

J-14 INSTRUCTION & SERVICE MANUAL

CONTENTS

PRELIMINARIES

Installing Handle	2
Hooking Up a Pyrometer	2
Where to Locate Your Kiln	2
Cleaning the Kiln	2
Electrical Installation	2
Electrical Specifications	3

OPERATION

Pyrometric Cones	3
High Fire Kiln Wash	4
Pyrometers	4
Enameling on Metal	4
Wax Burnout	5
How to Cut and Fuse Glass	5

MAINTENANCE

Locating Electrical Trouble	7
Heating Elements	7
Manual Control Switch Replacement	7
Thermocouple Testing (Manual-Fire)	8
Thermocouple Replacement	8

INTRODUCTION

Operating your kiln before reading these instructions can damage your kiln. For instance, overheating wax in the kiln can ruin the elements. So please read this manual first. Follow these simple instructions, and your kiln should give years of trouble-free firing.

When you call or write about your kiln, give the complete model number and part number (P/N). It will insure that you receive correct replacement parts. This information is on the electrical data plate located on the kiln base near the power cord.

We suggest you read the manual twice. The first time read it straight through before you plug in your kiln. The second time use it to set the kiln up and fire it.

If you have an electronic kiln, you should find an instruction folder for it in this instruction packet.

If you notice that your kiln makes a clicking noise during operation, do not be concerned. The infinite control switch clicks as it cycles on and off; digital kilns use relays that cycle also.

We wish you the best of luck with your new kiln. May it give you years of faithful service!

Freight Damage

When your kiln arrives, check the following:

Visible Damage If the carton is damaged (crushed, holes, etc.), remove the carton and check the kiln for both interior and exterior damage. If the kiln is damaged, you have two options:

a. Refuse the shipment and have it returned to the manufacturer, or

b. Accept the shipment after having the driver note the damage on the Bill of Lading. Then call us.

Shortages 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.

Hidden Damage If you discover hidden damage after the driver has left, notify the shipper immediately. Then call us. Save all packing materials for inspection by the claims adjuster.

Important

Read each page of this manual in detail before you install or operate your kiln. Warranty does not cover damage caused by failure to follow instructions.

Toxic Glazes and Glass

Some glazes and glass 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.

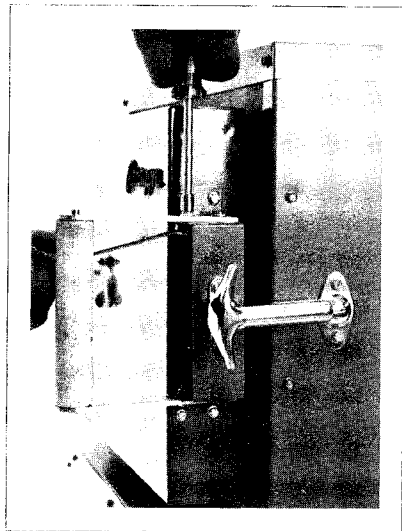
Important Safety Rules

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

- 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.
- **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 or grozing (chipping) glass.
- Wear firing safety glasses when looking into kiln's peephole.
- Keep food away from your work area.
- **Digital Kilns:** Turn controller safety switch off when kiln fires to completion.

BEFORE FIRING

Install the handle.



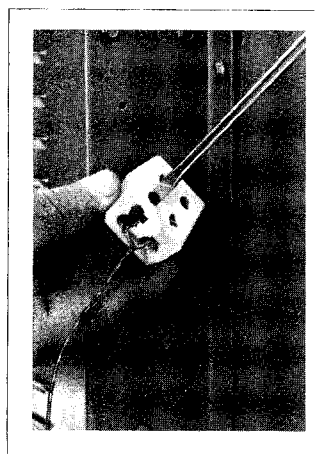
Manual Fire Kilns: Connecting a Pyrometer

For your convenience, a thermocouple has already been installed in your kiln for pyrometer hook-up. You will find it on the back of the kiln.

1 Remove the thermocouple (temperature sensor) from your pyrometer. Leave the thermocouple lead wires attached to the pyrometer.

If the lead wires connect to the thermocouple direct without a ceramic block, remove the lead wires from the back of the pyrometer. Order another set of thermocouple lead wires for your pyrometer.

2 Connect the thermocouple lead wires to the thermocouple ceramic block on the back of kiln. Remove the holddown bracket to gain access to the screws on the thermocouple block. Connect the red and yellow wires to the correct terminals.



Where to Locate Your Kiln

1 Place your kiln in a well ventilated, covered and protected area such as the garage, basement, utility or ceramic hobby room. Do NOT store gasoline, paint or other flammable liquids in your kiln room.

