Duncan

ELECTRONIC KILN
OWNER'S MANUAL

A LETTER FROM THE PRESIDENT

Thank you for selecting a Duncan Electronic Kiln for your ceramics needs.

At Duncan, a great deal of pride and a total commitment to producing only the very best go into every item we make.
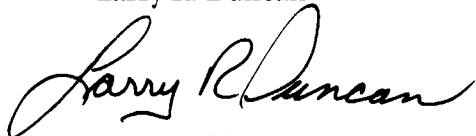
Every effort has been taken to ensure that you will have years of trouble-free enjoyment from what I honestly believe is the finest kiln available.

To ensure your fullest enjoyment of your kiln, please take a few minutes to read this manual. It tells you all you need to know about the proper operation of your kiln.

Whether you're using your kiln for personal use or firing the creative work of others, knowing the proper way to use your kiln will give your ceramic pieces the look of quality.

Have fun, enjoy your kiln and welcome to the Duncan Family!

Larry R. Duncan

Larry R. Duncan

PRESIDENT

QUICK START GUIDE

If you are a ceramist who is experienced in the following:
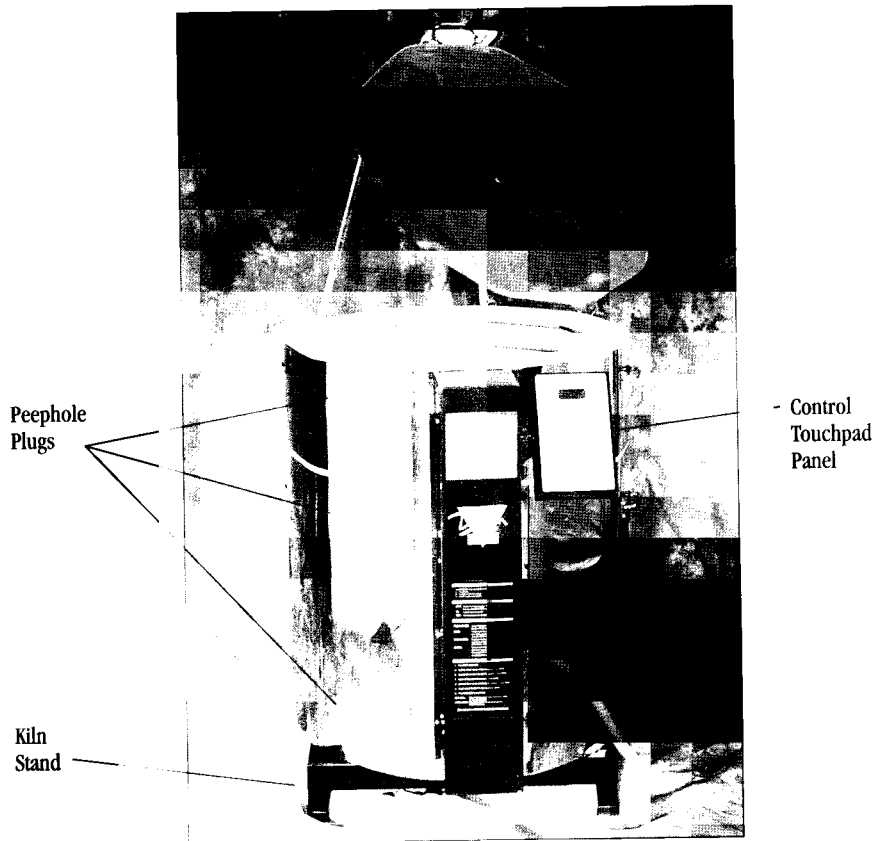
- Setup and preparation of an electric kiln for firing
- Initial test firing
- Proper loading of ware

. . . then you may wish to skip the first few sections and proceed to the section titled "**GO**" on page 7.

Otherwise, take the time to familiarize yourself with all instructions given in this manual before proceeding.

TABLE OF CONTENTS

Peephole
Plugs

Kiln
Stand

- Control
Touchpad
Panel

UNPACKING YOUR KILN

(Please read all instructions before you start.)

Visual Inspection. Your Duncan Electronic Kiln was cushioned, shrink-wrapped, crated, and placed on a pallet for shipment from the factory. Before uncrating your kiln, inspect it for any visible damage that may have occurred during transit. If damage is detected, contact your freight agent and ask for an inspection. Also, notify the dealer from whom you purchased your kiln. Save all your packing materials for verification. DO NOT assemble or fire your kiln if damage is detected.

If no damage is detected, then you are ready to take the following steps:

- Using a claw hammer or mallet and a pry bar, carefully remove the top wooden cross members.
- Carefully remove the side supports.
- At this point, the front and back sections of the crate will be separated from the sides and from the top, and may be carefully lowered to the floor.
- With a utility knife or scissors, make a vertical cut in the shrink-wrap to facilitate its removal. Take care to avoid cutting into the electrical cords and components. Also, avoid marring the stainless steel surface of your kiln.
- Remove the shrink-wrap and other packing materials. Dispose of these properly by recycling them whenever possible.

INVENTORY THE CONTENTS

Your Duncan Electronic Kiln arrives almost fully assembled. Separate components will include:

- The Kiln (including lid and controller main panel)
- The Control Touchpad Panel
- Kiln Peephole Plugs (one for each peephole)
- Kiln Stand (if ordered)

GET READY

ATTACHING THE CONTROL TOUCHPAD PANEL

The Control Touchpad Panel is a box that features a white touchpad with multicolored keys. It attaches to the upper right side of the main electrical panel which is located on the front of your kiln.

1. Before attaching the touchpad panel to the main panel, find the wire harnesses protruding from the connecting sleeves. The wire harnesses are fitted with mating connectors.

2. Attach the mating connectors (they will only fit one way).

3. Once the mating connectors are attached, slide the stem protruding from the Control Touchpad Panel into the sleeve located on the main panel. At the same time, slide the mating connector and wire harnesses into the main panel.

4. Adjust the angle of the Control Touchpad Panel until it is most comfortable for you, and tighten the set screws with a flathead screwdriver.

PLACEMENT OF THE KILN

• Be sure that the location of your kiln is well ventilated and free of flammable materials. A kiln should never be placed in a tightly enclosed area, such as a closet or cabinet, as air circulation is needed to prevent overheating.

• Never operate your kiln in a wet area, or where moisture is likely to accumulate.

• Your kiln should be placed out of the way of children and activities unrelated to kiln firing.

• A kiln should never be placed in an area that restricts your access to the peepholes or control panel.

• Do not allow the electrical cord to touch the kiln jacket.

aching the Control Touchpad Panel

Adjustment of the Control Touchpad Panel

• Kilns are heat-generating appliances. Use common sense when working near your kiln to avoid burns. Wait until the kiln has fully cooled before attempting to unload fired pieces. Wear protective gloves when removing or inserting vent plugs.

1. Place the kiln stand on a level surface. The floor beneath the kiln should be of a material that cannot be discolored by heat and which will not present a fire hazard. Recommended floor surfaces are cement, ceramic tile, brick, stone and the like. The stand must be leveled to minimize stress on the kiln during firing and to prevent contents from falling off the stilts. To level the kiln, place shims under the appropriate leg or legs, NOT between the kiln's bottom and the stand. Otherwise, you may weaken the structural integrity of the kiln bottom.

2. Taking hold of the lower handles on the side, lift the kiln into position on the stand. *(Note: If yours is a multi-sectioned kiln, do not attempt to lift it using handles on the upper section, as this may cause separation.)* Center the kiln onto the stand, providing a minimum of 12" clearance between the kiln and the closest wall.

3. Make sure that the kiln is stable on the stand.

ELECTRICAL REQUIREMENTS

The electrical requirements of your Duncan Electronic Kiln are given in the table at the right. Be sure that the power supply to the outlet nearest your kiln is adequate for your kiln's requirements. Otherwise, your kiln will not perform at its optimum level. It's best to have your power supply tested by a qualified licensed electrician.

Electrical Requirements Chart

Model	Amps	Watts	Copper Wire Gauge	Circuit/Fuse Size	Kilowatt Hrs./Firing*
The Teacher Model DE-820					
DE 820-2	24	5760	10	30	20
DE 820-4	24	4992	10	30	24
The Studio Model DE 1020					
DE 1020-2	40	9600	8	50	38
DE 1020-4	40	8320	8	50	38
The Pro Model DE 1029					
DE 1029-2	45	10800	6	60	40
DE 1029-4	45	9360	6	60	40

All models will run on either a single-phase or any two legs of a three-phase circuit.
* Cone 05 average firing

INSTALLING AN ORTON KILNVENT® SYSTEM

If you will be installing an Orton KilnVent® System, follow these instructions:

1. Drill one (1) 1/4" hole in both the lid and the floor of your Duncan kiln *(Ignore the instructions given in the Orton KilnVent® Owner's Manual having to do with the size and number of holes to be drilled.)*

2. Follow all other instructions given by Orton for installation of their Orton KilnVent® System.

GET SET

PREPARING YOUR KILN

Three steps are in order before the initial firing of your kiln:

1. *Clean the inside.* All loose debris must be removed to ensure the proper functioning of the heating elements. Brick chips and other matter can accumulate during shipping and unpacking, and may hasten deterioration of the heating elements. We recommend that you carefully remove foreign particles with a vacuum.

