Chameleon KILNS

INSTRUCTIONS

INSTRUCTION & REFERENCE MANUAL

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IMPORTANT CAUTIONS

INSTALLATION CAUTIONS

AMBIENT TEMPERATURES
Operate in an environment between 0°C and 38°C (32 - 100°F).

CLEARANCES
Install kiln a minimum of 30 cm (12") away from any wall, although a minimum of 45 cm (18") is preferable. Maintain a minimum of 90 cm (36") between two adjacent kilns especially if they are going to be used at the same time.

REQUIRED VENTILATION FOR THE KILN IF YOU USE IT FOR CERAMICS
It is important to vent the room that the kiln is operating in if you are using it for firing ceramics. Firing ceramics generate harmful fumes and heat when firing ceramics. Fumes can include carbon monoxide, formaldehyde, sulphur dioxide, heavy metal vapours, and fluorides (all of which can be very toxic). Install kiln in a well-ventilated area. Never operate in an enclosed space (such as a closet) without proper ventilation. The heat in an enclosed room could present a significant fire hazard. Severe corrosion can be caused by kiln fumes, salt air or other environmental conditions. Ventilation must be to the outside (and not under a window).

PROTECT POWER LEAD FROM KILN CASE
Route Power Lead away from kiln in such a way that it cannot touch the hot case of the kiln. Secure wires so they cannot move.

KEEP KILN DRY & IN PROTECTED SPACE
The kiln must be kept dry. Water in contact with a kiln can cause an electrocution hazard.

FIRE EXTINGUISHER
Keep an adequate fire extinguisher (rated for electrical fires) near the kiln and check it yearly or according to local codes

GENERAL ENVIRONMENT CAUTIONS

SURFACE IS HOT AND CAN CAUSE BURNS
Kiln surface can be extremely hot (up to 260°C/ 500°F) and can cause severe burns if touched.

KEEP CHILDREN & ANIMALS AWAY FROM KILN
Protect children, animals, and unqualified adults from the kiln.

KEEP FLAMMABLES AWAY FROM KILN
Avoid flammable or loose clothing around kiln.

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PRE-FIRING CAUTIONS

PROPER USE OF KILN WASH
Make sure the floor of the kiln and the tops of the shelves are coated with kiln wash. This will protect these surfaces from melting glass, glaze and ceramics. Do not coat the undersides or sides of the shelves. Do not apply kiln wash to the brick sides or element holders.

DO NOT USE SILICA SAND IN KILN
Silica can damage the kiln elements.

NEVER FIRE MOIST GREENWARE
We recommend using Preheat in your bisque programme to help dry out any moisture that you cannot see.

LOADING & UNLOADING CAUTIONS

UNPLUG KILN WHEN NOT IN USE

KEEP LID CLOSED WHEN KILN IS NOT IS IN USE
Do not store anything on the closed lid or in the kiln.

DO NOT OPEN THE LID WHEN KILN IS ABOVE 120°C (250°F)

FIRING CAUTIONS

DON'T FIRE KILN ABOVE 1100°C, 2200°F)

ATTEND THE FIRING
No automatic safety device is foolproof! Be especially careful about attending the kiln while it is supposed to shut off. You can plan your firing using the Delay feature. If you can not be at the kiln all the time be sure to attend the end of the firing.

USE PROGRAMME REVIEW
Review the current programme prior to starting the kiln to ensure the correct profile is programmed. This is done by pressing the Review Prog button.

USE THE PROPER THERMOCOUPLE
Never use a different type of thermocouple with your controller unless it has been set up from the factory. Use of a type S thermocouple will over fire your kiln. The standard thermocouples that come with the Chameleon is type K.

USE CAUTION WHEN VIEWING INTO THE KILN
Use dark glasses (shade number 1.7 to 3.0) to view inside the kiln through the peepholes when firing. These will protect you from the radiant infrared radiation and will also protect your eyes in case the ceramic ware explodes. Do not use regular sunglasses for this.

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USE CAUTION WHEN OPENING THE KILN

1) Use heat resistant gloves when opening peephole plugs.
2) Use heat resistant gloves when opening a hot lid.
3) Do not open the lid when kiln is above 120°C (250°F).

