay, it will “shiver,” breaking off in sections. Test each clay and glaze combination using clay scraps such as broken bisque pieces.



Use stilts to separate the ware from the kiln shelf.

Use stilts to support low-fire glazed ware during firing. The shelf tops and floor *MUST* be kiln washed with all purpose, high fire kiln wash for protection from glaze drops.

**Note:** Kiln wash only the top side of the shelf. Kiln wash on the underside of the shelf will flake off onto glazed ware placed below the shelf.

**Caution:** Never apply kiln wash to the ceramic fiber floor of the Home Artist Kiln.

Glazed pieces must be thoroughly dry before firing and should not be fired with greenware unless both mature at the same cone. Even then, separate the glaze from the greenware by loading glazed pieces in the bottom of the kiln and greenware on shelves above. Low-fire glaze usually fires to a lower cone than greenware, so firing time will be shorter if glazed pieces are loaded separately.

Check to make sure that first, no two pieces of glazed ware are touching each other, the kiln walls, the floor or the shelves; and second, that the underside of the kiln shelf is clean before you place it over glazed pieces. Any dust falling on your ware will cause pinholes.

To eliminate stilt marks, you can prevent glazed pieces from sticking to the shelf by “dry foot-

ing.” This is an alternative to stilting. To “dry foot” a piece, remove all glaze from the portion of the piece that will rest on the shelf. Using a wet sponge or a piece of grit cloth, clean off the glaze from the bottom of the ware and slightly above the base so that it will not run down and touch the base. Do not use dry footing for low-fire glazed pieces that will be placed in water while used or cleaned. The unglazed areas will absorb water, which can cause glaze crazing.



“Dry footing” means removing the glaze from the base of the piece. This eliminates the need for stilts.

Vent the lid with the lid prop for about an hour. Red glazes should be placed in the top of the kiln for extra venting. Separate clear glazes from colors. Load clear glazes in the bottom of the kiln and colors above them. Pieces that go together, such as a cup and saucer or bowl and lid, should be placed next to each other. This helps assure uniformity in color. Keep pieces  $\frac{1}{4}$  to  $\frac{1}{2}$ ” apart. The bubbles and gases emitted from glazes can contaminate other nearby pieces. If you are firing ware draped with lace, vent the lid until all smoke disappears.

To keep holes in glazed salt and pepper shakers from closing in with glaze, insert tooth picks in the holes. They will burn away during the firing.

Allow the kiln to cool to room temperature before opening the lid.

Feel free to experiment with firing speed using throw-away samples of bisque. Some glazes look better when fired at a particular speed.



In the greenware firing, a bowl and lid are fired together. In the low-fire glaze firing, they are kept separate as shown above.

Remove the stilts from the ware after firing by breaking the thin film of glaze holding them. Handle with caution. Remove the sharp stilt edges by rubbing with a stilt stone, electric grinder or hand grinder. (See photo, page 7.)

**“Many of our customers, in very stressful jobs, find release through clay. One, a doctor, found clay to be the road back from a mental breakdown.”**

**Stephen Mills**

# Overglaze

Overglaze is decoration applied over fired glaze or polished porcelain bisque. Overglazes include china paints, gold, and luster, which fire from 022 to 014.

Use stilts to increase the flow of heat under the pieces, and make sure ware is not touching other ware. Hard-bodied porcelain can be stilted. But do not stilt soft-bodied ware such as bone china. The stilt would embed into the glaze. Ware must be completely dry before firing. Remove smudges and fingerprints from the bottom of pieces. Wipe dust off the pieces with a soft silk cloth.

**Note:** Use stilts to increase the air flow under pieces with large, flat surfaces, or sections that vary in thickness. You can place small pieces directly on the kiln shelf.

Test fire all china paints on the glazes you are using. China paints will crack or peel if applied heavily. Apply several light coats instead, firing between each, until you get the shade you want. Not all china paint colors reach maximum color saturation at the same temperature even when fired on the same ware. So you must know which colors you should fire first at higher temperatures to prevent burning out the original colors in later firings. For example, reds mature at a lower temperature than other colors and are fired after the other colors have been fired. Do not fire reds and yellows side by side. Colors also mature at a lower temperature on ceramic pieces than on porcelain or hard china. Check the overglaze manufacturer's literature for information on which cone to use with each color and type of ware.