2. *Apply two coats of kiln wash* to **only** those surfaces that will come in contact with ware. Kiln wash is a protective coating applied to the top of the hearth plate (any shelf on the bottom of the kiln), and to the tops of kiln shelves to prevent glaze drips from adhering permanently to those surfaces. Renew the kiln wash coatings periodically as needed.

Kiln wash is usually purchased in powdered form, mixed with water to the consistency of skim milk, and applied with a brush. When surfaces protected by kiln wash become rough from repeated firings, scrape them off and apply a new coat.

Never apply kiln wash to the side walls, kiln lid or the bottoms of shelves, as it may fall off during firing and mar your glazed ware.

3. *Remove the uppermost peephole plug.* This allows air to circulate through the kiln during firing. Restricting the air flow can result in the dulling of colors and substandard bisque firings.

GO

Now that your Duncan Electronic Kiln is properly installed and its contact surfaces prepared with kiln wash, it's time to put it through its paces.

THE DRY RUN

The first firing of your Duncan Electronic Kiln will be without any ware loaded into it. This is to burn off any residues from the heating elements and any other matter that may be present, such as dust, which can produce vapors that are harmful to most glazes.

In the *Dry Run* phase, you will be putting your kiln through a complete Cone 05 firing cycle. The basic firing steps for this will be the same as for most subsequent firings, and are as follows (refer to diagram of touchpad):

1. Load into the kiln the shelves, posts and stilts that will be used in future firings, and press the key marked **CONE FIRE**

2. Press the keys for the number **05** (Cone 05). That number will appear in the display. Now, press **ENTER**.

3. The optimum firing pattern for a Cone 05 firing is preprogrammed into your kiln. Simply press the **START/STOP** key to launch it into operation.

The kiln will automatically shut off upon completion of the firing cycle. When it does, the display will alternate between the symbol **CPL** and a time reading. The time reading simply indicates the time it took to successfully complete the firing cycle. You may use the **START/STOP** key to ascertain the internal kiln temperature.

(Note: These instructions are listed on the main panel just to the left of the touchpad panel.)

Basic Firing Steps

BREAK-IN PERIOD

There is a break-in period for your kiln's thermocouple, during which the kiln may fire one-half cone hotter than normal. This can last for fifteen to twenty firings. Monitor your first few firings. If your kiln fires at a level above normal, see the steps listed under *Calibration of the Controller* on page 13.

BASIC FIRING STEPS — CONE FIRE MODE

The Duncan Electronic Kiln is designed to take the guesswork out of ceramic firing. Optimum firing patterns for each cone level have been programmed into your kiln to give you consistent results every time.

The firing steps are as **simple as 1-2-3**.

1. After you've loaded your pieces into the kiln (see the section on Firing Basics), go to your adjustable touchpad panel and press the key marked **CONE FIRE**.

2. Select the proper cone level for the piece(s) you're firing (see chart on page 18). That number will appear in the digital display. Then press **ENTER**.

3. You've told your kiln which firing pattern to follow, so simply press the **START/STOP** key to launch it into operation.

Step	Press	Activity	Display
1	Cone Fire	Enters cone fire mode	ConE
2	Cone number (**06**, for example)	Enters desired cone	06
3	Enter	Enters cone number into memory	CPL
4	Start/Stop	Launches program	-ON-

The factory settings on your Duncan Electronic Kiln are programmed for a *medium* firing speed. In most cases, that will produce the best results for whichever cone firing level you choose.

! **Important:** THE ZEROES PRECEDING A CONE NUMBER ARE SIGNIFICANT. If the cone number has a zero, it must be entered. Failure to do so will result in an overfiring.

OPTIONAL FIRING STEPS

In the "Options" section of your touchpad are six keys that let you modify the firing patterns that you select in Cone Fire mode.

Changing the firing speed. Depending upon the pieces you're firing, you may wish to alter the program so that it either runs faster or slower than the standard speed, which is medium.

1. To do this, begin as you did in the Basic Firing Steps 1 and 2 by selecting and entering a specific cone firing level.

2. Then select the speed you want (**FAST, MEDIUM, SLOW**), and press **ENTER**.

3. Initiate the firing as you did before by pressing **START/STOP**.

Step	Press	Activity	Display
1	Slow	Selects slow speed	SPd SLO
2	Enter	Enters slow speed to memory	CPL
3	Start/Stop	Launches modified program	ON

60

Alarm. This function is for people who wish to keep close tabs on the progress of certain firings. When the kiln reaches an internal temperature that you select, an audible alarm will sound, letting you monitor that stage of the program.

1. After following Basic Firing Steps 1 and 2 **(page 8)**, press **ALARM**.

2. The display will flash, asking you to input a temperature in degrees (°F or °C) at which you want the alarm to sound. **Input the degrees**, and press **ENTER**. Valid inputs are 0 - 9999. (Default setting is 9999.)

3. Press **START/STOP** to initiate the firing.

Step	Press	Activity	Display
1	Alarm	Enters alarm mode	ALAr
2	Alarm temperature (**1200**, for example)	Selects alarm temp.	1200
3	Enter	Inputs alarm temp.	CPL
4	Start/Stop	Launches firing program	-ON-

4. To cancel the alarm after it sounds, simply press the **ALARM** key. (*Note:* A new alarm step cannot be entered without first stopping the firing program.)

Delay Start. This is a feature that lets you delay the start of your firing program for a specified period of time. Many people use it to delay the kiln firing until the evening hours, when utility rates are lower.

1. After following basic firing steps 1 and 2 **(page 8)**, press **DELAY START**.

2. The display will flash, asking you to input a time period in terms of hours and minutes (up to 99:99). **Input the hours and minutes**, and then press **ENTER**.

3. Set the program to start by pressing the **START/STOP** key.

Step	Press	Activity	Display
1	Delay Start	Awaits time input	DELA
2	Enter delay time (**0800** for example)	Selects delay period	08.00
3	Enter	Inputs delay time	CPL
4	Start/Stop	Launches firing program	-ON-

Hold. Use this function key to specify a different hold time for the final segment of the cone firing program than that which is standard.

1. After completing Basic Firing Steps 1 and 2 **(page 8)**, press **HOLD**.

2. The display will flash, asking you to specify a time period in terms of hours and minutes (up to 99:99). **Input the hours and minutes**, and press **ENTER**.

3. Set the program to start by pressing the **START/STOP** key.

Step	Press	Activity	Display
1	Hold	Awaits time input	HOLd
2	Enter hold time (**0015**, for example)	Selects time period	00.15
3	Enter	Inputs hold time	CPL
4	Start/Stop	Launches firing program	-ON-

Note that all of the optional programming features of your Duncan Electronic Kiln may be installed for each firing. Simply delay pressing the **START/STOP** key until all desired steps have been entered.

Custom Firing — Ramp/Hold Mode

In the rare instance when there is not a standard firing program to fit your particular needs, such as when firing porcelain, stoneware or glass, the Duncan Electronic Kiln lets you create your own. Up to six programs may be created and stored in permanent memory. These may have as many as eight segments, each with its own firing speed, temperature target and hold time.

The steps to create a custom firing program are as follows:

1. Press the key marked, **RAMP HOLD/VIEW**. The symbol **USEr** will flash in the display, alternating with a number between 1 and 6. That number will correspond with the previous program that was run on the kiln.

2. **Select a number** between 1 and 6 to assign to the new program you are installing, and press **ENTER**.

3. Input the desired number of **ramp segments** (1-8), and press **ENTER**. (Ramp refers to a temperature change over a specified period of time).

4. Input the **rate** of temperature rise (degrees per hour) for Segment 1, and press **ENTER**.

5. Input the **hold temperature** for Segment 1, and press **ENTER**.

6. Input the **hold time** in hours and minutes for Segment 1, and press **ENTER**.

7. Repeat steps 3 through 5 for each additional segment.

8. Input the alarm temperature, and press **ENTER**.

9. Launch the program into operation by pressing the **START/STOP** key.

Example: To set the kiln to fire at 150°F/hr. up to 1000°F, and then at 300°F/hr. to 1850°F - with an alarm to sound at 1500°F - follow these steps:

Step	Press	Activity	Display
1	Ramp Hold/View	Enters Ramp Hold mode	USr
2	Number (1 - 6)	Selects the user program number to store the profile	1
3	Enter	Inputs user number	SEGS
4	Number (1 - 8)	Selects the number of firing segments	2
5	Enter	Inputs number of segments	rA 1
6	Temperature (1 - 9999) 150 for example	Selects the rate of rise for the first segment	150
7	Enter	Inputs rate of rise	°F 1
8	Temperature (1 - 2400) 1000, for example	Selects end temperature for first segment	1000
9	Enter	Inputs end temperature for first segments	HLd1
10	Time in hours and minutes (00.00 - 99.99) 15 minutes, for example	Selects time to hold at the end temperature for segment one	00.15
11	Enter	Inputs hold time for segment one.	rA 2
12	Temperature (1 - 9999) 300 for example	Selects the rate of rise for the second segment	300
13	Enter	Inputs rate of rise	°F 2
14	Temperature (1 - 2400) 1850, for example	Selects end temperature for second segment	1850
15	Enter	Inputs end temperature for second segments	HLd2
16	Time in hours and minutes (00.00 - 99.99) 1 hour, for example	Selects time to hold at the end temperature for segment two	01.00
17	Enter	Inputs hold time for segment two	ALAr
18	Temperature (1 - 9999) 1500, for example	Selects temperature that alarm will sound	1500
19	Enter	Inputs alarm temperature	CPL

Note: At any time during the firing process, you may press the **RAMP HOLD/VIEW** key to display the current firing segment. **Important**: Pressing this key twice in quick succession will call the symbol **SStP** (Skip Step) to the display. Pressing **ENTER** will then instruct the kiln to skip to the next ramp segment.