GENERAL MAINTENANCE CAUTIONS

ELECTRICAL SAFETY

Unplug kiln when servicing it. The elements carry high voltage when switched on and could electrocute you. Troubleshooting tests performed under power should ONLY be done by a licensed electrician.

THE WRONG PARTS CAN BE HAZARDOUS

Off-brand elements, if not designed properly, can present a hazard to the kiln (by drawing too much amperage). The wrong type of fuse, relay, switch or other component can cause a fire or other hazardous condition. An improperly rated lead can cause a fire. Do not substitute or replace any parts with unauthorized products.

KILN MODIFICATIONS

All customer modification is made solely at the risk of the customer. Modifications will void the warranty. L&L takes no responsibility for hazardous conditions created by unauthorized modifications. Any authorization for an engineering change must be in writing from the factory.

KILN MAINTENANCE

See the section at the end of this booklet on periodic maintenance you need to perform on your kiln.

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OPERATION

HOW YOUR CHAMELEON KILN WORKS

The automatic program control measures the temperature inside the kiln using the thermocouple probe. The control automatically adjusts power to evenly heat up the kiln according to one of the four programs you are firing. You do not typically have to adjust anything once you start firing. However, if you are manually venting the kiln (if you are firing ceramics) by opening the vent hole you will have to manually close this at the appropriate point in the program (typically about 500°C / 932°F). Note that you would not typically vent the kiln for glass firing.

USING YOUR CHAMELEON KILN

TURNING ON THE KILN

1) Make sure your circuit breaker or fused disconnect switch is turned on.
2) Make sure the kiln is plugged in.
3) Turn on kiln with the On/Off switch on the front of the control box. (This is also a thermal type circuit breaker).

WHEN YOU FIRST TURN ON THE KILN

1) When the kiln is turned on you will see either **Err P** or **StOP** in the display. If you see **Err P** press any key to see **StOP**. When you see **StOP** or **IdLE** alternating with the temperature you are ready to begin programming. (NOTE: If the power was on recently the display might read what it said before power was turned off).
2) Press **ENTER** to begin.
3) The previously fired program will be displayed, either **USr 1, USr 2, USr 3, or USr 4**.
4) If you want to review that program hit the **DOWN** (Review) button.
5) If you want to fire that program hit **ENTER** and keep hitting **ENTER** to scroll through the program. At the end of the program you will see **rEd l**. Hit **ENTER** again to start the program.
6) If you make a mistake just hit **ENTER** again to **StOP** the program. (You can stop the program from firing at any time by doing this). This will return you to the **IdLE** alternating with temperature. Hit **ENTER** again to display the program you are in. You can then change the program (see "Editing a Program" below) or can hit **ENTER** again and review and edit the program you are in.

WHAT YOU SEE WHILE FIRING

1) If you have a Delay Time programmed you will see **dLAY** alternating with a time (i.e. **00.30**). This will count down until it hits **00.00**.
2) Then the display will show you the actual temperature inside the kiln as it begins to fire.

TO CHANGE TO A DIFFERENT PROGRAM

1) Select the program to change or fire with: When the display reads **IdLE** alternating with temperature hit **ENTER**. One of the four **USr** programs will display. Use the **UP** and **DOWN** arrows to scroll to the program you want to change.

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2) Hit **ENTER** and you will scroll through that program. If you don't want to make any changes just keep hitting **ENTER** until **rEdl** displays. You must go through the entire program. You can make changes while you are doing this if you want (see "Editing a Program" below). This is actually a good way to review the program before firing. You cannot bypass this process. Once **rEdl** displays and you hit **ENTER** the program will fire.

3) NOTE: If the Display reads **rEdl** and you do not want to fire the program that the control is ready to fire then hit **ENTER** once to start that program and then again to **StOP** it. The display will then read **StOP** briefly and then alternate between **IdLE** and temperature and you can now choose a different program to run or edit.

GLASS PROGRAMMES

See the **Starter Projects for Fusing & Slumping** for various programmes to use for firing glass. There is also a glass slumping programme shown on page 10.