2 Provide a minimum of 12 inches' clearance between kiln and the closest wall.

3 Keep the kiln away from curtains or other combustible materials.

4 Position kiln on a level, fire-proof surface. We recommend a metal table.

5 Keep unsupervised children away from the firing area.

6 Keep the power cord away from the kiln case, which gets hot enough to damage the cord set.

7 Never allow the room temperature to exceed 100 - 110° F. (Measure room temperature three or more feet from the kiln.) If necessary, use fans to lower room temperature.

8 If you use two or more kilns side by side, keep them at least four feet apart. Otherwise room temperature can build up around the furnaces and overheat the electronic controllers.

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

Cleaning the Kiln

Your kiln interior should be cleaned regularly. Use a soft brush nozzle on a vacuum cleaner to remove dust.

ELECTRICAL INSTALLATION

Your kiln must be plugged into a correctly wired circuit to operate properly. The circuit must not be used by other appliances while the kiln is firing. Turn off the circuit breaker for the circuit your kiln will use. 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.

Never use an extension cord on 240 volt kilns. Avoid extension cords on 120 volt models if possible. If you must use one on a 120 volt kiln, never use one smaller than 12 gauge or longer than 20 feet. Never plug it into a ceiling outlet!

Voltage fluctuation can vary the firing time for a given pyrometric cone from as little as 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. (However, 208 volts cannot be adjusted to 240 volts, and vice versa.)

The receptacle must have a separate safety grounding wire. This protects you from serious electrical shock. If you have the least doubt that your circuit is properly wired, have an electrician check it.

Electrical Specifications

Specifications on the kiln's electrical data plate supersede specifications on this chart.

This chart is for United States and Canadian 120 and 240 volt, single phase models with a factory-installed cordset only. For foreign countries, refer to the kiln's electrical data plate. Your electrical circuit should be installed only by a licensed electrician and in accordance with local codes. For models not listed, see data plate.

Changing the cord plug will void your warranty!

MODEL NO.	Electrical Power Rating			Circuit Size*		NEMA Config.
	Volts**	Amps	Watts	Copper Wire	Fuse Size	
J-14-1	120	20	2400	12	20	5-20R
TnF-J-14-1	120	20	2400	12	20	5-20R
J-14-2	240	10	2400	12	20	6-20R
TnF-J-14-2	240	10	2400	12	20	6-20R

*These are only recommended copper wire and circuit breaker sizes. Refer to and comply with local electrical codes if they differ from our recommendations.

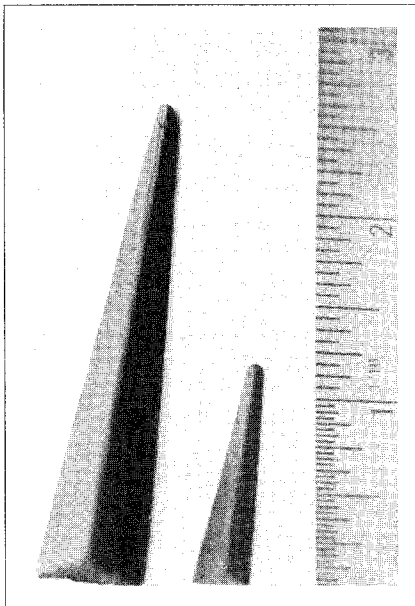
**Single phase only.

PYROMETRIC CONES

If you are using your kiln for enameling, you do not need pyrometric cones. A pyrometer is used in enameling instead of cones. Enameling artists can skip this section.

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.

Handle cones carefully. If dropped, they may develop cracks that could affect their performance. Pyrometric cones come in 1 1/8" and 2 1/2" lengths. Use only large cones with your J-14 kiln.



Cones mounted on the shelf must be slanted 8° from vertical. They will not bend accurately if they are slanted to the wrong angle. 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. Self-supporting cones stand upright without holders. We recommend self-supporting cones. They automatically slant at 8° so they are easier to use. The shelf under the cones must be protected with kiln wash. (See next section.)