Tiles and other large, flat pieces sometimes crack when placed flat against a shelf. Use tile setters to distribute heat



Firing plates vertically minimizes the chance of debris falling on them during firing.

evenly around the pieces, or place them on top of a stilt for air circulation. The vertical plate holders minimize the chance of debris inside the kiln from falling on the plates. But firing plates horizontally is necessary when using certain decorations. In this case, you can use either a horizontal plate



Separate horizontally stacked china painted plates with stilts. Do not stilt soft-bodied ware such as bone china.

holder, or place a triangular stilt under the bottom plate, and a stilt between each plate stacked on top. Stacking plates with stilts should be limited to 3 or 4 plates. Line the stilts vertically.

**Note:** When separating horizontal plates with triangular stilts, load the plates gently. Otherwise the china painted plates will scratch.

When firing overglaze, vent the lid with the lid prop until all smoke and odor from china paint oil and other organic materials has vanished. How long this takes depends on how much decoration is on the ware. Gold and lusters will look dull if not vented. Some colors, such as red, need especially thorough venting. To be on the safe side, you can leave the lid in vented position throughout the entire overglaze firing.

The kiln can be fired at the kiln's Fast speed for most overglazes. Larger pieces should be fired slower. Some materials, such as bone china, also need a slower firing. China paints fired at a slow speed absorb more thoroughly into the glaze. If you are in doubt about speed, fire slower. It is not worth risking pieces you spent time on to fire the kiln fast.

Use the kiln's hold feature to soak china paint at the firing temperature. A 15 - 20 minute hold gives china paints time to absorb more deeply into the glaze. Before firing valuable pieces, do a test with hold time. Too much hold time can burn out china colors.

Slow cooling is important for some materials, such as gold. Glass paste on porcelain should also cool slowly. Be sure the kiln room is well ventilated. Allow the kiln to cool to room temperature before opening the lid.

## Decals

Squeeze bubbles out of the decal when applying. Vent by leaving the lid open all the way until the fumes burn off. Then prop the lid throughout the rest of the firing.



# Glass Fusing & Slumping

You will probably fire mostly stained glass, but you can also fire standard float (window) glass. Some types of float glass devitrify (form a dull, frosty surface) when fired.

**Caution:** Never fire tempered glass. It could explode if heated inside a kiln.

## Basic Glass Tools

**Reservoir Glass Cutter** uses a reservoir of oil to lubricate the cutter wheel.

**Running Pliers** are for cutting large pieces of glass.

**Breaking Pliers** are for cutting small strips.

**Grozing Pliers** shape the glass by chipping away the edges. They are often used when the score line doesn't break cleanly. Note that rough edges will become smooth when fired to fusing temperature.

## How to Cut Glass

**Note:** IMPORTANT! Wear safety glasses when cutting or chipping glass.

- 1 Lay the glass on a clean surface. Mark off the cut with a grease pencil or felt-tip pen. A small mark on each end of the glass will do. Lay a wooden straight edge over the glass and line it up with the marks you just made.



- 2 Hold the straight edge firmly and score the glass with the glass cutter. Press just hard enough so that the scoring noise sounds steady and unbroken.

- 3 Place the straight edge under the glass so that an edge is lined up with the score line you just made. Press down on the glass. It will break cleanly.

## Fusing Compatibility of Glass

When glass changes temperature, it expands and contracts. The rate at which glass changes size is called the *coefficient of thermal expansion*. If you fuse two glass pieces together and one changes size faster or slower than the other, the fused piece may crack—even several months after removing from the kiln.

When different glasses have a close enough coefficient of expansion to fuse successfully, they're called *fusing compatible*. Buy glass labeled fusing compatible. Or fuse glass that has been cut from the same sheet, which guarantees compatibility.

## Fusing Compatibility Test

- 1 To test glass for compatibility, fuse small ½" square sample pieces of different glasses onto a larger base piece of clear transparent. It should extend beyond the small sample pieces by half an inch on each side. One of the sample pieces should be cut from the base piece.
- 2 Heat the glass to a temperature that completely rounds the edges of the small sample pieces.
- 3 After the glass cools, place a polarizing filter under the glass and another filter over the glass. Look at the glass with light shining through it (hold it over a lamp). Turn one of the filters until the filters are at their darkest.

## Results of the Test

If you see a halo around the edges of the small glass samples, this usually means the glass is not compatible. If you see no halo, the glass is fusing compatible.