EDITING A PROGRAM

1) The Delay Time will delay the start of your firing. **ENTER** a Delay Time: **dELA** is displayed alternating with a time like **03.00** (Hours. Minutes). Use the **UP** and **DOWN** keys to change the delay time. Press **ENTER** when the desired delay time is displayed. Note**: 00.00** equals no delay. **NOTE: The delay time is like a countdown timer - it will countdown the hours and minutes after you start the program before the program actually sends heat to the kiln.**

2) **ENTER** the number of segments your program will have. NOTE: Each segment consists of a ramp rate, a set point temperature and a hold time. There are 8 segments available for programming. You will see **SEG** alternating with the last selected number of segments. Use the **UP** and **DOWN** keys to select the number of segments, then press **ENTER**. Note that you can have as little as one segment (for instance a program that makes the kiln go as fast as possible to a single temperature and then holds there).

3) Now program the ramp rate for the first segment. You will see **rA 1** alternating with the ramp rate. Ramp rates are expressed in degrees per hour. Use the **UP** and **DOWN** keys to select the desired rate and press **ENTER**. A rate of **9999** will cause the kiln to heat (or cool if in a down ramp) as fast as the kiln is capable of. The first segment of a program must always be an "up" ramp.

4) Now program what Temperature to reach at the end of the first segment. You will see **°C 1** alternating with the currently selected temperature. Use the **UP** and **DOWN** keys to select the desired temperature and press **ENTER**.

5) Now program the Hold Time for the first segment. You will see **HLd1** alternating with the currently selected hold time. Use the **UP** and **DOWN** keys to select the desired hold time and press **ENTER**.

NOTE: These programs are pre-programmed:

USr 1 is a slow bisque fire to 1015°C.

USr 2 is a fast bisque fire to 1020°C.

USr 3 is a slow glaze fire to 1180°C.

USr 4 is unprogrammed.

All of the above can easily be changed.

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IMPORTANT NOTE ABOUT HOLD TIMES DURING THE LAST SEGMENT: Be careful with hold times in the final segment of a program designed for ceramics - this will add to the heat work and will typically mean you need to fire to a lower temperature to get the same cone result.

6) Repeat the above three steps for each additional segment for the ramp rate, temperature, and hold time.
7) **rEdl** will be displayed after the last segment is entered. Press **ENTER** to begin firing. Remember - if you don't want to fire that program just start it and then stop it. You will return to the **IdLE** display alternating with temperature and you can then change programs.

PREHEATING CERAMICS: We recommend you preheat any previously unfired ceramic work at a temperature of 65°C / 150°F for several hours. We have 3 hours programmed into our standard slow bisque program. This will help remove water from the work and could prevent an explosion in the kiln. There is no need to use this will glass or metal work.

REVIEWING THE PROGRAM WHILE FIRING

1) Once you have started a program firing you can review it by hitting the **DOWN** (Review) Button.
2) The program will scroll. You will see, in the following order, various aspects of the program.
   a) The program name (**USr 1, USr 2, USr 3, USr 4**)
   b) Number of Segments (**SEG** followed by some number, i.e. **0004**)
   c) **rA 1** alternating with the ramp rate.
   d) **°C 1** alternating with the temperature (i.e. **0900**).
   e) **HLd1** alternating hold time (i.e. **00.30**)
   f) The above three steps are repeated for each segment.

CONTROLLED COOLING

You can control the cooling of the kiln by having a segment in the program that ramps down. You ramp down by having the temperature of a segment be lower than the temperature of the previous segment. Note that the first segment has to start with an up ramp.

THE END OF THE PROGRAM

1) The control will shut off power to the elements at the end of the program.
2) At the end of the program the control will flash **CPtL** and a number like **7.34**. The 7 stands for hours and the 34 stands for minutes. This is how long it took for the kiln to reach final set point.

OPTIONS WHILE FIRING

SKIP A STEP

During a firing you may advance from the current segment to the next ramp rate by using **Skip Step** or if you are in a hold period you may add time and temperature to the hold period.

1) While firing (running a program) press the **UP** (View Segment) key. The current ramp or hold is displayed followed by the current or traveling set-point, then **SStP** is displayed.
2) If you do not press a key within several seconds the display will return to showing the current temperature in the kiln.

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3) When **SStP** is displayed press **ENTER** to skip to the next ramp rate.

ADD TIME TO HOLD PERIOD

This option allows you to add time in 5-minute increments to a hold (soak) period.