Ceramic ware is affected by "heat work," which is the combined effect of time, temperature, and the atmos-

phere 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 firing maturity as firing to a

**TEMPERATURE EQUIVALENTS °F
ORTON PYROMETRIC CONES**

Cone Number Heated at:	Self-Supporting Cones			Small Cones 540° F. Per Hr.*
	27° F. Per Hour*	108° F. Per Hour*	270° F. Per Hour*	
022	--	1087	1094	1166
021	--	1112	1143	1189
020	--	1159	1180	1231
019	1213	1252	1283	1333
018	1267	1319	1353	1386
017	1301	1360	1405	1443
016	1368	1422	1465	1517
015	1382	1456	1504	1549
014	1395	1485	1540	1598
013	1485	1539	1582	1616
012	1549	1582	1620	1652
011	1575	1607	1641	1679
010	1636	1657	1679	1686
09	1665	1688	1706	1751
08	1692	1728	1753	1801
07	1764	1789	1809	1846
06	1798	1828	1855	1873
05 1/2	1839	1859	1877	1909
05	1870	1888	1911	1944
04	1915	1945	1971	2008
03	1960	1987	2019	2068
02	1972	2016	2052	2098
01	1999	2046	2080	2152
1	2028	2079	2109	2163
2	2034	2088	2127	2174
3	2039	2106	2138	2185
4	2086	2124	2161	2208
5	2118	2167	2205	2230
5 1/2	2133	2197	2237	N/A
6	2165	2232	2269	2291
7	2194	2262	2295	2307
8	2212	2280	2320	2372
9	2235	2300	2336	2403
10	2284	2345	2381	2426

*Rate of temperature increase during last 90 - 120 minutes of firing.

Tables by courtesy of
The Edward Orton, Jr. Ceramic Foundation

FIRING ACCESSORIES

higher temperature for a shorter time. The "Temperature Equivalents" chart shows that a self-supporting 05 cone bends to 6 o'clock at 1911° F., yet when fired slower, it will bend at 1870° F.

Large and small pyrometric cones are numbered from 022 through 01 and 1 through 10. Cone 022 matures at the lowest temperature; 10 matures at the highest. The number is stamped on the side or base of the cone. The cone to use with each material is usually stated on the label by the clay or glaze manufacturer. Your supplier can also give you this information.

Check the accuracy of your TnF controller by placing cones on the shelf. The firing cone is the same number you are firing to. Next to the firing cone place a large cone of a lower temperature; this is the guard cone. For example, if you are firing to 05, place large cones 05 and 06 on the shelf behind the peepholes.

Place your large cones at least 3 inches behind the peephole to protect the cones from exposure to cool air drafts. Place the cone in a position where you have a clear path of vision to the element on the opposite side. At higher temperatures, a cone is difficult to see if a piece of ware is behind it.

Always wear Paragon firing safety glasses when looking into the peephole. These glasses are specially coated to filter infra-red and ultra-violet light inside a kiln and to reduce glare, so cones are easier to see.

FIRING ACCESSORIES

All Purpose, High Fire Kiln Wash

If you fire glass or any material that can stick and fuse at high temperatures, you must coat the shelf in the bottom of your kiln. (Do NOT apply kiln wash directly to the ceramic fiber firing chamber.)

High fire kiln wash is a powder mixture of finely ground minerals that will not melt and fuse together at high temperatures. Mix it with water to the consistency of thick cream. As a powder, kiln wash has an unlimited shelf life.

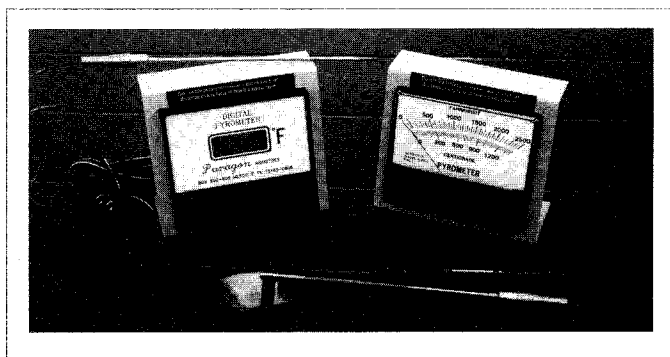
While recoating with kiln wash is not necessary after each firing, glaze drops should be scraped off the shelves as soon as they appear and a new coat of kiln wash should be applied to the bare area.

Keep kiln wash away from elements. Kiln wash will cause elements to burn out. Kiln wash should never be applied to kiln walls or to the underside of shelves.

Pyrometer

A pyrometer is a portable instrument for measuring the temperature inside the kiln from approximately 100° F. to 2400° F. The pyrometer is especially useful for enameling on metal and fusing glass. The thermocouple, which is inserted into the firing chamber, is the measuring unit of a pyrometer.

Kilns equipped with an electronic controller do not need a pyrometer. The controller itself has a built-in pyrometer.



FIRING YOUR KILN

Enamelling on Metal

Preparation of the Copper

Enamels come in transparent or opaque. They can be purchased directly from Thompson Enamel, P.O. Box 310, Newport, Kentucky 41072. Their Lead Free Enamels come ready to use. No enamel washing is required for these enamels.

