

DELPHI

Be Creative!

Delphi Ceramic Kiln Instruction Manual

INTRODUCTION

Thank you for purchasing a Delphi kiln. We are confident that the kiln will give you many years of relaxation and creative enjoyment.

The warranty on your kiln does not cover damage from overfiring, regardless of the circumstances. It is the operator's responsibility to make sure the kiln turns off when the firing is completed. Never leave your kiln unattended near the end of the firing.

Since the insulating firebricks expand and contract with each firing, hairline cracks will appear in the bricks while the kiln is cold—even in a new kiln. Do not be concerned with these. They are normal. The cracks close tightly when the heated bricks expand. The cracks function as expansion joints and will not affect the firing.

Do not be concerned with the light that appears around the edge of the lid. As long as the lid is closed all the way, there is little heat loss. Discolored paint is also inevitable and doesn't affect firing results.

IMPORTANT SAFETY RULES

- There is little danger of serious burn from accidental contact if you exercise the same caution you would use with an electric iron.
- Place the kiln on the stand that came with the kiln. When a kiln is safety tested, the lab fires the kiln on the stand designed for it. Cinder blocks or bricks can inhibit the flow of air under the kiln. They can also change the kiln's heating characteristics.
- Place the 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.
- Do not open the lid until kiln has cooled to room temperature and the switch is turned off.
- Dangerous voltage: do not touch the heating elements with anything.
- Disconnect kiln before servicing.
- Do not leave kiln unattended while firing. Do not leave a kiln turned on at your studio while you are at home sleeping.
- Wear firing safety glasses when looking into a hot kiln.
- Keep the kiln lid closed when the kiln is not in use. This keeps dust out of the kiln. Also, should someone turn on the kiln while you are away, the closed lid will keep the heat safely inside the firing chamber.
- Never place anything on the kiln 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.
- 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.
- Wear gloves when you load and unload your kiln. The gloves should be thick enough to protect you from glaze shards and bits of pyrometric cones that have stuck to shelves, sharp edges of broken ware, and sharp stilt marks on the bottom of glazed ware.

Razor-sharp glaze fragments can be so small that they are difficult to see.

- 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.
- 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.
- Avoid firing toxic materials inside the kiln, such as moth balls. Burning moth balls create toxic fumes and can even explode.
- Never fire tempered glass inside a kiln. It could explode.
- 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.
- As the kiln fires, it is a good habit to place your hand on the kiln's power cord to check the temperature. It is okay if the cord is slightly warm, but it should never feel hot. Make sure the plug is pushed all the way into the receptacle.
- 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.
- Do not wear loose-fitting clothing around a hot kiln.
- Unplug the kiln, or turn off the electrical shut-off box or circuit breaker when the kiln is not in use, especially if you are concerned that someone could turn it on while you are away.
- Remove flammable materials from the kiln room. If you fire a kiln in the garage, park your car outside. Remove the lawn mower, gasoline, and other flam-

mable materials. Keep packing materials such as shredded newspapers out of the kiln room.

- Keep unsupervised children away.
- Keep a fire extinguisher and smoke alarm in the kiln room. Mount the extinguisher near the door to the room.
- Do not breathe brick dust. Vacuum the kiln with a HEPA filtered vacuum cleaner or a central vacuum that takes the dust outside.

SETTING UP

Setting Up The Stand

Operate your Delphi kiln **ONLY** on the stand provided.

- 1 Insert the mar-proof plastic tips on the stand legs.
- 2 Place two stand side pieces in front of you as in the illustration. Place a stand leg inside the side frame. Insert bolts, tighten nuts.
- 3 Assemble the other corners the same way.



- 4 Position the stand on a concrete floor or a high temperature protective sheet. The stand must be level to alleviate stress on the kiln during firing and to prevent glazed pieces from falling off the stilts.
- 5 To level, place a shim **UNDER** the appropriate leg or legs, not between the kiln bottom and the stand.
- 6 Center the kiln on the stand providing for a minimum of 12" clearance between the kiln and the closest wall.
- 7 Make sure the kiln is sturdy on the stand. To move the kiln, lift it, don't push it. Pushing the kiln could collapse the stand.