1) When in a hold period (during a hold or soak, the temperature in the kiln will be alternating in the display with the remaining hold time), press the **UP** (View Segment) key.
2) When **SStP** is displayed press the **UP** key again and **tME** will be displayed.
3) Press **ENTER** and 5 minutes will be added to the hold time.
4) You will see the new hold time displayed.
5) You may use this procedure as many times as necessary

PREHEATING CERAMICS:

We recommend you preheat any previously unfired ceramic work at a temperature of 65°C / 150°F for several hours. We have 3 hours programmed into our standard slow bisque program. This will help remove water from the work and could prevent an explosion in the kiln. There is no need to use this with glass or metal work.

IMPORTANT NOTE ABOUT HOLD TIMES DURING THE LAST SEGMENT:

Be careful with hold times in the final segment of a program designed for ceramics - this will add to the heat work and will typically mean you need to fire to a lower temperature to get the same cone result.

ADD TEMPERATURE TO A HOLD PERIOD

This option allows you to add temperature in 5-degree increments to a hold (soak) period.

1) When in a hold period (during a hold or soak, the temperature in the kiln will be alternating in the display with the remaining hold time), press the **UP** key.
2) When **SStP** is displayed press the **UP** key twice more and **tMP** will be displayed.
3) Press **ENTER** and 5 minutes will be added to the hold time.
4) If you hit the **UP** key again you will see the new hold temperature displayed briefly.
5) You may use this procedure as many times as necessary to get the hold temperature that you want.

CHANGE PROGRAM WHILE FIRING

You can reprogram the control by stopping it and changing the program and then restarting it. The control will compare the current temperature with where the kiln should be in its new program.
To **StOP** the kiln hit **ENTER**. Then hit **ENTER** again and you will see your program name (i.e. **USr2**). Then hit **ENTER** again to reprogram your program. When you see rEdl press **ENTER** again to restart the program where you left off. NOTE IF YOU HAVE A DOWN RAMP IN YOUR PROGRAM: If there is a down ramp it will look for the first up ramp that has the temperature it is looking for. You may need to use **SKIP STEP** to get back to where you want to be if you have a down ramp in the program.

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FIRST FIRING TO 1015°C

The first firing of the kiln should be a test fire. Fire it empty except for shelves and posts.
NOTE: You may experience some smoking from the kiln on its first firing. This, if it occurs, is due to residual oil left on the element wire when the elements were made. The test firing should be done with nothing in the kiln except the furniture kit. Be sure to monitor the kiln from time to time. Especially watch it in the first few hundred degrees to be sure that the kiln was set up properly and then at the end of the firing to be sure the location you have chosen is safe and that everything is working properly. Run the **USr1** program for 8 hours.

PRE - SET PROGRAMS

USR1 - SLOW BISQUE TO 1015°C WITH 30 MINUTE HOLD

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	0006		Six segments
rA 1	50	2 hours	Ramp up at 50°C per hour
°C1	100		100°C set point
Hld1	00.30	30 minutes	to ensure pieces are dry
rA 2	75	1.75 hours	Ramp up at 75°C per hour
°C2	230		230°C set point
Hld2	00.00		No hold - cristobalite inversion phase 223 °C
rA 3	180	1.75 hours	Ramp up at 180°C per hour
°C3	545		545°C set point
Hld3	00.00		No hold – moves immediately to next segment
rA 4	100	1 hour	Ramp up at 100°C per hour
°C4	645		645°C set point
Hld4	00.00		No hold - quartz inversion phase 575 °C
rA 5	180	1.50 hours	Ramp up at 180°C per hour
°C5	915		second to final temperature
Hld5	00.00		No hold – moves immediately to next segment
rA 6	100	1 hours	Ramp up at 100°C per hour
°C6	1015		1015°C - final temperature
Hld6	00.30	30 minutes	soak

Total Estimated Time: 10 hours Note: These are best possible times based on the program. Times will vary with load size, voltage, element age etc.