Start with one of the many pre-shaped copper forms available, or shape and trim the copper to your own design.

1 Heat the copper on an enameling rack to about 1400° F. to burn off oil or grease. Heat the copper to just until smoke from oil or grease stops coming off the metal and its color has changed to a purple-red-pale green iridescence that moves across the copper. This indicates that the grease has vaporized. **Do not fire the copper any longer than this point.** Otherwise excess fire scale will form, making the next cleaning step difficult.

2 After the copper cools, brush any loose scale from the copper. Use a brush or paper towel, being sure that you do not put any grease or oil onto the copper, such as fingerprints. Clean the copper with a 3M Scotch-Brite® pad. This pad does such a good job that in most cases no further cleaning will be required. Additional copper cleaning products are available in the Thompson Enamel Catalog, including Sparex No. 2.

It is best to clean the copper just before you decorate it. If you wait too long to decorate after cleaning, the copper could get dirty again.

Decorating the Copper

Counter Enameling Most enameled pieces should be counter enameled on the back side. This gives the piece a much more finished look, it eliminates a great deal of fire-scale cleaning, and it controls the chipping and cracking that can result from the different rates of expansion and contraction in copper and enamel after the enamel has been fired.

Counter or backing enamel, a mixture that gives a mottled effect, can be used for counter enameling. Or you can use regular enamel. Counter enamel is applied by the sifting method described next.

When firing counter enamel, underfire it so that the fire scale on the front of the piece isn't too difficult to remove. You can purchase a masking preparation from your supplier to help prevent fire scale. You must place

the piece on a stilt when firing the other (front) side of the piece. The stilt prevents the back of the counter enameled piece from sticking to the enameling rack.

Applying Enamels Apply enamel over a clean sheet of paper so you can pour the excess back into the bottle for reuse. Transparent enamels should be applied in several thin coats. Transparent enamels can be mixed with fairly good results. If opaque enamels are mixed, however, a grainy effect results. The two basic methods of applying enamels are sifting and spatula.

Sifting or Dusting Enamel Spray or brush Thompson holding agent onto the copper. Then sift a 1/32" layer of enamel onto the copper. Use a #60 mesh sifter. If the coat is too thin, you can easily add another coat after firing. But a coat that is too thick will bubble and crack. The enamel must dry completely before firing.

Spatula or Inlaid Method You can use this method to decorate a small area with many different colors. Using a diluted solution of Thompson holding agent, dampen the enamels just to the saturation point, and maintain this moisture while working with the enamels. Apply the enamels onto the copper with a small spatula, and spread them out with a spreader to a coat of about 1/32" thick. Lines of contact can be formed by the spatula blade. Then spray the enamels with the holding agent to keep the grains of enamel in place. Allow the enamel to dry completely before firing.

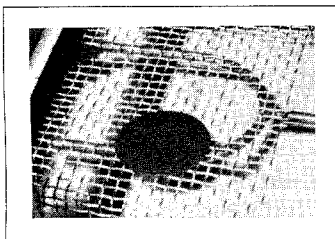
Firing Enamel

The pyrometer is a useful accessory for manual control kilns that will allow you to maintain the temperature you want. But with a little experience, you can tell how hot the kiln is firing by the color of the interior.

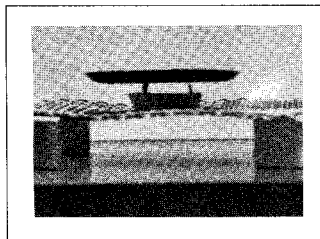
Heat the kiln to 1450° F. for most enameling. If you're not using a pyrometer, you can approximate this temperature by maintaining a bright, cherry red color inside the kiln. For some techniques a hotter or cooler firing chamber is desired.

Lay the copper shape on an enameling rack. If the part that touches the rack is enameled, place a stilt under the copper. Some bowls or other shapes have enameled sides that might run during firing. These should be fired with a stilt even if the piece has a plain bottom. Use an enameling fork to place the rack into the kiln. Wear safety glasses.

Firing should take about three minutes and requires undivided attention!



Use an enameling fork, firing glove and safety glasses to place the enameling rack into the hot kiln.



The proper placement of an enameling rack with stilt.

Look at your piece every 15 seconds through the peephole. Remove the rack when the copper piece appears a rosy red and the enamel is smooth. Place the rack on a steel pad and let it cool completely. Use a

protective glove when touching the peephole cover or opening the door.

After counter enameling, you will need to clean the fire scale off the front of the piece. A 3M Scotch Brite® pad works well for this. Then clean it with Thompson Sparex No. 2.