INFORMATIONAL KEYS

Informational Keys

The touchpad on your controller has four keys designed to put valuable information right at your fingertips.

CONE TABLE

Press this key, followed by a cone number plus **ENTER**. The display will indicate the number of degrees associated with that cone level.

Step	Press	Activity	Display
1	Cone Table	Research Mode	ConE
2	Cone number (022-10). **06**, for example	Selects desired cone number	06
3	Enter	Calls up temperature associated with selected cone	1818ºF

°F/°C

Use this key to toggle back and forth between the Fahrenheit and Celsius scales. All inputs and displays will be for the selected temperature scale. When in Celsius mode, an indicator light will appear in the lower left of the display.

REVIEW FIRING

Press this key at any time to see the current settings in the firing profile.

VIEW

Pressing this key during a Ramp/Hold program enables the operator to see the current segment being executed in the firing program.

THE CLEAR/RESET KEY

The CLEAR/RESET key has three functions, as follows:

• *Cancel a step.* If you change your mind while programming a particular setting (hold time, alarm, etc.), press this key once to cancel that setting. This will return the controller to home state, and the display will show the internal kiln temperature.

• *Reset Cone Fire.* If you decide that you want to clear all the functions you've entered for a firing program, press this key once while the controller is in home state. This will clear the Cone Fire setting as well as the Alarm, Delay Start, Firing Speed and Hold settings. The display will show the symbol **rEST** for 5 seconds.

• *Clear a user program.* To clear a firing program that has been stored in permanent memory, depress this key twice while the controller is in home state. The display will alternate between the symbols **CLr** and and **USr1**. At that point, select a number between 1 and 6 (for the the program you wish to erase), and press the **Enter** key. The symbol **CLr** will appear for 5 seconds, indicating that the erasure was successful.

DEFAULT SETTINGS — HOME STATE

Function	Default Setting
Cone Fire	0
Firing Speed	Medium
Alarm	9999 (used to specify 'no alarm')
Delay Start	00:00 (used to specify 'no delay start')
Hold	00:00 (used to specify 'no hold time')
Ramp Hold	Defaults per each component: Segments = 1 Rate of Rise = 0000 Hold Temperature = 0000 Hold Time = 00:00

KEY FUNCTIONS / DISPLAY MESSAGES

Given below is a comprehensive listing of each key's function and the display readouts that will appear when the key is pressed.

DUNCAN ELECTRONIC KILN PANEL FUNCTIONS

Key	Function/Display
CLEAR/RESET	Depressing this key while setting a function will return the panel to home state and the function will remain unchanged. The display will show the internal kiln temperature. Depressing this key once while in home state will clear the Cone Fire setting and reset ALARM, DELAY START, FIRING SPEED and HOLD to default. The display will show the word **rESt** for 5 seconds. Depressing this key twice in quick succession while in home state will prompt the display to alternate between the word **CLr** and **USr1**. The user may input the numbers 1 through 6, depending upon which user program is to be deleted, followed by ENTER. The display will show the word **CLr** for 5 seconds, indicating that the user program has been cleared. *This key is inactive during firing.*
°F/°C	Use this key to toggle between displays of the internal kiln temperature in either Fahrenheit or Celsius degrees. In Celsius mode, a decimal point will appear in the lower right corner of the display. *This key remains operational at all times, except when programming a specific function.*
CONE FIRE	Depressing this key will initiate the cone fire sequence. The display will show the prompt, ConE asking the operator to enter a cone number, followed by ENTER. *This key is inactive during firing.*
1 through 0	Numerical keys are used to signify a variety of commands, including cone firing level, number of segments in a custom program, and time and temperature targets. *These keys are inactive during firing.*
ENTER	Depressing this key will load commands from the display into the kiln memory. After depressing ENTER, the display will flash CPL, and then return to the internal kiln temperature reading, or else the results of the input will be displayed. If the kiln is in the RAMP HOLD mode, depressing ENTER will call up the next input prompt. When pressed while the display is flashing **CPL** and the time to fire, it will prompt the display to show the internal kiln temperature. *This key is inactive during firing.*

Key	Function/Display
STOP/START	Depressing this key while the kiln is off will launch the current kiln program. The word **ON** will appear in the display for 10 seconds. Depressing this while the kiln is in operation will stop the current kiln program. The word **STOP** will appear in the display and remain for 5 seconds. When pressed while the display is flashing **CPL** and the time to fire, it will prompt the display to show the internal kiln temperature.
SLOW	Depressing this key will display the word **SLO**. Pressing ENTER will change the kiln firing speed to the slow rate. *This key is inactive during firing.*
MEDIUM	Depressing this key will display the word **MEd**. Pressing ENTER will change the kiln firing speed to the medium rate. *This key is inactive during firing.*
FAST	Depressing this key will display the word **FASt**. Pressing ENTER will change the kiln firing speed to the fast rate. *This key is inactive during firing.*
ALARM	Depressing this key will cause the display to alternate between the word **ALAr** and the present setting for the alarm temperature. The user may at this time enter the new alarm temperature, followed by ENTER. *This key is inactive during firing.*
DELAY START	Depressing this key will cause the display to alternate between the word **dELA** and the current setting for the delay time, in hours and minutes. The user may now enter a new delay time, followed by ENTER. *This key is inactive during firing.*
HOLD	Depressing this key will cause the display to alternate between the word **HOLd** and the current setting for the hold time in hours and minutes. The user may now enter the new hold time, followed by ENTER. *This key is inactive during firing.*
CONE TABLE	Pressing this key will display the prompt **ConE**. The user can now enter a cone number, followed by ENTER, to display the temperature in degrees of that cone. The temperature will remain in the display for 5 seconds. *This key is inactive during firing.*

KEY FUNCTIONS / DISPLAY MESSAGES

Key	Function/Display
RAMP/HOLD VIEW	RAMP HOLD: This function is only active while the kiln is off.
	Pressing this key will cause the display to alternate between the word **USr** and the current program number (1 to 6) that is in use. The user may then enter the new program number, followed by ENTER.
	The display will now begin cycling between the word **SEGS** and the current number of segments (1 through 8) for this program. The user may then enter the desired number of segments, followed by ENTER.
	The display will then show **rA** and the current segment (1 through 8), and will alternate between this and the current rate of rise. The user may then enter the new rate of temperature climb, followed by ENTER.
	The display will then show **°F** and the current segment number (1 through 8), and will alternate between this and the current hold temperature (if the display is in Centigrade, then the display will show °F). The user may then enter the new hold temperature, followed by ENTER.
	The display will then show **HLd** and the current segment (1 to 8) and will alternate between this and the current hold time in hours and minutes. The user may then enter the new hold time, followed by ENTER.
	The kiln will sequence through the above steps for each segment in the program.
	When the final segment is complete, the display will flash **CPL** twice and then display the internal kiln temperature.
	VIEW: This key is only active during firing.
	Depressing RAMP HOLD/VIEW during firing will display the current segment of the program in progress. This will remain on the display for approximately 5 seconds.
	Depressing this key twice in quick succession will cause the display to respond with the word **SStP**, and pressing ENTER within 15 seconds will instruct the program to skip the remainder of the current segment.
REVIEW FIRING	Pressing this key will display all settings of the current firing profile. Each portion of the review will remain on the display for 1.5 seconds. After the review, the display will return to its previous state.
	If the kiln is set up in a cone fire profile, then the display will show: **CONE** and the **cone number**, the firing temperature, the firing speed (SLO, MEd, or FASt), **HOLd** and the hold time, **ALAr** and the alarm temperature, and **dELA** and the delay start hours and minutes.
	If the kiln is set in a ramp hold profile, then the display will show: **PrOG** and the current program number, **SEGS** and the number of segments in the program, **rA 1** and the rate of temperature change for segment 1, **°F 1** and the hold temperature for segment 1 (if the display is in Centigrade then the display will show **°C 1**), **HLd1** and the hours and minutes to hold for segment 1. The display will cycle through **rA**, **°F** and **HLd** for each segment. **ALAr** and the alarm temperature, as well as **dELA** and the delay start hours and minutes will also be displayed.
	This key remains operational at all times.

CALIBRATION OF THE CONTROLLER

The controller allows the user to recalibrate the panel to compensate for variations in the kiln over time. The operator may adjust the temperature target for each cone firing level.

The procedure is as follows:

- Press **CONE FIRE** and input 999. Then press **ENTER**. The display will alternate between **CONE** and a cone number.

- Enter the cone number to be modified, followed by **ENTER**. The display will alternate between the prompt, **OFSt**, and the current offset temperature.

- Enter the desired degrees of offset temperature, followed by **ENTER**. Valid inputs are 0 to 99.