Attach the Lock-In Lid Support

Connect the lid support to the stud on the side of the kiln. Tighten the lock nut until it is snug.



Where to Locate Your Kiln

- Place your kiln in a well-ventilated, covered, and protected area such as the garage, basement, storage building, utility or ceramic hobby room.

Caution: The fumes from a kiln can corrode metal and etch windows. If you are installing your kiln in a living area such as the basement or in the garage, it should be vented with a motorized vent.

- Do NOT store gasoline, paint, or other flammable liquids in the kiln room.
- Never allow the room temperature of your firing room to exceed 100 - 110°F. (Room temperature is the temperature measured three or more feet away from the kiln.) If necessary, use fans to lower room temperature.
- Never place the kiln near curtains or other combustible materials such as art room supplies.
- Position the kiln stand on a level surface that will not be damaged by heat. We recommend a cement floor. However, a sheet of protective material may be used under the stand. Consult your hardware or building supply store for a recommendation.
- Avoid placing the kiln stand on rubber tile, linoleum or any surface that might tend to mar or discolor when heated.
- Do not allow the kiln's power supply cord to contact the side of the kiln. This could burn the cord.

Seating the Elements

Shipping may dislodge the elements of your kiln. Please perform the kitchen knife test to make sure the elements are seated in their grooves.

KITCHEN KNIFE TEST

Caution: Always unplug the kiln before touching an element with anything.

Caution: Touch only a cold element never a hot one with a plastic object such as a comb. Plastic will melt on and ruin a hot element.

Press the elements into their grooves by running a blunt kitchen knife, plastic comb, or similar blunt object completely around each groove. Do this before the first firing, because it may not be evident to the eye whether the coil is in its groove.



Note: Don't force the element into the groove corners. If the element won't fit easily, lengthen it with automotive snap-ring pliers. Stretch the space between the coils just a little where the element fits into the wall brick corners. It should then easily seat into the corners.

If the element doesn't lie flat in the bottom of its groove, you needn't be concerned as long as the element fits all the way back into each corner and doesn't bulge outside the groove. In fact, elements will not lie flat in their terminal bricks (right behind switch box).

Cleaning the Kiln

Clean your kiln before firing. Use a soft brush nozzle on a vacuum cleaner to remove brick dust from inside the kiln, especially from the grooves. A damp cloth or damp sponge may also be used to gently wipe dust from the side-walls and brick bottom. Clean the kiln again whenever you notice dust inside.



You can use a plastic vacuum nozzle, but do not touch the firebricks with the nozzle.

Note: Vacuum the kiln with a HEPA filtered vacuum cleaner or a central vacuum that takes the dust outside.

THE ELECTRIC CIRCUIT

Circuit Breaker Panel

Install the kiln within 25' of the fuse or circuit breaker panel. For every additional 50' from the panel, increase circuit wire size by one gauge.

Circuit Wire

Trying to save money on the circuit installation by using a smaller diameter wire is not cost effective, because the thinner wire generates more heat than the thicker

wire. The heat means wasted electricity and possibly slightly lower voltage.

Use copper wire. Do not allow an electrician to use aluminum wire on your new circuit. Aluminum terminals corrode worse than copper and require greater installation care. Avoid using extension cords.

Voltage Affects Firing Time

Voltage fluctuation can vary the firing time for a given pyrometric cone from as little as one half to more than twice the average time. If the voltage is too low, the kiln will never reach full temperature. This can be corrected only by having the utility company adjust the voltage.

PREPARING THE KILN

Kiln Features

Heating Elements

The heating elements in your Delphi kiln are heavy duty for long life. All high temperature, heavy duty elements must be handled carefully. They are quite brittle after being heated to a high temperature and will break if bent while cold. By heating to a dull red glow with a propane torch, an element may be bent safely.

Never allow glaze, glass, silica sand, kiln wash, or other foreign materials to touch the elements since they will destroy the element when the kiln is fired.