Why did we include a sample square cut from the base transparent glass? It tests for annealing. A halo around that piece means the glass was not annealed properly. Perform the test again, this time cooling more slowly through the annealing range.

## The Annealing Range

Each type of glass has a temperature range that it must pass through slowly when it cools. This is called the *annealing range*. This slow cooling gives hot glass time to release the stress of cooling. If you cool the glass too fast through the annealing range, it will break.

The larger and thicker the glass, the slower it must pass through its annealing range. You cannot over-anneal, so err on the side of caution if you aren't sure how long to anneal. Small projects such as earrings rarely need annealing time as they cool.

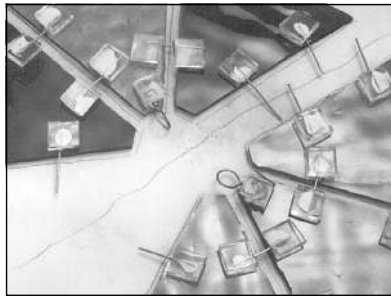
## Cleaning and Gluing the Glass

Grease, dirt, and fingerprints etch permanently into the glass during firing. Clean the glass with glass cleaner (the type without silicones), rubbing alcohol, or even plain water just before assembling the pieces on the kiln shelf.

Use white glue, such as Elmer's diluted 1:1 with water, to hold the glass pieces together after you place them on the kiln shelf. Use the glue sparingly. Glue is especially important when fusing wire into the glass. The glue prevents the glass or wire from moving out of place before they fuse. The glue disappears during firing.



Avoid using glue on the coated side of dichroic glass. If you lay dichroic glass carefully onto the piece, glue is unnecessary, so avoid it altogether if you do not know which side of the dichroic is coated.



## Loading the Kiln

Air should circulate between the shelf and the bottom of the kiln, so place three or four 1/2" posts in the kiln. Lay the shelf over the posts.

## Firing the Glass

- 1 Vent the kiln by propping the lid with the lid prop. Venting allows the gases released to escape. When the kiln reaches 500 - 800° F / 260 - 426°C, lower the lid from the vented position.



Looking at the glass during firing. Open the lid about 1". Always wear firing safety glasses when looking at the hot glass.

- 2 The first time you fire a particular brand or type of glass, program the controller for a higher temperature than the estimated fusing temperature. Watch the glass by opening the lid 1" for several seconds at a time. Shut the kiln off when the glass fuses the way you want. Make a note of the shut-off temperature. For future firings, program the kiln for that temperature and rate.

**Note:** With every firing, be sure you are near the kiln before the expected shut-off time.

- 3 After you shut the kiln off, vent the lid for 10 minutes by using the lid prop. Then close the lid.

- 4 The annealing range for most glasses is between 950°/510°C and 700°/371°C. Cool slowly through this annealing range. Leaving the door closed will slow the cooling enough for most projects. If you need even slower cooling, program a separate segment for cooling. See the kiln's digital controller manual.

**Note:** For safest cooling, leave the ware inside the kiln until the kiln reaches room temperature. If you remove the ware too soon, the sudden temperature change can crack the piece.

**"I used to have this wonderful haiku pinned up above my kiln when I had my studio:**

**"Now that my house has burned down, I have a better view of the rising moon.'**

**"During firing, I would lose stuff that I had made. Things I thought would be beautiful turned out ugly. The haiku helped me realize that I had to live with loss and 'failure' and learn from it."**

**Sandra Dwiggins**

# Imperfection

Poor firing results are naturally disappointing, especially after you have spent hours on a piece. Mistakes are an inevitable part of the learning process. They are bound to happen. The time spent making a faulty piece is never time wasted if you learn from the mistake. Use this section to find out how to make the ware better the next time.

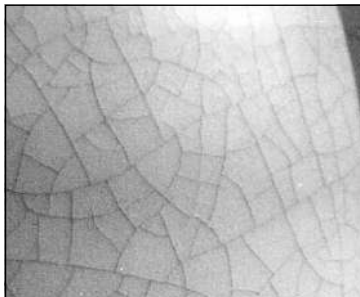
## Bisque

**Warped ware** can be caused by distorting upon removal of the piece from the mold, firing too close to the elements, or firing a piece in an unnatural position.

**Sagging ware** is usually the result of overfiring.

## Glaze

**Crazing** is usually caused by underfired bisque. Bisque should be fired to the highest temperature at which it will still take glaze. Crazed ware may be refired to the proper cone. *CAUTION: China paints and other overglazes will burn off when fired to 06.*



Crazing appears as tiny cracks.