Wax Burnout

You can use your kiln to remove wax from jewelry investments. This is simple. Keep uppermost in mind, however, that you must prevent wax or carbon from contacting the kiln's walls or elements. When carbon collects on the sidewalls or on a heating element, the firing chamber will probably need to be replaced. This is because carbon is a conductor of electricity and will cause the elements to short circuit. Damage to elements from contact with foreign materials is not covered by warranty.

1 First, remember to keep the peephole covers open during the entire wax elimination process. They allow fumes to escape from the kiln. Place a wax tray under your investment inside the kiln. The tray must be able to withstand 300° F. of heat, it should be about 1/2" deep, and it should be 1 1/2" smaller than the firing chamber in both width and length. The tray will catch melting wax as it drips from your investment. (You must remove the tray before the kiln gets hotter than 300° F.)

2 Heat the kiln to 300° F. and hold it at that temperature for at least one hour.

With the wax tray in the kiln, you must not fire the kiln hotter than 300° F. and you must keep it at 300° F. for at least one hour. During this hour, the wax will melt from your investment and drip into the tray. If the kiln gets hotter than 300° F., the wax will smoke and deposit carbon inside your kiln, causing expensive damage.

You will need a pyrometer or digital controller to maintain 300° F. in your kiln during the lost wax process.

3 After the kiln has fired for one hour, open the kiln and remove the investment and metal tray. Pour the wax from the tray and leave the tray out of the kiln until your next wax elimination. (Do not leave the tray in the kiln.)

4 Complete the burnout of your investment using the directions of the investment materials manufacturer.

If you follow these directions, you need never worry about ruining your elements from smoking wax. If for some reason wax does smoke inside your kiln, you might be able to save the elements anyway. First, open the peephole cover(s). With the kiln empty, turn the kiln on low heat and gradually raise the temperature to 1500° F. over a period of five hours or longer. Then maintain the 1500° F. temperature for one hour.

How to Cut and Fuse Glass

Basic Glass Tools

Reservoir Glass Cutter Buy a good reservoir glass cutter. A good glass cutter will last many years and is a pleasure to use. Buy your glass cutter from a stained glass supplier. The kind sold in hardware stores sometimes won't cut stained glass.

Running Pliers are used to cut thin strips of glass.

FIRING YOUR KILN

Breaking Pliers for cutting small strips.

Grozing Pliers shape the glass by chipping away the edges. The rough edges will become smooth when the glass is fired to fusing temperature.

Basic Glass Cutting

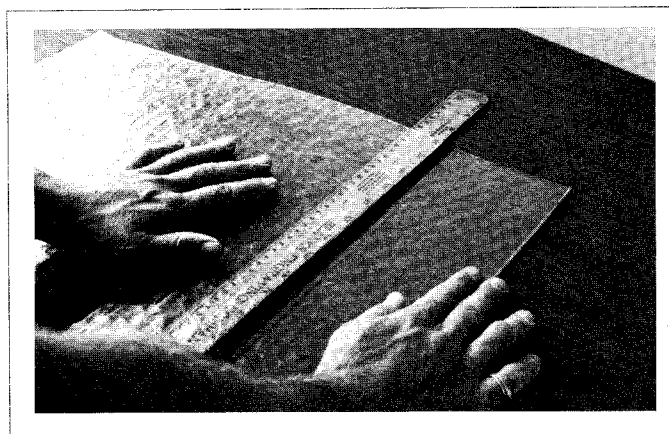
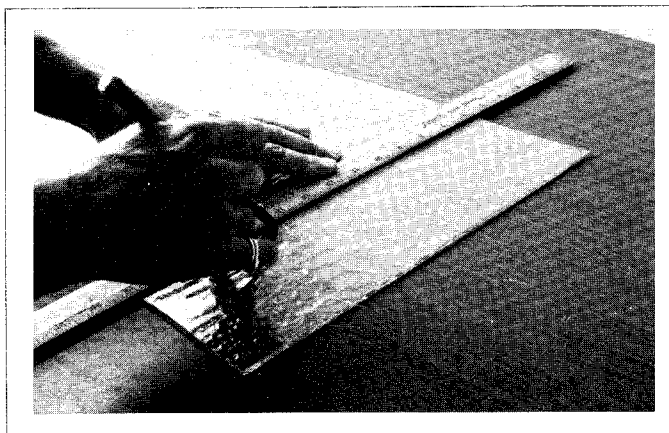
Wear safety glasses when cutting or chipping glass.

1 Lay the glass on a clean surface. Mark off the cut with a grease pencil. 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 hard enough so that the scoring noise sounds steady and unbroken. But don't press harder than you need to.