- The prompt, **COLd**, will appear in the display. Press any key, other than **ENTER** and **RESET**, to toggle between **HOt** and **COLd**. Press **ENTER** to input the offset temperature.

- The **ConE** prompt will appear again. Press **999** plus **ENTER** to reset another cone temperature, or select the desired cone level and press **ENTER**.

(If **COLd** was entered, indicating that a colder firing is desired, then a negative sign will appear on the left side of the display, followed by the offset temperature in the middle two display positions. This will remain on the display for 5 seconds. If the input was **HOt**, indicating a hotter fire is desired, then the display will not show anything on the left side of the display.)

KEY FUNCTIONS / DISPLAY MESSAGES

Example — Controller Calibration: Your kiln is firing to shelf cone 03 at 3 o'clock each time you set it to fire to cone 04. Use the cone table function to determine that cone 04 = 1941°F, and that cone 03 = 1991°F. Since a cone 03 at 3 o'clock is about halfway between cone 04 and cone 03, that would be approximately 1966 °F (1941 + 1991 = 3932 ÷ 2 = 1966). You want the kiln to fire to 1941 °F, but it is actually firing to 1966 °F, or 25°F too hot.

To correct this, follow these steps:

Step	Press	Activity	Display
1	Cone Fire	Enters Cone Fire mode	ConE
2	999	Selects Calibrate mode	999
3	Enter	Enters into the controller calibrate mode	ConE
4	Cone number (022 - 10) This example is 04.	Selects the cone number to be modified	04
5	Enter	Inputs the cone number	OFSt
6	Offset temperature (1 - 99) 25 for this example	Selects the number of degrees by which the controller will raise or lower the firing temperature	25
7	Enter	Inputs offset temp	COLd Note: pressing any key other than enter and reset will toggle this to HOt.
8	Enter	Inputs COLD (this example) or HOT	-25 for 10 seconds then ConE.

You may now enter a cone 04 firing and test the kiln for a correct shelf cone 04 firing. It may be necessary to adjust the temperature offset again to get a closer firing.
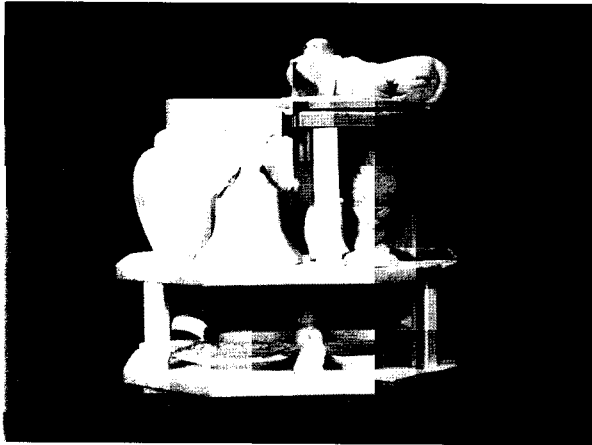
FIRING BASICS

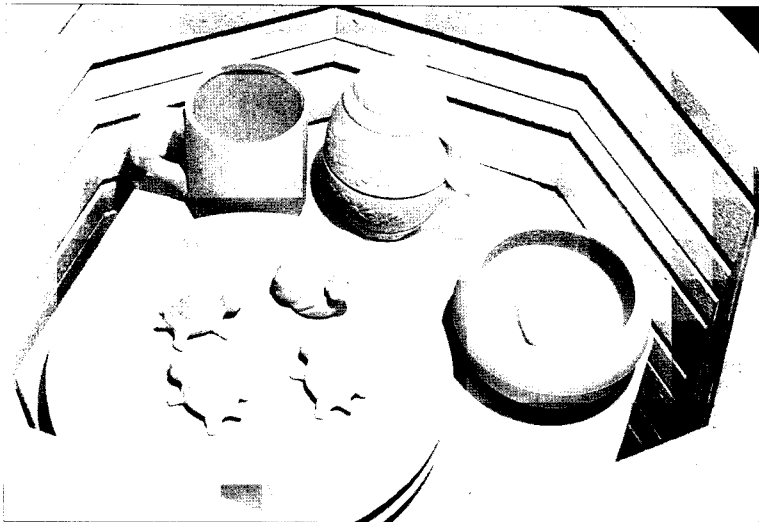Figure 1 — Staging the load.

Figure 2 — Stacking of greenware.

LOADING THE KILN — GENERAL

• Before loading, make certain that the kiln is in **STOP** mode, that the inside of the kiln is free of dust and that the tops of all shelves (including the hearth plate) are coated with kiln wash.

• Load only bone-dry ware into your kiln. Damp ware may crack during firing and sometimes will even explode, causing damage to other ware and to heating elements. Greenware should be air-dried for approximately two days after casting, depending upon the size of the piece and the humidity in the air. Glazed ware should dry for four to six hours before firing. Drying should not be hastened by placing the pieces on the top of the kiln, as this may crack or warp them. Firing wet glazes may cause pinholes, cracking or bubbling. If this happens, try refiring the piece.

• At least three posts should be used to support each shelf. Before positioning a shelf on posts, make sure there is at least one inch clearance between the shelf and ware that is nearby. Place posts of the proper size and length on the shelf prior to placing the ware.

• Lower shelves into the kiln carefully so as not to damage the kiln walls or the thermocouple. Place shelves so that you have at least one element showing between each pair of shelves, and one element between the uppermost shelf and the top of the kiln.

• Keep shelves and ware at least one inch from kiln walls. Plan your load and arrange it before actually placing it into the kiln. This will help you to use the space more efficiently. (See Figure 1)

• Place the heaviest shelf load of ware in the kiln layer that is exposed to the greatest number of heating elements.

FIRING BASICS

- Keep ware of similar height on the same shelf to make best use of space. Combine light and heavy pieces on the same shelf to help the kiln heat evenly. **(See Figure 2)**

- Large flat pieces should be placed so that their edges are between elements. This will promote more even heating and minimize potential cracking.

- Be sure your hands are clean when loading your kiln. Oils or dirt from hands may contaminate the color and alter the finish.

LOADING GREENWARE FOR BISQUE FIRING

- Greenware may be nested or stacked during firing. It is very fragile, however, and care should be taken not to force pieces into position. Greenware may be placed directly onto shelves without having to stilt them. **(See Figure 2)**

- If greenware is nested or stacked, it is advisable to select the **SLOW** firing speed. The **FAST** firing speed is never recommended for greenware.

- Generally, ware should be fired in its natural position except for pieces with flat vertical surfaces, such as wall plaques and clocks. Pieces with lids should be fired with the lids in place to ensure a proper fit.

LOADING FOR GLAZE FIRING

- Glazed pieces should not touch or they may bond permanently. Allow at least 1 inch between pieces so their vapors will not cause cross-contamination.

- Glazed ware should be stilted or dryfooted to keep it from sticking to shelves. Stilting is the preferred method for low-fire (cone 04, 06) glazes. To avoid glaze buildup on stilts, coat them with kiln wash.

- Do not place greenware and glazed ware in the same load.

- If you plan to refire a glazed piece and need to stilt it, coat the bottom of the piece with a light coat of clear glaze. This will give the bottom some texture, and keep it from slipping off the stilts.

LOADING PORCELAIN FOR BISQUE FIRING

- Porcelain is a high-fire clay body that vitrifies (becomes nonporous) when fired. Some porcelain pieces may sag during firing. Hand-formed rolls of the same clay body may be used to support parts that might otherwise have a tendency to sag. Apply alumina hydrate to the rolls where there is contact with your ware to avoid fusing. When firing greenware pieces having lids, apply alumina hydrate to the pieces at any point where contact is made.

- Simple shapes, such as plates, can be supported by commercially-made setters designed for particular articles. Do not use stilts when firing porcelain.

- Keep pieces at least 1 inch away from kiln walls.

LOADING PORCELAIN FOR GLAZE FIRING

- Any glazed ware should be dryfooted. Pieces that require support during the bisque firing will not require support during the glaze firing, because the lower temperature requirement will not produce sagging

LOADING STONEWARE FOR BISQUE OR GLAZE FIRING

- Stoneware is a high-fire clay body that normally vitrifies (becomes nonporous) when fired.

- Greenware items can be stacked or nested without risk of their fusing. Greenware can be placed directly on shelves. Stilting is not required. Be sure pieces are bone-dry. Dampness in the ware can cause them to crack or explode.
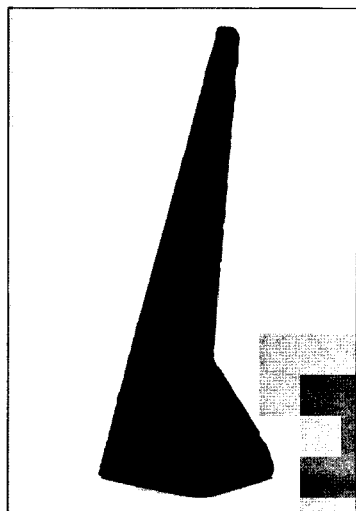
Figure 3 — Pyrometric cone.

Figure 4 — Guide cone, firing cone, guard cone.

LOADING STONEWARE FOR GLAZE FIRING

• For a glaze firing, the tops of the shelves must be coated with Duncan Kiln Wash and the ware should be dryfooted, rather than placed on stilts.