Peephole

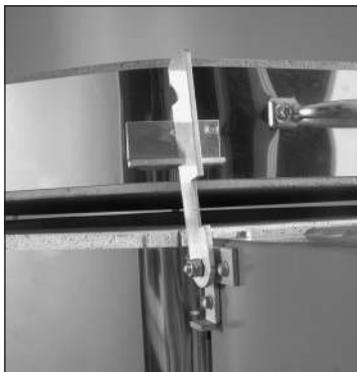
A peephole, tapered for a wide view without heat loss, is used for observing the progress of your firing so you can see when the pyrometric cones bend. Use at least one large cone on the shelf during every firing. With venting as their secondary function, peepholes allow oxygen to be drawn into the kiln's chamber and serve as an escape passage for smoke and water vapor.



When looking through the peepholes, always wear firing safety glasses, which are available from Delphi. They protect your eyes from the bright glare of the firing chamber and make it easier to see the cones at high temperatures.

Prop-R-Vent

Ceramic pieces release gases and water vapor during firing. Venting allows these gases to escape. Delphi's fall away Prop-R-Vent is installed on the switch box. The prop supports the lid in an open posi-



tion during the venting period. The Prop-R-Vent vents the lid in two stages.

To close the lid after venting, lift the lid handle an inch. The Prop-R-Vent will fall down by itself. Lower the lid gently; warranty does not cover damage to the kiln or the ware due to a dropped lid. For lusters and overglazes, engage the Prop-R-Vent in its second position for additional venting. Do not rush the cooling of your kiln with the Prop-R-Vent. This can damage your ware.

The Lid Support

Your kiln has the lock-in lid support. Please do not let unattended children raise the lid. Do not let the lid drop. It is fragile and must be lowered gently.

Dust-Free Refractory Coating

The dark coating on the lid, the top rim of firebricks, and in the peepholes reduces dust and hardens the firebrick surface for longer life. Though it will lighten after the first firing, the coating will last for several years.

PYROMETRIC CONES

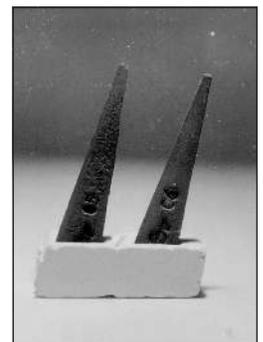
Pyrometric cones are small pyramids of clay and mineral oxide that soften and bend when exposed to heat. They indicate when your ware has fired to maturity. When consulting your dealer with a glaze problem, you should have a bent cone from that firing. The cone will help trouble shoot the problem. The cone lets you compare one firing to the next.

Cone Numbers

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. 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.

Using Cones

Place the cones on a kiln shelf with the ware. As the cones heat and bend, they form a glassy material that will stick to a bare shelf. Therefore, apply kiln wash to the shelves to prevent sticking. Do not apply kiln wash to the cones. (See page _ for kiln wash.) The cone slants 8 degrees from vertical and bends in the direction of the slant. They will not bend accurately if they are slanted at the wrong angle. Place the cone so that it will not touch nearby ware as it bends.



Regular large cones require a cone plaque.

Large 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. Or you can mount large cones in a pat of clay. The pat of clay should be com-

pletely dry before firing to prevent the possibility of exploding. To speed drying, make indentions in the clay with the end of a small brush handle after the cone is inserted. Self-supporting cones stand upright without holders. We recommend self-supporting cones; they are easier and faster to use than standard large cones.

How to Position Cones on the Shelf

Place your cones on a shelf behind the peephole. If the size of your ware doesn't permit placing a shelf in the kiln at peephole level, use a post to raise the cones.



Self-supporting cones silhouetted by an element.

- 1 Place the cones 8" away from the peephole. Positioning them closer makes them difficult to see and may also subject them to cool air drafts.
- 2 Have enough space around the cones to keep them from touching a piece of ware when they bend.
- 3 Position cones so that when viewed from the peephole, they are silhouetted by an element on the opposite kiln wall. (Keep cones at least 2" from an element.)
- 4 The element that silhouettes the cones should be level with the lower part of the cone. If the element is in line with the upper part of the cone, you won't be able to see the cone when it bends.
- 5 If you use the three-cone system, always have the higher temperature cone on the same side in every firing. Otherwise you can lose track of which cone is which.
- 6 Wear kiln firing safety glasses when viewing the cones through the peephole.

The Bending of the Cone

The large standard and self-supporting witness cones have reached maturity when the tip bends to the 6 o'clock position.