**Glaze too thin in spots** can be caused by uneven glazing or a “hard spot” on the bisque. Ceramic glaze should be applied in flowing coats; first in one direction and the next coat in an opposite direction (horizontal, then vertical or vice-versa). Allow to dry between each coat. Some glazes may require twice the recommended coats because of thin application. “Hard spots” are sometimes the first spot where the poured slip touches the mold. Heating bisque in an oven to approximately 120 degrees F. will help in applying glaze to hard bisque.

**Crazing immediately on removing** from the kiln can be caused by not firing the ware hot enough or opening the lid while the kiln is still hot. Refire to the proper cone. Crazing in spots can be caused by not having mixed the glaze thoroughly before using.

**Black specks** in the ware are usually caused by organic materials not completely burned out in the bisque firing. This works its way to the surface during the glaze firing.

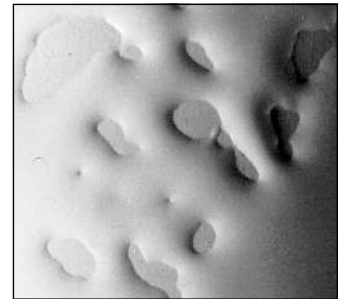
**Pinholes and bubbles** in glazed ware can be caused by too heavy a glaze application, by severe underfiring or by dust on the bisque. Underfired bisque still contains carbons that did not burn off completely. During the glaze firing, these gases rupture the glazed surface, causing pinholes and bubbles. Damp bisque can reduce the number of air pockets and pinholes that may form when glaze dries too quickly. Clean bisque with tap water or use a base coat of glaze thinned 3 parts glaze to 1 part water immediately before applying glaze in the usual manner to the bisque.

**Poor color** in colored glazes can be caused by too thin an application, placing ware too close to an element or to other glazed ware which may be incompatible, insufficient venting during the early stages of firing, or overfiring glazes in the red family.

**Light edges** on dark glass glaze pieces may be caused by the flow of the glaze away from the edges in two directions. Try an extra coat of glaze on the edges, or apply a thin coat of underglaze in the following manner: Mix 1 part water with 2 parts of suitable dark or black underglaze and brush a thin wash coat of the underglaze over the bisque ware. Then, immediately apply the first regular coat of full strength glaze. Allow to dry thoroughly between coats. Continue with number of coats recommended by the manufacturer.

**Sagging glaze** is usually caused by applying too much glaze on a vertical surface causing the glaze to actually sag when fired.

**Crawling or bare spots** on a fired piece can be caused by applying the glaze too heavily. Oil from your skin that gets on the greenware before it is fired can also cause this. Another cause may be hard spots from too much polishing of your greenware when sponging. A few drops of vinegar in your sponging water will help alleviate this problem. Crawling may be corrected by applying more glaze to these spots and refiring.



Crawling, or bare spots.

## Underglaze

**Streaks** in underglaze are usually caused by not applying enough coats to the greenware. After a piece has been decorated with underglaze and fired, you may check it for streaks by submerging it in water and immediately removing it. The piece will appear glossy, just as if it had been glazed, and streaks and thin spots will show up. The weak spots can be touched up and refired. Be sure the underglaze has been fired before putting it under water. For interesting designs, underglaze colors may be applied over unfired matte or texture glazes that do not flow.

## Overglaze

**Breaking** in overglaze firing can be caused by poorly fired bisque. A slow bisque fire is always better for ware that is to be china painted. The greenware should be completely dry *before* being placed in the kiln. Standing plates on edge or using a plate holder gives good heat circulation and will help prevent plate breakage.

**Purple spots in gold** are usually due to a thin application of gold or too much thinner. If gold is applied accidentally to an area it will show purple after being fired unless cleaned with a good gold remover.

**Broken lines** in gold can be caused by overfiring or too heavy an application. However, this can be very attractive when gold is crackled over a dark color of fired glaze.

**Peeling china paint** can be caused by the paint being applied too heavily.

**Loss of color** in china painting is usually a result of overfiring or thinning your paint with too much medium when applying.

**Faded colors in overglaze decals** are a result of either underfiring or overfiring. If pinks and reds are drab, refire to a hotter cone. When used with a china paint background, apply and fire the decals first, then china paint and fire again. Check the recommendations of decal supplier. If decal was underfired, refire to proper firing cone. If decal was overfired, the design may be repainted in china paints and refired.