PYROMETRIC CONES

Although the firing programs installed on your Duncan Electronic Kiln are designed to produce optimum results for each cone level, we suggest that you use pyrometric cones to check the accuracy of your firings. (See Figure 3)

Pyrometric cones measure the combined effects of time and temperature during a kiln firing. Cones are numbered according to a desired cone firing level. The lower the cone number, the cooler the firing, and vice versa. See the scale given below.

◁ Cooler							Hotter ▷	
019	018	017	06	05	0	2	5	10
				Cone Level				

When the right combination of time and temperature have been applied to achieve the desired level, the cone will bend at an even 90° angle. A cone which bends at less than a 90° angle indicates underfiring. A bend greater than 90° means that the piece(s) have been overfired.

FIRING BASICS

It's best to place three cones together during a firing; one of the level designated for that firing (Firing cone), one for the next higher level (Guard cone), and one for the next lower firing level (Guide cone). In a proper firing, the Firing cone will bend at a 90° angle. The Guide cone will show a bend greater than 90°, and the Guard cone will show less than a 90° bend. **(See Figure 4)**

Place cones at least 3 inches away from peepholes to avoid a false reading. For greatest accuracy, it is a good idea to place three cones on *each* shelf on which pieces have been placed. Keep ware well away from cones to prevent their coming into contact with one another.

CHOOSING YOUR CONE

Use the following chart as a general guide to selecting the right cone.

Type of Firing	Shelf Cone Desired
BISQUE	
Stains, acrylics	06-04
Stains that have glazed areas	04
General-purpose ware	04
Porcelain	6
Stoneware	6
GLAZE	
Luster (Mother-of-Pearl)	020
Metallic overglazes	019 - 018
China paints	019 - 015
Decals	018 - 015
Hobby ceramics glazes	06
Porcelain or stoneware glazes	6

Note: These are general guidelines. Always check the specific product label for the recommended shelf cone.

CONVERSION TABLE FOR PYROMETRIC CONES

C°	F°	Orton Cones	British Cones	Seger Cones
600	1112	—	022	022
605	1121	022	—	—
615	1139	021	—	—
650	1202	020	021	021
660	1220	019	—	—
670	1238	—	020	020
690	1274	—	019	019
710	1310	—	018	018
720	1328	018	—	—
730	1346	—	017	017
750	1382	—	016	016
770	1418	017	—	—
790	1454	—	015	015a
795	1463	016	—	—
805	1481	015	—	—
815	1499	—	014	014a
830	1526	014	—	—
835	1535	—	013	013a
855	1571	—	012	012a
860	1580	013	—	—
875	1607	012	—	—
880	1616	—	011	011a
895	1643	—	—	—
900	1652	011	010	010a
905	1661	010	—	---
920	1688	—	09	09a

FIRING BASICS

CONVERSION TABLE FOR PYROMETRIC CONES (CONTINUED)

C°	F°	Orton Cones	British Cones	Seger Cones
930	1706	09	—	—
940	1724	—	08	08a
950	1742	08	—	—
960	1760	—	07	07a
980	1796	—	06	06a
985	1805	07	—	—
1000	1832	06	05	05a
1020	1868	05_	04	04a
1040	1904	05	03	03a
1060	1940	04	02	02a
1080	1976	—	01	01a
1100	2012	—	1	1a
1115	2039	03	—	—
1120	2048	—	2	2a
1125	2057	02	—	—
1140	2084	—	3	3a
1145	2093	01	—	—
1160	2120	1	4	4a
1165	2129	2	—	—
1170	2138	3	—	—
1180	2156	—	5	5a
1190	2174	4	—	—
1200	2192	—	6	6a
1205	2201	5	—	—
1230	2246	6	7	7
1250	2282	7	8	8
1260	2300	8	—	—

FIRING FAULTS

Imperfections in a firing may indicate a problem with the kiln, the glaze or finish used, or from errors by the kiln operator. The following table lists problems, their probable causes, and suggested remedies.

Recognizing Firing Faults

Symptoms	Probable Cause	Remedy
Cratered or Bubbled Glaze	1. Underfiring. 2. Glaze application too thick. 3. Immature bisque.	1. Grind down the bubbles, add a thin coat of glaze and refire to proper firing cone.
Crazing	1. Underfired or immature bisque. 2. Kiln cooled too rapidly. 3. Thermal shock (removing piece from kiln too soon or subjecting it to extreme temperature changes). 4. Improperly formulated body.	1. Sometimes can be corrected by refiring the piece one cone hotter than the original firing.
Cloudy Transparent Glaze	1. Glaze applied too heavily. 2. Not fired hot enough.	2. Refire to proper firing cone.
Greyed or Discolored Glazes	1. Ware placed too close too element. 2. Overfiring. 3. Insufficient application of glaze. 4. Fired with incompatible colors or greenware. 5. Glaze was applied to greenware. 6. Insufficient ventilation during firing.	1. Although difficult to correct, sometimes refiring to the proper firing cone will correct this. 2. Try applying a heavy coat of glaze and refiring, if remedy #1 doesn't work. 3. Glazes that have greyed usually cannot be salvaged.
Shiny Matte Glazes	1. Misfiring, either overfiring or. underfiring, depending upon the glaze composition.	1. If underfired, refire to proper firing cone. 2. If overfired, this is difficult to correct. Sometimes applying another coat of glaze and refiring will help.
Pinholes	1. Underfired bisque. 2. Dust left on ware or in the kiln. 3. Glaze was applied to greenware before refiring. 4. Firing too rapidly. 5. Improperly adjusted slip.	1. Refire to proper firing cone. 2. Apply a thin coat of glaze and refire. 3. Problem best remedied before glazing Properly adjust slip with silicate of soda, properly fire and clean bisque
Smooth Texture Glazes	1. Insufficient application. 2. Misfiring.	1. Reapplying glaze and refiring to proper cone will usually correct the problem.

FIRING BASICS

Symptoms	Probable Cause	Remedy
Distorted Bisque	1. Overfiring. 2. Ware incorrectly removed from the mold.	1. Saving these pieces is usually impossible.
Cracked Metallic Overglazes	1. Overfiring. 2. Too heavy an application.	1. Refire object to cone 06 to burn off the overglaze, then apply another coat and refire to the firing cone recommended by the overglaze manufacturer.
Faded Decals	1. Overfiring. 2. Underfiring.	1. If decal was overfired, the problem cannot be corrected. 2. If decal was underfired, refire to the proper **firing** cone. **Note:** In both cases, check the manufacturer's firing recommendation to determine overfiring or underfiring.
Blistering During Decal Firing	1. The decal firing was too hot, causing the glaze to start to react. 2. Underfired bisque.	1. Saving these pieces is usually impossible.

TROUBLESHOOTING

In designing your new Electronic Kiln, Duncan's engineers have taken the approach that *less is more*. Fewer parts mean fewer repairs. With the most up-to-date, high-performance components, and solid-state electronics, your Duncan Electronic Kiln is made to give you years of trouble-free service. But in the rare instance when your kiln might need repair, please refer to the following service guide.

COMMON QUESTIONS

• **The pieces I've fired have not reached full maturity. Can I extend the current firing?** Yes. So long as the kiln has not cooled greatly since the end of the program. If the shelf cones have cooled too much, they will not give an accurate reading. Otherwise, it's OK to run the kiln through an abbreviated final cycle. To do this, follow these steps:

• Select the **Cone Fire** mode as you normally would, and enter a cone number that is one level hotter than the program just completed. It's a good idea, also, to program an extra five minutes of hold time at the end of the refiring, in order to compensate for different cooling rates within the kiln. Then, just press the **Start/Stop** key. Your kiln will automatically adjust for the current internal temperature.

• **I've plugged in my kiln, but nothing shows up on the display panel.** Most likely, the problem is with your power source. Check the circuit breaker for your kiln. If it has not tripped, then you probably have a bad fuse. Fuses can get damaged while the kiln is in shipment. To replace the fuse, refer to instructions given in the section on **Repairs and Replacements** (Electrical).

• **A blue spark appears at night from the Main Panel when the kiln is operating. Is this a problem?** No. This is normal. A small arc will occur at the moment that the contacts open on the power relays.

• **Smoking occurred when I first fired my kiln. Is this a cause for concern?** No. This is simply the result of trace substances burning off as the heating elements cure.

• **Flaking has occurred on the thermocouple.** Again, this is normal — especially when the kiln is fired to higher cone levels. A simple remedy is to keep a soft toothbrush

handy, and use it periodically to remove scale. Your kiln's thermocouple is made of high-performance materials, and is fully encased to prevent the kind of corrosion that can often cause breakdowns. If replacement becomes necessary, refer to the instructions given in the section on **Repairs and Replacements (Electrical)**.