Large standard cone: The tip should bend straight down until it just begins to touch the cone holder.

Self-supporting cone: The self-supporting cone should bend downward until the tip is even with the top of the base. The tip should be about 1/2" above the shelf surface.

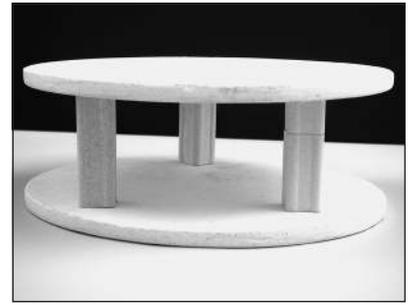


The self-supporting cone bent to maturity.

FIRING ACCESSORIES

Shelves

Shelves are flat slabs of fireclay that have been fired to a higher temperature than will be encountered in your kiln. With multiple shelves you can stack more ware in your kiln than you could ever place on the bottom of the kiln alone.



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 post is more stable.

All Purpose, High Fire Kiln Wash

High fire kiln wash is a mixture of finely ground minerals that do not fuse at porcelain and stoneware temperatures. It acts as a barrier between the shelf and dripping glaze. The kiln shelf must be coated with kiln wash to keep ceramic glaze and glass from sticking to it. Without a barrier, the glaze would embed permanently into the shelf.

Caution: Do not apply kiln wash to the kiln walls or lid. Contact with kiln wash will destroy heating elements.

Brush kiln wash on the tops of kiln shelves and on the kiln bottom to prevent glaze drippings from sticking permanently to these surfaces. As a powder, high fire kiln wash has an unlimited shelf life.

PREPARING TO FIRE THE KILN

Vacuinating the Kiln

Note: Do not breathe brick dust. Vacuum the kiln with a HEPA filtered vacuum cleaner or a central vacuum that takes the dust outside.

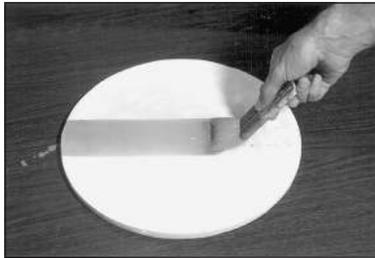
One of the easiest kiln maintenance tasks you can perform is regular vacuuming. Vacuum the kiln before every glaze firing. This helps to prevent dust particles from landing on glazed ware during firing. Vacuum every four bisque firings.

Use the soft brush nozzle on a vacuum cleaner. Be sure to vacuum the element grooves, the inner surface of the kiln lid or roof, and the underside of kiln shelves.

As you vacuum the kiln, examine the walls for glass or glaze particles that have embedded into the firebricks. Dig these out carefully with a screwdriver. Otherwise the particles will embed deeper into the firebrick during the next firing.

How to Use Kiln Wash

- 1 Pour a little water into a disposable container and add powdered kiln wash until it has the consistency of coffee cream. Stir until lumps dissolve.
- 2 Use a soft paint brush to apply the kiln wash to the shelf. Each time you dip your brush into the kiln wash mixture, swirl the brush around the bottom of the container. This is because the kiln wash settles quickly. Start the brush stroke near the center of the shelf and work toward the edges. This is to avoid a buildup of kiln wash on the edges.
- 3 Apply two or three thin coats of kiln wash changing the direction of the brush stroke 90° with each coat. Let the kiln wash dry for a few minutes between coats. Do not apply thick coats; they tend to flake off.
- 4 Remove any buildup of kiln wash from the edges of the shelf by tracing around it with a finger. Excess kiln wash may break off the edges and fall onto ware positioned below the shelf. Dry the shelves completely before firing.
- 5 Brush kiln wash onto the kiln bottom. Protect the kiln walls and elements from kiln wash with a piece of cardboard. Never apply kiln wash to kiln walls or to the underside of shelves.
- 6 Let the kiln wash dry overnight. You can speed drying by placing shelves in the kiln and heating to around 200°F / 93°C for an hour. The kiln-washed shelves are still wet if they feel cool to the touch.



Guidelines for Loading the Kiln

Disconnect the power before loading the kiln.