**Weakening of luster colors** can be caused by overfiring.

**White spots** in lusters or metals can be caused by moisture on the ware before it was placed in the kiln or from having been fired at the same time as other overglazes. *Apply lusters only on a dry day.*

**Powdering of luster colors** can be caused by too heavy an application.

## Glass

**Glass Cracking** is caused by heating or cooling too fast or fusing incompatible glass. Not enough glass separator on the shelf can also cause glass cracking.

Most problems in fusing are caused by rushing the firing. The glass must change temperature slowly during the critical temperature range of 100° - 500° F. This critical range applies to both heating and cooling.

The second critical temperature range is annealing, which is the cooling range of 950° - 750°F average. Cool the glass slowly during this range so the stress in the glass will have time to dissipate.

If you become impatient after the glass has fused and you open the kiln for a few seconds to peek inside, you may hear a “ping,” which is the sound of glass cracking. Avoid the temptation to open the kiln. Wait until the kiln has cooled to room temperature. Some artists schedule their fusing so that it is completed before they go to bed. That way they will be asleep while the glass cools and they won’t be tempted to open the kiln while it is still hot.

After each firing, examine the shelf. Recoat if the kiln wash is chipped. When glass sticks to a bare section of shelf, the glass will crack.

**Glass Bubbles** are often caused by heating the kiln too fast. Air, grease or dirt trapped between layers of glass can cause bubbles. Other causes are uneven glass volume, and moisture or air trapped between the glass and shelf.

Make sure the shelf is completely dry before firing. If you have applied fresh glass separator, leave the shelf in the kiln at 300°F for 30 minutes before placing glass on it.

One way to eliminate bubbles is to hold the temperature at 100°F below fusing temperature for 20 minutes. This gives the shelf time to heat up to match the temperature of the glass.

**Glass Separator Sticks To Glass** when fired too hot. Instead of firing to a full fuse temperature, try firing 50°F cooler and holding at that temperature for twenty minutes.

# Maintenance

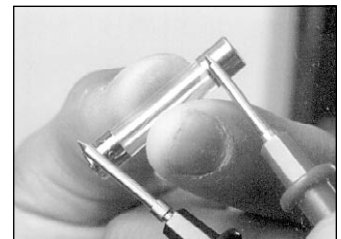
## Trouble-Shooter

### Kiln Does Not Turn On, Display is Blank

- Make sure the circuit breaker is in the “on” position.



- If the breaker is on, check the kiln’s fuse. It is located on the kiln’s switch box. Remove the fuse by pressing on the fuse holder and turning counter-clockwise half a turn. Check the fuse by placing the probes of an ohmmeter on the ends of the fuse. If the ohmmeter



reads less than one ohm (digital meter) or reads 0 ohms (analog meter), the fuse is bad. Replacement fuse:

AGC ½ A 250V AC

**Note:** If you do not have an ohmmeter, visually inspect the fuse. You will see a thin strand of unbroken wire in a good fuse. The wire usually appears broken in a burned fuse, like the filament in a light bulb.

### Circuit Breaker Trips

- If the circuit breaker trips after the kiln has fired for awhile, make sure no other appliances are operating on the same circuit as the kiln. The breaker may need replacing. The breaker may have tripped due to loose connections in the breaker box. If the fuse or circuit breaker panel feels unusually warm, have your electrician check for loose connections, particularly at the center screw of the fuse socket, even in a new fuse box.



- If the circuit breaker trips immediately after the kiln is turned on, the kiln may have a short circuit. Unplug the kiln. Open the kiln switch box and look for a loose wire touching the case.

## Temperature is Inaccurate

- Make sure the thermocouple extends into the firing chamber by the correct amount:  
A 1/8" diameter thermocouple should extend into the firing chamber 1/2" - 5/8".  
A 1/4" diameter thermocouple should extend into the firing chamber 1" or more.
- If the temperature is inaccurate even though the thermocouple extends into the firing chamber correctly, replace the thermocouple.