Error Messages

Error Number	Description	Possible Cause(s)	Correction
1	Temperature ramp is less than 12º/hr.	Heating elements may be weak. Load may be too heavy. Relay failure. Low Voltage.	Check elements. Reduce load size. Check relays. Test voltage.
2	Actual hold temperature is 50º or more *above* programmed hold temp.	Excessive heating rate just prior to hold segment. One or more relays stuck in the closed position.	Reprogram with a lower heating rate. Unplug kiln and test resistance at the plug with an ohmmeter.
3	Actual hold temperature is 50º or more *below* programmed hold temp.	Kiln unable to reach target hold temperature. Lid opened during firing. Weak elements.	Keep lid closed during firing. Test elements with an ohmmeter.
4	Program is in the down-ramp cycle, and temperature is more than 50º *above* previous hold temperature.	Relays may be stuck in the closed position.	Stop the program, and unplug kiln. Test circuit at the plug using an ohmmeter.
5	Program is in the down-ramp cycle, and temperature is more than 50º *below* the present set point.	Lid may be open. Elements may have failed.	Do not open the lid until the kiln has reached at least 500ºF. Check elements.
6	Negative reading at the thermocouple.	Thermocouple lead wires have been reversed.	Correct any reverse wiring.
7	Program is ramping up, and temperature is 50º or more *above* set point.	Relay stuck in the closed position.	Stop the program, and unplug kiln. Check relays.
8	Contoller in up-ramp mode, but kiln temperature is ramping down.	Relays have either failed while in the open position or are no longer get ting power from the controller.	Check the relays.
FAIL	Controller cannot sense thermocouple.	Thermocouple failed or disconnected.	Secure or replace thermocouple.
ENTr/ConE/FirE	Controller asking for a cone number to be selected.	No cone number was selected for Cone Fire mode.	Enter a desired cone number.

REPAIRS AND REPLACEMENTS (NONELECTRICAL)

FIREBRICKS

Insulating bricks are designed specifically for heat retention. With proper care, they will last indefinitely. Small cracks may appear after a few firings. This is normal, and actually serves a practical function by providing small expansion joints for intermittent heating and cooling. It is rare that bricks suffer enough fatigue from normal use to warrant replacement. But in the event that yours do, follow these steps:

Firebrick Replacement

1. **Unplug the kiln from its power source**.

2. Detach the kiln lid by removing the hinge and lid-brace mounting assembly from the kiln jacket.

3. Remove the heating elements from the bricks you are replacing. Elements are brittle when they are cool, so heat them briefly to soften them before removal. Use needle-nose pliers to remove the elements. **(See Figure 5)**

4. Loosen the clamps holding the kiln jacket together, and remove only as many screws as are necessary to free the bricks being removed.

5. Carefully remove damaged bricks.

6. Insert replacement bricks with the element groove down.

7. Tighten the case clamps and align the peepholes with the kiln jacket. If new peephole brick does not line up right, it can be sanded to the necessary shape.

8. Replace all other parts removed during disassembly.

9. Briefly reheat the elements to soften them again, and replace them into the grooves using a dull instrument.
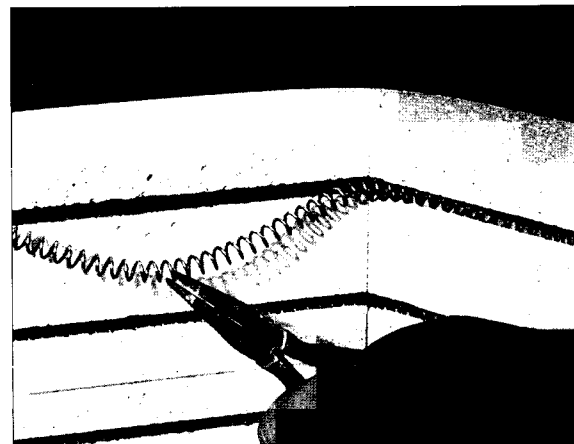

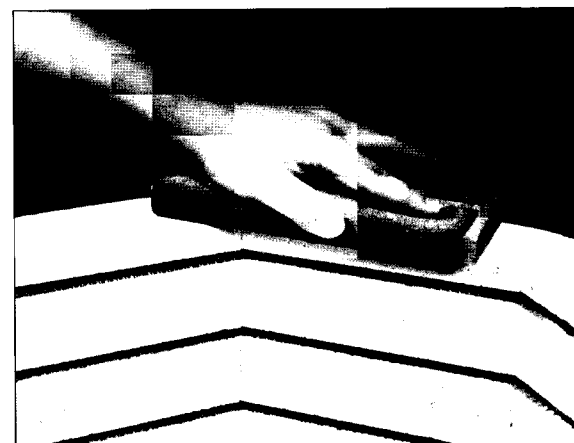Figure 5 — Removing heating element.

Figure 6 — Leveling the surface.

Figure 7 — Marking the base plate.

10. If the top bricks are not flush, use a sanding block to align their surfaces. (See Figure 6)

11. Test the kiln with a multimeter for electrical soundness.

12. Vacuum the kiln, removing extraneous matter.

KILN FLOORS

With proper care, the kiln floor may never need replacement. Use of a hearth plate (shelf placed on the floor of your kiln) is your best insurance against kiln floor damage. Take care always to remove fallen glazes and debris soon after it accumulates. Follow each such removal with a fresh coating of Duncan Kiln Wash.

In the rare instance when your kiln floor needs replacement, follow these steps.

Kiln Floor Replacement

1. **Unplug the kiln from its power source.**

2. Place a pad of newspapers on the floor to prevent scarring the top of the lid.

3. Carefully turn the kiln upside down, holding the lid closed.

4. Mark the case and base plate with a crayon or grease pencil, indicating the positioning of the base plate. (See Figure 7)

5. Remove the screws holding the base plate in position.

6. Loosen the case clamps nearest the bottom of kiln, and pry away the base plate with a flathead screwdriver.

7. Loosen all remaining case clamps and pull out the floor.

REPAIRS AND REPLACEMENTS (NONELECTRICAL)

8. Vacuum the tops of the wall bricks after the floor is removed to eliminate any brick particles on the surface.

9. If you wish, you may replace the kiln floor with a new one, or simply turn over the old floor and fit it into place.

10. Replace the base plate, aligning the marks and screw holes in the kiln jacket with those in base plate.

11. Install one screw in the base plate opposite the case clamps.

12. Tighten the case clamps, aligning all screw holes. Then replace all screws.

13. Turn the kiln right-side up and place it on the stand.

14. Test the kiln with a multimeter for electrical soundness.

15. Vacuum the kiln, removing all extraneous matter.

KILN LID

Minor damage to a lid will not affect a kiln's performance. However, if the lid coating is chipped or gouged, leaving a crumbled area, the condition will worsen if not repaired. Simply smooth the area with sandpaper, vacuum up the dust and brush on a thin coat of **Duncan Kiln Cement and Sealer**. *Never use kiln wash on the underside of the kiln lid.* Periodically check the lid band for tightness, and make any adjustments that are necessary.

In the unlikely event that you would need to replace your kiln lid, here are some easy steps to follow:

Kiln Lid Replacement

1. **Unplug the kiln from its power source**.

2. Remove the lid-brace mounting plate from the old lid.

3. Remove all screws from the lid hinges.

4. Remove the old lid and place the new lid on the kiln.

5. Position the lid so that the corners are aligned.

6. Attach the hinges to the lid by first aligning them with the locator holes in the band.

7. Attach the lid-brace mounting plate to the lid, using prepunched locator holes in the band as a guide.

8. Vacuum the kiln, removing all extraneous matter.

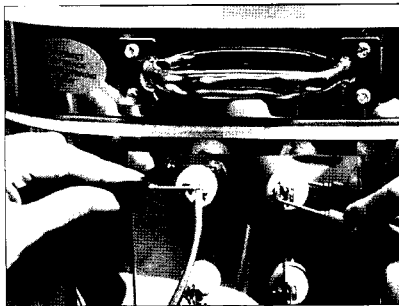Figure 8 — Opening main panel.

Figure 9 — Testing heating elements.

Figure 10 — Removing connector assemblies.
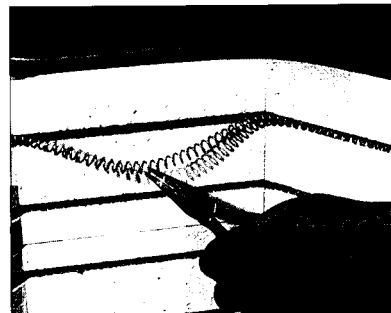

Figure 11 — Removing insulators.

Figure 12 — Removing heating element.

HEATING ELEMENTS

During the firing process, heat reacts with oxygen in the air to form a natural protective layer around the heating elements. This oxidation process repeats itself over time, to the point when the element eventually fails. Foreign matter coming into contact with an element can hasten this process. With proper care, however, heating elements can last for many years.

In the event that you experience a failure of one or more heating elements, follow the steps given below.

Element Replacement

1. **Unplug the kiln from its power source.**

2. Open the main panel by loosening the screws holding it to the kiln chassis.
(See Figure 8)

3. Test the elements with a multimeter to ascertain which ones are damaged.
(See Figure 9)

4. Using a screwdriver, a 3/8" nut driver or small crescent wrench, loosen and remove the appropriate connector assemblies. **(See Figure 10)**

5. Compress each element end with a pair of pliers, or cut them off and remove the insulators. **(See Figure 11)**

6. Use needle-nose pliers to remove the old element. Carefully pull out both ends of the element from the terminal brick. Lift the element up and out of the groove. Clear remaining debris from the groove. **(See Figure 12)**

7. Install the new element by inserting one end through the terminal brick. Use needle-nose pliers to help push it through. Feed the element into the slot, making sure each preformed bend fits snugly into a corner with no tension on the groove's lip. If necessary, compress the element as you progress around the kiln. Before feeding the element into the last two bricks, insert the loose end through the terminal brick. Use a table knife or closed needle-nose pliers to gently press the element down into groove.