Keep ware at least one inch away from any heating element. Glazes may bubble and land on an element if the ware is too close. If you fire a piece that is so large that a tip of it comes closer than one inch to a kiln wall, place that section of the piece between elements and not directly opposite an element.

The minimum spacing between shelves is 2 1/2". Shelves must be stacked so there is at least one row of heating elements between any two shelves.

As you load each shelf into the kiln for a glaze firing, wipe off or vacuum dust from the underside of the shelf. Separate glazed ware by half an inch. If they are placed too close together, a glaze of one color may contaminate the glaze of a different color on the next piece.

Low- and High-Fire Clay

Q What is the difference between firing low and high fire greenware and glaze?

A Low-fire greenware is fired to a higher temperature than the glaze firing. High-fire greenware is fired to a lower temperature than the glaze firing.

Do not fire plaster, plaster of paris, or polymer clay in the kiln. They are not designed to be fired to high temperatures.

Clay is usually 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.

Note: Greenware is unfired clay. Bisque is fired clay that has not yet gone through the glaze firing.

FIRING THE KILN

- 1 After you have loaded the kiln and positioned cones so that you can see them through the peephole, lower the lid to the vented position.
- 2 Turn the switch to the on position.
- 3 Vent the kiln at the beginning of the firing by removing the peephole plug and propping the lid with the Prop-R-Vent (see page [_](#)). Venting the kiln allows moisture and fumes to escape. Hold a mirror above the lid or peephole 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 until the mirror no longer fogs.

Note: 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.

After the kiln has released the moisture, the vented period is over. Lower the lid all the way, and close the peephole.

- 4 When the cones bend to the 6 o'clock position, turn the switch to the off position and allow the kiln to cool to room temperature before unloading.

KILN MAINTENANCE

How to Open the Switch Box

Note: The switch box is the metal housing that covers the element connectors and holds the electrical components such as switches or the digital controller.

Caution: Whenever you turn off the circuit breaker to your kiln, tape the breaker box door shut and leave a note saying, "WORKING ON KILN. BREAKER OFF."

- 1 Disconnect the power to the kiln.
- 2 Remove and save the screws at the side of the switch box that hold it to the kiln.
- 3 Remove the box. You may need to prop the switch box on a chair, wooden box, or other object as you lean the switch box against the kiln.



Element Maintenance

Reseating a Bulging Element

Once an element has been fired, it becomes brittle and will break if it is bent while cold. Follow this procedure to heat the element.

- 1 Always unplug the kiln or disconnect the power before touching the element with anything! Whenever you turn off the circuit breaker to your kiln, tape the breaker box door shut and leave a note saying, "WORKING ON KILN. BREAKER OFF."

Note: You can purchase a propane torch from a home improvement center. Buy the type that has a push-button igniter. When you press the button, a blue flame appears. When you release the button, the flame goes out. For element maintenance, do not use the older manual propane



torches. Turning them on and off is awkward. You first turn a knob to start the flow of propane and then hold a match under the nozzle.

- 2 Heat the element with a propane torch until the element is red hot. Press the igniter and hold the flame near the bulging element. You will see the element turn red in just a few seconds. Then release the push-button igniter.
- 3 With a pair of long nosed pliers (dime store quality will work fine), shrink the bulging portion of the element by pressing the individual turns in the coils together slightly. Take a little from each turn so that no two turns are pressed tightly enough to touch.
- 4 As the element shrinks, work it back toward the groove and into place. Work rapidly, and at the first sign of stiffness in the coils, stop bending and re-heat the kiln. The elements do not have to be red to be bent safely, as the stiffening can be felt through the pliers.
- 5 To lengthen the element to fit into the corners, reverse the above procedure and expand the distance between coils by using snap-ring pliers. Use caution, as your warranty covers elements that fail only in service under normal use and not from being broken while cold.

Note: You can purchase snap-ring pliers from an automotive parts store.

- 6 When you have the coils positioned above the dropped recess in the grooves, reheat the element section and run a blunt kitchen knife around the elements to seat them into the grooves.

Note: Do not use a plastic object, such as a comb, to press hot elements into their grooves. Melted plastic ruins elements.

- 7 Fire the kiln to cone 4 or 5 to soften the elements completely.



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