## Replacing the Thermocouple



- 1 UNPLUG the kiln.
- 2 Remove the screws on the sides of the switch box that hold it to the kiln. Gently lift the box away from the kiln.
- 3 Remove the two screws securing the thermocouple ceramic block to the kiln. Remove the thermocouple assembly from the kiln.
- 4 Slide the new thermocouple assembly into the hole in the kiln wall. The thermocouple should protrude into the firing chamber 1/2" - 5/8" for a 1/8" diameter thermocouple, and 1" or more for a 1/4" diameter thermocouple. To adjust the thermocouple length, change the gap between the thermocouple and the



Insert the new thermocouple into the kiln wall. Adjust to the proper length. Then tighten the ceramic block screws holding the thermocouple.

ceramic block. Then securely tighten the 4 screws in the ceramic block.

- 5 Fasten the ceramic block to the heat shield with the two screws removed in step 3.



- 6 Remove the 4 screws holding the controller faceplate to the top of the switch box. Lift out the faceplate.
- 7 Remove the 2 thermocouple wires attached to the back of the controller. They are held in place by button or lever type connectors. To remove the wires, lift the levers (or press down on the connector buttons) and pull the wires out.
- 8 Strip 1/2" of insulation from the ends of the new thermocouple wires. Be sure the wire ends are separated where the insulation has been stripped. If bare ends touch, the thermocouple will not work properly.
- 9 Attach the wires to the back of the controller. One wire is yellow, the other red. Make sure the wires connect to the correct terminals, which are color coded. Reinstall the controller to the switch box.

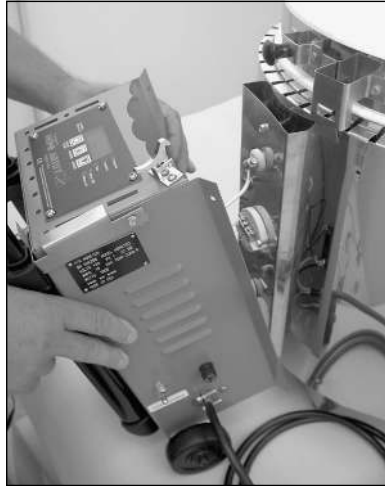


- 10 Position the thermocouple wires so they are away from the hot sides of the kiln case and other electrical wires. (Placing thermocouple wires next to or looped around other wires could cause erratic controller readings.)  
Press the buttons on the back of the board to remove the thermocouple wires shown here. Observe color coding.
- 11 Check that no wires touch the kiln case or element connectors. **Wires touching element connectors or kiln case will burn.** Reinstall switch box.

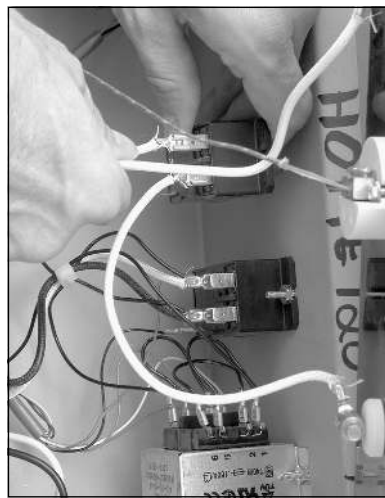
## Replacing a Relay or Transformer

1 UNPLUG kiln.

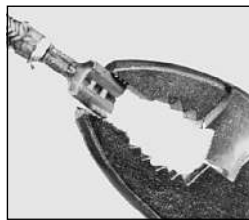
2 Remove the screws on the sides of the switch box that hold it to the kiln. Gently lift the box away from the kiln.



3 The transformer and relay are bolted to the inside of the switch box. Hold the new part next to the one you are replacing, aligned in the same direction. Remove and transfer one wire at a time from the old part to the new one. Make sure each connection is tight.



4 Replace push-on connectors and wires damaged by heat. If wire connectors do not fit snugly on terminals, gently squeeze the end of the terminal with pliers.



5 Remove the old part from switch box. Install the replacement.

**Note:** If you are replacing the transformer, examine the new one to make sure the primary is properly wired for your kiln's voltage. (See the kiln's wiring diagram.)

6 Check to see that wires are not touching kiln case or the element connectors. Wires touching element connectors or the kiln case will burn out. Move switch box into place and reinstall switch box screws.