REPAIRS AND REPLACEMENTS (ELECTRICAL)

8. Replace the insulators.

9. Cut the loop off the element and spread the wires using your pliers.

10. Replace the connectors (U-terminal or bus bar) onto the element. Slip the element ends between the terminal clamp and the U-terminal or bus bar so that the clamp's curved edges form a vise around the element. Since holes in the bus bar and U-terminal are not centered, place the widest part toward the insulators.

11. Firmly tighten the connections (the tighter, the better). **(See Figure 10)** Insulators should be snug against the heat shield (Approx 60 in/lbs torque).

12. Cut off excess element wire close to the connectors. **(See Figure 11)**

13. Connect wires from the elements to the switches, and reposition the main control panel on kiln.

14. Test the kiln with a multimeter for electrical soundness.

15. Vacuum the kiln, removing all brick chips lodged in the element groove.

16. Follow the firing steps given under **The Dry Run** on page 7.

CONTROL TOUCHPAD PANEL

The Control Touchpad Panel houses the brains to your Duncan Electronic Kiln. Its internal components are all solid-state and cannot be repaired in the field. If repairs become necessary, simply disconnect the entire assembly from the main control panel, package it carefully and return it to the factory. You will be notified upon its receipt at the factory, and apprised of any costs that will be incurred for repairs. See **Warranty** for mailing information. (Note: Attempts at field repairs are likely to void the warranty.)

FUSE REPLACEMENT

If, upon first installing your kiln, no power is detected at the control panel, check the power supply to your outlet. If the circuit breaker has not been tripped then chances are the fuse may have been damaged in transit. Replacing the fuse takes only seconds and requires no tools.

1. **Unplug the kiln from its power source**.

2. Locate the fuse about halfway down the left side of the main service panel in the front of your kiln. **(See Figure 13)**

3. Press on the fuse just slightly, and give it a quarter turn counterclockwise.

4. Remove the fuse, and replace it with a new one in the reverse order as the steps given above. **(See Figure 14)**

THERMOCOUPLE REPLACEMENT

Your kiln's thermocouple performs as a thermometer, relaying precise and continuous information to the controller about the kiln's internal operating temperature. It is constructed of high-performance materials that are protected from the kind of corrosion that can often cause breakdowns. If a problem occurs with your kiln's thermocouple, the word **FAIL** will appear in the display of your Control Touchpad Panel. To replace it, follow these steps:

1. **Unplug your kiln from its power source**.

2. Remove the mounting screws on the right side of the main panel **(See Figure 15)** in the front of your kiln. Swing open the panel. The thermocouple mounting block will be plainly visible at this point. It is a wafer-shaped, bone-colored element with four screws on top and two screws holding it to the kiln chassis. **(See Figure 16)**

Figure 13 — Locating the fuse.
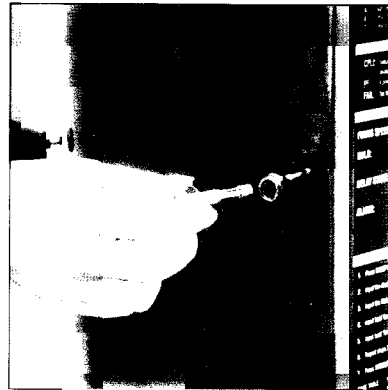

Figure   fuse.

Figure 15 —   n panel.
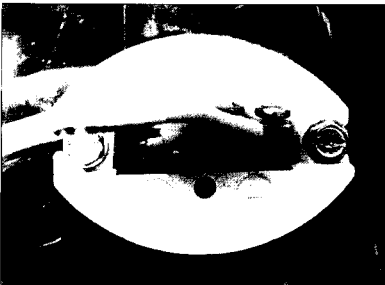

Figure 16   ting block.

Figure 17 — Thermocouple assembly.

Figure 18 — Extracting thermocouple.

3. Remove the two screws holding it to the chassis, and extract the thermocouple assembly. Note the markings on the thermocouple mounting block corresponding to *positive* and *negative*. (See Figure 17)

4. Loosen the two center screws on the top of the mounting block, and extract the thermocouple element. (See Figure 18)

5. Insert the new thermocouple, making sure that the *red* lead goes to the *negative* side of the mounting block.

6. Retrace the steps you took during disassembly to reassemble the thermocouple and main panel.

POWER RELAY REPLACEMENT

1. **Unplug the kiln from its power source**.

2. Remove the heat shield from the main panel.

3. Remove the relay subassembly (without detaching the lead wires).

4. Remove the mounting screws from the power relay to be replaced. Do not undo any electrical connections yet.

5. Remove one slip terminal from the old power relay. Connect that terminal to the same post position on the new relay. Continue in this manner until all terminals are reconnected to the new relay.

6. Use the mounting screws removed in step #4 to attach the new power relay to the main panel.

7. Assemble all components in reverse order as the steps given above.

SPECIFICATIONS

PRODUCT SPECIFICATIONS

Electronic Kiln Specifications

Model No.	Volts	Firing Chamber			Outer Dimensions			Maximum Temp.		Elec. Requirements					Shipping Wt.
		Width	Depth	Cu. Ft.	Width	Depth	Ht.	Cone	°F	Amps	Watts	Copper Wire Size	Circuit /Fuse Size	Kilowatt Hrs Per Firing*	
The Teacher — Model 820															
DE 820-2	240	17.5"	19.75"	2.9	25"	28"	25.5"	8	2300	24	5760	10	30	20	145lb
DE 820-4	208	17.5"	19.75"	2.9	25"	28"	25.5"	8	2246	24	4992	10	30	24	145lb
The Studio — Model 1020															
DE 1020-2	240	23.13"	19.75"	5.0	31"	33"	25.5"	8	2300	40	9600	8	50	38	190lb
DE 1020-4	208	23.13"	19.75"	5.0	31"	33"	25.5"	6	2246	40	8320	8	50	38	190lb
The Pro — Model 1029															
DE 1029-2	240	23.13"	28.75"	7.3	31"	33"	34.5"	8	2300	45	10800	6	60	40	240lb
DE 1029-4	208	23.13"	28.75"	7.3	31"	33"	34.5"	6	2246	45	9360	6	60	40	240lb

All models will run on either a single-phase or any two legs of a three-phase circuit.
* Cone 05 average firing.

GLOSSARY

Absorption — Degree of moisture that will soak into plaster when casting, or into bisque when glazing or decorating with nonfired colors.

Adherence — Ability of a glaze, underglaze or nonfired color to stay in place on a given surface.

Alumina Hydrate — A mineral that, in a powder form, prevents porcelain or stoneware greenware articles that touch from fusing together during firing or adhering to kiln shelf.

Bar, Pyrometric — (See Cone)

Bisque — Fired, unglazed objects of clay. Hard bisque, witness cone 04 or higher; soft bisque, witness cone 06.

Blistering — Broken bubbles on fired glaze surface.

Bone-Dry — Term used to describe greenware that is completely dry, containing no free moisture.

China — Special type of high-fire clay body that has a translucent quality.

Cone or Bar, Pyrometric — Heat-measuring device used when firing a kiln. A bar or a three-sided pyramidal form made of ceramic materials that react to time and temperature in the same way ceramic ware does in a kiln.

Control Touchpad Panel — The box that houses the electronic circuits that govern the operation of a Duncan Electronic Kiln. Features the Control Touchpad, a multicolored sealed panel used for entering commands. Adjustable facing angle for user ease and comfort.

Cratering — Moon-like craters on a glazed surface.

Crawling — Term used to identify a glaze defect in which the glaze pulls away or *crawls* from the bisque, leaving bare bisque areas.

Crazing — Hair-like cracks that appear on a fired glaze surface. Often referred to as either immediate or delayed crazing.

Crevice — A recessed area of greenware or bisque.

Dryfooting — Leaving the bottom area of an article unglazed so stilting is unnecessary. Not recommended for low-fire ceramic utility items due to the porosity of the ware.

Dunting — Breaking away of clay body during firing due to trapped air or foreign substance.

Earthenware — Nonvitreous ware made from low-fire clays.

Element — A high-temperature resistance wire wound in a coil that carries electrical current for heating kiln.

Firebrick — Insulating blocks that line the interior walls of the kiln and that house the heating elements.

Firing — The process of maturing ceramic products by various degrees of heat.

Firing Chamber — Inside area of kiln.

Firing Cone — (See Firing Basics)

Flash — The undesirable transference of a soft glossy sheen onto unglazed ware when high-fired glazed and unglazed ware are fired together.

Flashing — Shiny edges on ware which many low-fire glazes show when high-fired.

Flow — The term used when referring to the *running* or *moving* qualities of a glaze.

Flux — Any substance added to clay or glaze to lower maturing temperature.

GLOSSARY

Foot — Bottom of ceramic item.

Furniture — Articles necessary to use full capacity of kiln space: shelves, posts and stilts.

Glaze — A fired finish consisting of a prepared mixture of frit that produces a glass-like surface when fired.

Greenware — Unfired clay articles.