3 Place the straight edge under the glass so that an edge of the wood is lined up with the score line you just made. Press down on the glass with your hands. The glass will break cleanly.

How to Cut Small Glass Squares Make all your score lines first. Then turn the glass over and tap out the squares. This is an easy, fast way to cut many small pieces.



Compatibility of Glass

Glass expands and contracts during firing and cooling. When pieces of glass are fused together, they must expand and contract at the same rate, or the fused piece will crack. When fusing two pieces of glass, cut them from the same sheet of glass. This will guarantee compatibility. Or you can buy stained glass that has been tested and labeled as compatible.

6 *J-14 kilns fire the imagination!*

Annealing Glass

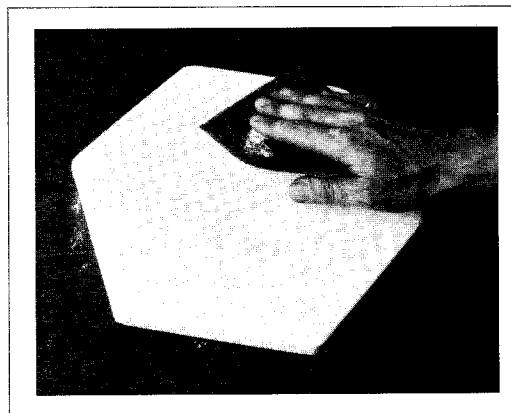
The most common mistake in firing glass is in fast cooling rather than fast firing. The critical cooling period is called the annealing range.

Annealing glass removes the internal stresses. Glass cooled too quickly contains internal stresses that can break the piece even months after firing.

Basic Glass Fusing

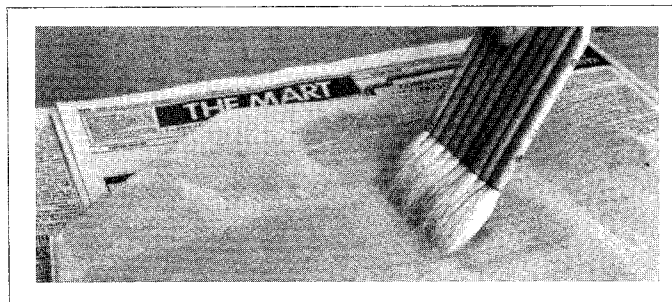
Coating the Shelf

1 Glass is fired on a kiln shelf and not directly on the bottom of the kiln. The kiln shelf must be coated with glass separator to keep the glass from sticking to the shelf. Glass separator is finely ground minerals that won't melt at high temperatures. Glass separator is sold as a powder and mixed with water. Before coating the shelf, remove most of the old separator with sandpaper or grit cloth. This gives you a smooth surface. (Recoat the shelf when the coating begins to crack or chip.)



Remove most of the glass separator from the shelf before recoating. Grit cloth, shown here, works well.

2 After you've mixed the separator with water, brush it onto the kiln shelf with a fine-haired paint brush or hair brush. Use two or three thin coats changing the direction of the brush stroke each time.



3 Dry the shelf overnight before firing. You can speed drying by placing the shelf in the kiln and turning the kiln on for a few minutes with the peephole covers open. Then unplug the kiln and leave the shelf in the warm kiln.

4 The separator will never be perfectly smooth, but one way to make it smoother is to lightly rub the palm of your hand over the dried separator. The smoother you make the separator, the smoother will be the underside of your glass.

Preparing the Glass for Firing

1 After you've cut the glass pieces to the patterns, clean the glass. You can use window cleaner, rubbing alcohol, or plain water. Fingerprints will etch into the glass during firing, so handle the glass carefully after you've cleaned it.

2 Lay the glass on the shelf. Use white glue to hold the glass pieces together after you place them on the shelf. All you need is a drop or two. Glue is especially important if you're fusing copper wire into the glass. The glue prevents the glass or wire from moving out of place before they fuse. The glue disappears during firing.

Firing Glass

1 You do not need to use cones to fire glass, though cones can be helpful. When the kiln interior becomes red, start watching the glass every few minutes by opening the door just a crack.

As the glass heats, the layers will begin to sag and fuse together. The edges will become rounded, and the surface will appear liquid. When the glass is fused the way you like it, turn off the kiln. Allow the kiln to cool slowly to room temperature before opening the kiln.

Hold the kiln at 900° - 1000° F. for 20 minutes to anneal a glass piece up to 1/4" thick. For thicker pieces, hold at that temperature longer.