## Replacing the Temperature Controller

1 UNPLUG the kiln.

2 Remove the 4 corner screws holding the controller faceplate to the switch box. Carefully lift out faceplate.



3 Disconnect all the wires from the back of the board. You will find two plugs and two single wires.

4 Connect the wires to the new board. Reinstall faceplate to the switch box.



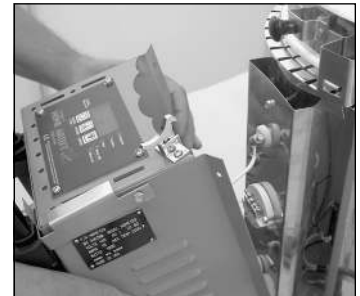
## Replacing the Firing Chamber

When the element burns out, the ceramic fiber firing chamber must be replaced.

To test for a burned out element, you will need an ohmmeter.

1 UNPLUG the kiln.

2 Remove the screws on the sides of the switch box that hold it to the kiln. Gently lift the box away from the kiln.



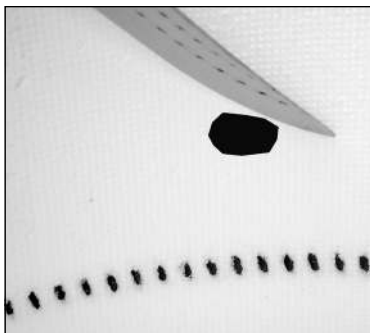
3 Place ohmmeter leads against the element connectors. A no-needle-movement reading on an analog meter, or OPEN on a digital meter, indicates a burned out element.



Replacing the firing chamber is a factory repair. Please call 800-876-4328 or 972-288-7557 for instructions, or see the dealer who sold you the kiln.

## Ceramic Fiber Repair

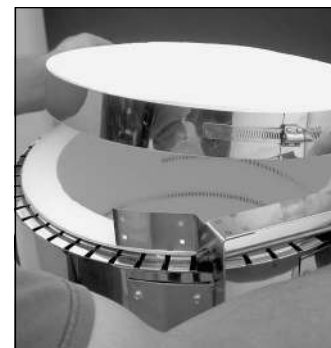
If glass, ceramic glaze, or other materials drip onto the firing chamber, repair before the next firing. Otherwise the glaze will remelt and embed deeper into the fiber.



- 1 Unplug the kiln.
- 2 Cut or scrape the ceramic fiber to remove the contaminant. Remove as little fiber as possible. If a heating element is located where you are scraping, avoid touching the element.

## Replacing the Lid

- 1 Remove the hinge screws from the lid band.
- 2 Lift off the lid. Place the new lid in position.



- 3 Drill new holes in the lid band for the hinge.
- 4 Install screws.



# Glossary

**bisque** Fired, unglazed clay.

**cone, pyrometric** A small pyramid of ceramic materials that will react to the effect of time, temperature and atmospheric condition inside the kiln in the same way as ceramic ware.

**crazing** Hairline cracks in glazed ware. Most common cause is underfired bisque.

**decals** A design or picture printed in overglaze or underglaze colors on a protective coating. The decal is slipped from the paper backing onto the appropriate ware and fired for permanency.

**dry footing** Removing glaze from the bottom of ware before firing to eliminate the need to stilt.

**earthenware** A natural clay, porous compared to stoneware and porcelain. Fires to around cone 04. It will not hold liquids unless it is glazed.

**element** A coil of wire that heats when electricity passes through it.

**enamel** Liquid or powder containing finely ground glass. Usually applied to metal, such as copper, and fired in a kiln.

**glaze** A liquid composed of glass particles and applied to ceramic ware.

**greenware** Unfired clay objects.

**grog** Fired, crushed clay.

**heat soak** Maintaining the same temperature inside a kiln.

**hold time** See “heat soak.”

**kiln furniture** The shelves and posts used to position ware inside a kiln.

**kiln wash** A powder mixed with water and brushed on top of shelves as protection from drops of fired glaze.

**luster** An iridescent overglaze, sometimes metallic.

**maturing point** The stage where clay or glaze has received the correct amount of “heat work.” This is usually measured by the 6 o’clock bend of a large pyrometric cone placed on a kiln shelf beside the ware being fired.

**overglazes** China paints, lusters, gold, etc., usually used over a fired glaze but may also be applied on polished porcelain bisque and fired for permanency.

**plaster** A white powder used for making ceramic molds.

**porcelain** A vitrified, translucent ceramic ware. Fires to a higher temperature than any other ceramic ware.

**pyrometer** An instrument for measuring temperature.

**ramp** Changing the temperature with a controller. If the temperature change is drawn in graph form, the resulting line looks like a ramp.