Guard Cone — (See Firing Basics)

Guide Cone — (See Firing Basics)

Hard Bisque — Ware that has been fired to witness cone 04 or hotter.

High-Fire — Refers to ceramic articles or glazes that are fired to witness cone 4 or higher (stoneware and porcelain).

Home State — The controller's starting point for your programming steps. The point before which any commands have been entered.

Immature Bisque — Ware that has been fired cooler than witness cone 06.

Impervious — Impenetrable. Often used as another term for waterproof.

Kiln — A heating chamber for hardening and maturing clay and glaze

Kiln Furniture — (See Furniture)

Kiln Wash — A coating used on the tops of kiln shelves and kiln floor to protect them from glaze drippings.

Maturing Point — Temperature needed to mature glaze or clay.

Nonmoving Glazes — Glazes that move or flow very little in the glaze firing.

Nontoxic — Refers to a ceramic product that conforms to the US standard ASTM D-4236 and is certified to contain no materials in sufficient quantities to be toxic or injurious to humans or to cause acute or chronic health problems.

Overglaze — A decorative finish applied over a fired glaze surface and made permanent by firing.

Pinholes — Tiny holes penetrating a glazed surface. A glaze defect caused by underfired bisque, applying glaze to greenware, firing too rapidly or poorly deflocculated casting slip.

Pooling or Puddling — Fired glaze that has run to the bottom or puddled in detail of ware.

Porcelain — A vitrified clay body that matures at a high temperature and is translucent.

Porosity — The permeability of fired or unfired clay.

Posts — Columns of refractory material used to support shelves inside the kiln. (See Furniture, Kiln)

Pyrometer — An instrument that indicates temperature in the kiln.

Ramp — A term that, as used in kiln firing technology, refers to a change in heat over a specified period of time. When plotted on a time/temperature graph, it resembles slope of a ramp.

Refractory — Heat-resistant material.

Running — Refers to fluidity of a glaze at the point of maturity before cooling and hardening.

Scrubbing — Applying an initial priming coat of thinned opaque underglaze or glaze, or partially removing fired metallic overglaze from ware.

GLOSSARY

Seep — The leaking of fluids through fine cracks or openings.

Shelf Support — Same as posts. (See Furniture, Kiln)

Shelves — Flat slabs of special high-temperature materials on which ware is placed inside kilns. (See Furniture, Kiln)

Shivering — Occurs when the glaze or underglaze and the clay body are incompatible. The clay body shrinks more than the color, causing the color to peel or break away from the body after firing.

Shrinkage — Reduction in size of a clay object as a result of firing.

Smoking — Greying or discoloration of a glaze, caused by underfiring.

Soaking — Holding the temperature in the kiln chamber for a longer period of time than usual.

Soft Bisque — Ware that has been fired to witness cone 06-05.

Stilts — Supports used to separate a glazed article from a shelf during firing. (See Furniture, Kiln)

Stoneware — A heavily grogged clay body requiring a high-firing to vitrify.

Stoneware Clay Tints — Nontoxic, dinnerware-safe tints that can be added to Duncan Stoneware Slip or low-fire ceramic slip to create beautiful decorator colors. Colors are more intense in low-fire slip than in stoneware slip.

Stoneware Dry Body — Duncan's nontoxic stoneware clay in powdered form.

Stoneware Slip — Duncan's nontoxic stoneware clay in liquid form.

Terra-Cotta — Natural low-fired clay. Also a color.

Thermal Shock — Subjecting the ware to abrupt changes from hot to cold or vice versa.

Thermocouple — A sensing device that transmits to the kiln's controller precise information about the kiln's internal operating temperature.

Translucent — Transparent, allowing color underneath to show.

Underglaze — A ceramic color used under a glaze.

Vent Holes — Small holes made by piercing greenware when attachments have been made to allow trapped gases and moisture to escape from attachments during bisque firing.

Viscosity — Rate of resistance to flow.

Vitreous — Impervious surface (waterproof).

Vitrify — To become a stone-hard, impervious surface.

Wash — Color and water solution used for shading and antiquing.

Waterproof — (See Impervious)

Water Smoking — The first part of firing during which moisture is forced from the clay.

Witness Cone — (See Cone)

FIRING RECORD

KILN MAKE: _____ MODEL NO.: _____ PAGE NO.: _____

| DATE	FIRING		NO. OF SHELVES	LOAD SIZE	FIRING SPEED	FIRING TIME	SHELF CONE RESULTS						REMARKS
	CONE	TYPE					BOTTOM	SHELF #2	SHELF #3	SHELF #4	SHELF #5	SHELF #6	
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											
		GW GLAZE OG OTHER											

FIRING CURVES

Given below are the typical patterns for a programmed cone 04 firing at three different speeds: slow, medium and fast. Firing curves vary according to cone firing level.

CONE 04 - SLOW SPEED
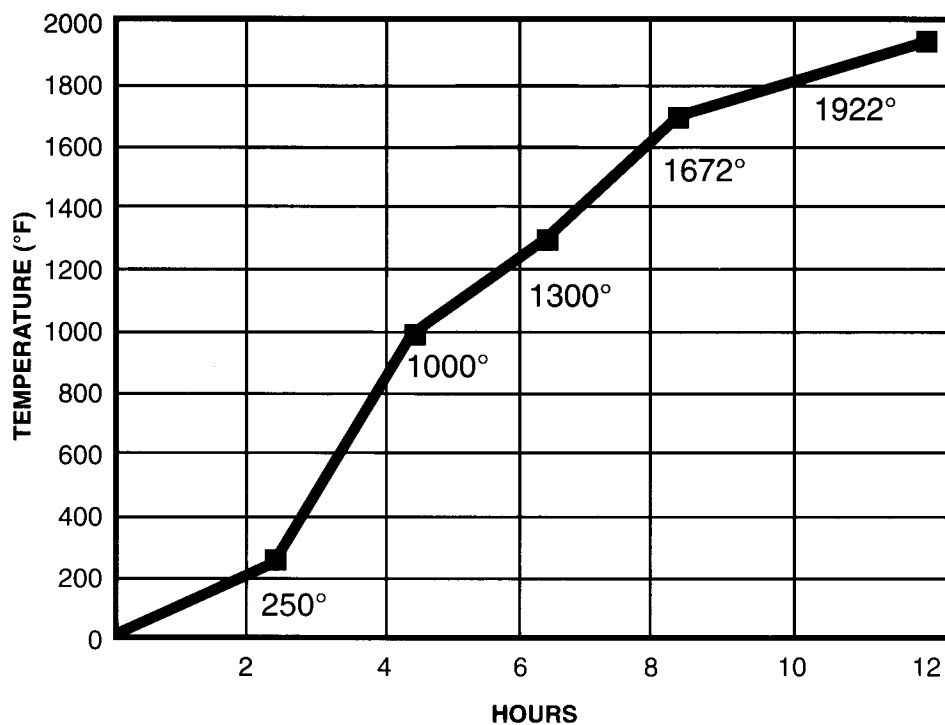
CONE 04 - MEDIUM SPEED
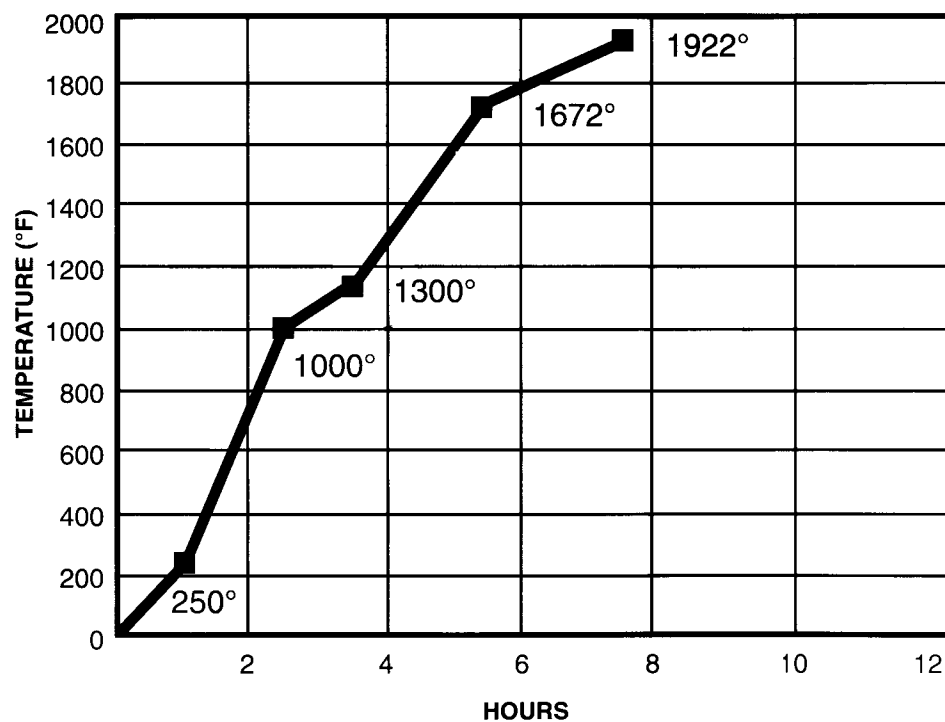
FIRING CURVES

CONE 04 - FAST SPEED