Glass Trouble-Shooter

Cracking is usually caused by cooling the glass too fast. In the 900° F. - 500° F. range, glass goes through the "annealing" process where stresses are relieved. The glass is especially sensitive to cracking in this range. Glass can crack below 500° F. if it cools too quickly. Remove the glass from the kiln only when it is cool enough to be handled with bare hands.

Cracking can also be caused by fusing incompatible glass. Purchase stained glass that has been tested for fusing compatibility.

Glass bubbles These are usually caused by air, grease or dirt trapped between layers of glass, or by fusing uneven layers of glass.

When you place small glass pieces on top of a larger base piece, air pockets will sometimes rise up from under the base piece. This causes a bulge in the glass. These types of bubbles appear in single layers of glass. To avoid them, redesign the piece.

When you laminate glass between two sheets of glass, trapped air may form bubbles. To avoid these bubbles, cut the top piece of glass into several butted strips. This allows the air to escape.

Frosty glass surface Dust, fingerprints, or oil on the glass surface can cause frosty, permanent images. Vent the kiln when you first heat up the glass so organic matter can escape from the kiln.

The devitrification range is the temperature that the glass must pass through rapidly to avoid a frosty surface. This temperature is 1400° F. for most glasses. To cool the glass rapidly during the devitrification range, turn off the kiln when the firing is completed. Open the door an inch or so until the temperature drops to 900° F. Then close the door again. If you are not using a pyrometer, close the door when the glass loses its red appearance.

MAINTENANCE

Locating Electrical Trouble

If your kiln stops heating while firing, check fuses or circuit breakers first. Wire heats when an electric current passes through it. If the same current passes through both a small wire and a large wire, the smaller wire will reach a higher temperature. A fuse uses this principle to protect the wiring in a building. It has a small, short wire of low melting temperature metal connected in such a manner that all current passing through the circuit must also pass through the fuse. The fuse wire size is selected so that the maximum safe current the wiring can handle will generate enough heat to melt the wire (i.e. blow the fuse). A circuit breaker uses a tiny heating element to heat a thermostat, which interrupts the current when the maximum safe amount is reached.

A blown fuse or tripped circuit breaker is not necessarily an indication of electrical trouble with your kiln or wiring. A short circuit or "short" causes a large amount of current to flow, generating so much heat that the fuse or breaker opens the circuit almost instantly. If your kiln should blow a fuse after firing for some time, there is little probability of a short. Replace the fuse or reset the breaker, and if it does not blow again as soon as the kiln is turned back on, there is no short in your kiln wiring.

A loose or poor connection at the fuse or breaker will generate heat. 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.

Element Replacement

High temperature elements are damaged by contact with silica or silica bearing compounds, such as glaze and kiln wash. If silica touches an element, the element will burn out during the next firing. This type of damage is not covered by warranty.

Also, reduction firing, which removes the oxygen from your kiln, will ruin your elements. The elements are protected by a coating of oxidation, which reduction firing destroys. Reduction is performed at your own risk; elements damaged by reduction are not covered by warranty.

To replace an element, return your furnace to the factory. Element replacement necessitates replacement of the ceramic fiber shell, a factory procedure.

Manual Control Switch Replacement

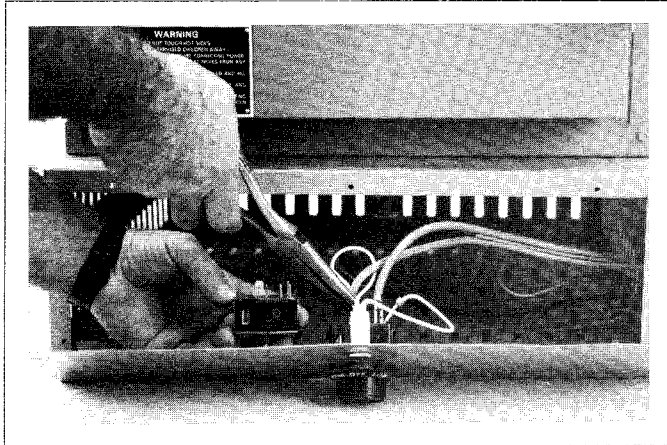
To replace electrical components of an electronic controller, see your controller instruction booklet.

1 UNPLUG kiln. Remove the screws in the front panel of the kiln. (The front panel is where the switch knob is located.) Pull panel out to expose switch.

2 Pull off switch knob with fingertips. Some switch knobs are held in place by a set screw on the side of the knob. If knob won't come off when you pull it, check to see if a set screw is securing it to the shaft.