**relay** An electromagnet that, when triggered by current from the controller, turns on the heating elements.

**segment** A set of instructions for the controller in the Ramp-Hold mode. A segment

changes firing speed, temperature, and can add hold time.

**sgraffito** Decorating ware by scratching the surface layer of clay. This reveals a clay of a different color underneath.

**silica** A mineral that will not harden at a very high firing temperature, used for separating porcelain greenware during firing.

**slip** A liquid clay used in making ceramic objects by casting.

**stilts** Small clay or metal-tipped supports used to prevent glazed objects from sticking to the kiln shelf.

**stoneware** A vitreous ceramic body usually made from native clays. Fired to much higher temperatures than earthenware.

**thermal shock** Stress caused by sudden changes in the temperature of ceramic ware. Can cause cracks or breaks.

**thermocouple** The measuring unit of a pyrometer that is inserted into the kiln’s firing chamber.

**transformer** An electrical device in the kiln’s switch box that changes the higher voltage from the wall outlet to 24 volts. The lower voltage powers the kiln’s controller.

**underglaze** A decoration applied to greenware or bisque, usually applied under the glaze.

**venting** Allowing air to come into the kiln and vapor and gases to escape. This is one of the most important steps in firing.

**vitrify** To change into a glassy or a non-porous state by heat and fusion.

# Paragon Kiln Limited Warranty

Paragon kilns are warranted to the original purchaser by Paragon Industries, Inc. (herein "Paragon"), subject to the listed exclusions below, to be free of defects in workmanship for the period specified below. The warranty period begins from date of shipment from the Paragon factory unless date of original purchase from an authorized Paragon distributor or dealer can be established.

## Warranty Period:

Home Artist series kilns rated to 2000°F: 1 year

This warranty period applies unless otherwise agreed to in writing.

This warranty excludes: 1) Kilns damaged by overfiring (exceeding the melting temperature of the material being fired) regardless of cause of overfiring; 2) Ware, tools, kiln furniture, or anything inside damaged by overfire; 3) Kilns allowed to exceed the maximum temperature shown on kiln's nameplate, regardless of cause; 4) Kilns subjected to abuse, neglect, freight damage or improper storage; 5) Kilns used for either reduction or salt firing; 6) Kilns damaged by improper electrical installation; 7) Kilns used for purposes other than firing ceramics, glass, heat treating, or the purpose for which it was intended; 8) Element burnout caused by contact with foreign materials; 9) The patented Dawson Kiln Sitter and/or Limit Timer manufactured by W.P. Dawson, Inc., 399 Thor Place, Brea, California 92621.

WARRANTY COVERAGE EXTENDS ONLY TO THE ORIGINAL PURCHASER AND DOES NOT COVER REPLACEMENT OF PARTS THAT ARE, BY THEIR NATURE, EXPENDABLE. THIS WARRANTY IS VOIDED IF THE PRODUCT IS ADVERSELY AFFECTED BY ATTACHING ANY FEATURE OR DEVICE TO IT, OR IS IN ANY WAY TAMPERED WITH OR MODIFIED WITH-

OUT EXPRESS WRITTEN PERMISSION FROM PARAGON INDUSTRIES, INC.

Paragon Industries, Inc., will repair or replace any parts that become defective under normal and proper use during the specified period for the kiln purchased, providing the kiln has not been subjected to misuse or the listed exclusions. Paragon will furnish and install replacement parts at the factory with transportation costs to and from the factory paid by the owner; or upon receipt of defective parts at the factory, and after factory examination of the defect, Paragon will furnish replacement parts, complete with installation instructions, shipped postpaid to owner. The warranty on the repaired and/or replaced parts will be limited to the unexpired term of the original warranty.

Any claim for adjustment under this warranty must include name and address of dealer from whom kiln was originally purchased. Repair or replacement of any defective parts shall fulfill all obligations of Paragon. No other obligations or liabilities are assumed in connection with Paragon kilns nor does Paragon Industries, Inc. authorize its distributors or dealers to assume any other obligations or liabilities on its behalf.

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This agreement is made in the State of Texas and its validity, construction, and all rights under it will be governed by the laws of the State of Texas. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

**"Clay becomes part of us. We long to be with it when away from the studio. We spend hours in its company, and we fight with it. When we need the peace and calm of clay, it is there waiting. When we need excitement, it is ready to come out of the kiln. Clay entices us, because working with it works out so much of our everyday life."**

**Carol Jackaway**



**Paragon Industries, Inc.**

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