MAINTENANCE

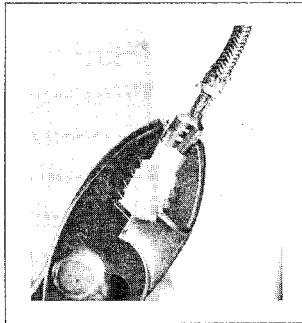
3 Hold the new switch next to the defective one, and in the same direction. Remove and transfer one wire at a time from the old switch to the new one making sure each connection is tight.



4 If push-on terminals do not have a snug fit, gently squeeze the end of the terminal with pliers.

5 Remove the single nut from the front of the defective switch. Remove switch and put new one in place making sure it is right side up. Reinstall shaft nut checking to make sure it is not backwards. Tighten so switch will not turn during operation.

6 As the front panel is moved back into place, check to see that no wires are touching the floor pan (the metal pan under the firing chamber bottom). Wires touching floor pan may burn. Tighten front panel screws. Reinstall knob.



Thermocouple Replacement

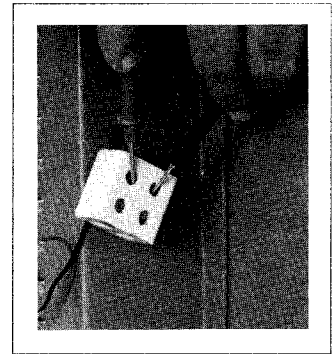
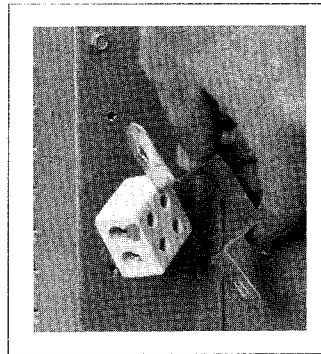
The thermocouple is the rod that protrudes into the kiln through the back wall. The thermocouple reads kiln temperature.

Testing the Thermocouple on Manual-Control Kilns

To test the thermocouple on digital kilns, see separate instruction booklet.

1 To test the thermocouple, find the outer thermocouple block. It is on the outside of the rear electrical box. Remove holddown bracket. Disconnect the wires going to the pyrometer.

2 You will find two wires coming out of the electrical box and connected to the thermocouple block. Touch the probes of an ohmmeter to the screws that connect those wires to the thermocouple block. 0 ohms means the thermocouple is okay. Infinity ohms (no needle movement) means the thermocouple is broken or a wire is disconnected.



Thermocouple Replacement (All Models)

1 Manual-control kilns: Disconnect the thermocouple wires from the thermocouple block on the outside of the electrical box.

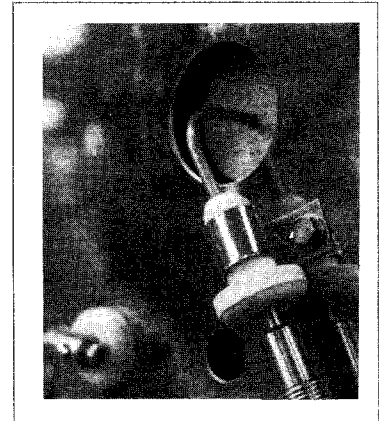
All models: *UNPLUG* kiln. Remove the electrical box.

2 To prevent the thermocouple from touching anything metallic, it is held in place with a porcelain insulator. Remove the screw from the thermocouple fastener, which holds the porcelain insulator in place. Pull thermocouple from its ceramic fiber hole.

3 Insert the new thermocouple into the ceramic fiber hole so that it protrudes into the firing chamber by at least 3/4". Place a mark on the thermocouple 1/4 - 3/8" beyond the heat shield surface.

4 Remove the thermocouple. Slide the porcelain insulator, wide end first, onto the thermocouple as far as it will go. Gently bend the thermocouple at the mark with your hands. Do not use pliers, or the thermocouple may kink.

5 Slide the thermocouple back into the hole. Position the thermocouple fastener so that it holds the porcelain insulator



against the heat shield. Install the screw. Do not let the thermocouple fastener touch the thermocouple.

6 Manual-control kilns: Thread the thermocouple lead wires through the hole in switch box.

All models: Position the thermocouple lead wires so they are away from the hot sides of the kiln case and electrical wiring. (Thermocouple wires next to or looped around other wires could cause erratic readings.)

7 Check to see that no wires are touching the kiln case or the element connectors. **Wires touching element connectors or kiln case will burn out.** Reinstall switch box.

8 Manual-control kilns: Connect the thermocouple lead wires to the thermocouple block on outside of switch box. Observe color coding. (If the yellow and red wires are reversed, pyrometer will read backward.) Install holddown bracket.