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USR2 FAST GLAZE TO 1020 °C

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	0002		Two segments
rA 1	300	3 hours	Ramp up at 300°C per hour
°C1	900		900°C set point -second to Final Temp
Hld1	00.00		No hold – moves immediately to next segment
rA 2	100	1.2 hours	Ramp up at 100°C per hour
°C2	1020		1020°C set point - Final Temperature
Hld2	00.00		No hold – End of program, start natural cooldown

Total Estimated Time: 4.2 hours (4 hours 12 min) Note: These are best possible times based on the program. Times will vary considerably with load weight, voltage, element age, etc.

USR3 - SLOW GLAZE TO 1180 °C

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	0003		Three segments
rA 1	100	2.5 hours	Ramp up at 100°C per hour
°C1	250		250°C set point
Hld1	00.00		No hold – moves immediately to next segment
rA 2	230	3 hours	Ramp up at 230°C per hour
°C2	940		940°C set point - Second to Final Temp
Hld2	00.00		No hold – moves immediately to next segment
rA 3	100	2.4 hours	Ramp up at 100°C per hour
°C3	1180		1180°C set point - Final Temperature
Hld3	00.00		No hold – End of program, start natural cooldown

Total Estimated Time: 7.9 hours (7 hours 54 min) Note: These are best possible times based on the program. Times will vary considerably with load weight, voltage, element age, etc. NOTE: This program will not work on The Robin kiln because that kiln can only go up to 1100°C. You can change the final temperature of this program if you want to fire a slow glaze to a lower temperature.

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OTHER SUGGESTED PROGRAMS

PROGRAM FOR SLUMPING GLASS

People have many different ways and programs for firing glass. Here is one recommendation for slumping that you can try. CAUTION: Be very careful not to over fire glass it can cause a real mess when it melts (like a big hole in your kiln floor) which we cannot be responsible for. Use your peepholes to observe the glass when it starts to slump and be sure to use proper safety glasses (See Cautions).

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	0003		Three segments
rA 1	204		Ramp up at 204°C per hour
°C1	760		760°C set point
Hld1	00.15	15 minutes	Hold for 15 minutes
rA 2	9999		Ramp down as fast as possible
°C2	510		510°C set point
Hld2	01.00	1 hour	Hold for 1 hour
rA 3	38		Slow Ramp down to anneal glass
°C3	38		38°C set point - to room temperature
Hld3	00.00		No hold – End of program

A FAST BISQUE PROGRAM TO CONE 05

This is a sample of how you would write a program to do a Fast Bisque to Cone 05. You may want to try this on very thin walled pieces but in general the Slow Bisque is a safer way to fire.

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	0005		Five segments
rA 1	50	1 hours	Ramp up at 50°C per hour
Hld1	0.50	30 minutes	This is the Preheat
rA 2	150	1 hours	Ramp up at 150°C per hour
°C2	200		200°C set point
Hld2	00.00		No hold – moves immediately to next segment
rA 3	100	30 minutes	cristobalite inversion phase 223 °C
°C3	250		250°C set point
Hld3	00.00		No hold – moves immediately to next segment
rA 4	310	2 hours	Ramp up at 310°C per hour
°C4	870		870°C set point - Second to Final Temperature
Hld4	00.00		No hold – moves immediately to next segment
rA 5	75	2 hours	Ramp up at 75°C per hour
°C5	1020		1020°C set point - Final Temperature
Hld5	00.00		No hold – End of program, start natural cooldown

On loads that are very important always use cones you can see through the peepholes in case of a failure of some kind.

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A PROGRAM TO HEAT TO 980 °C AND HOLD FOR 8 HOURS

DISPLAY	VALUE	TIME	COMMENT
dLAY	00.00		Add a delay time in here if you want it
SEG	001		One segment
rA 1	9999	As fast as possible	
°C1	982		
Hld1	08.00	8 hours	8 Hour hold

OTHER CONTROL OPTIONS

DEFAULT SETTINGS

The Model 3K controller with RMPATE software has several selectable features. These features include:

1) Complete beeping sequence. This is the alarm sounding at the end of a firing. The default setting is "On".
2) Temperature scale, °F or °C. The default setting is °C.
3) Maximum temperature, 927°C, 1093°C, or 1288°C. The default setting is 1288°C.

NOTE: You do not normally have to change these settings. We include them in here only as reference.

COMPLETE BEEPING

There are three choices for the beeping, which occurs when the firing is complete.

1) **FULL** - this option causes a continuous beep when the firing is complete. Beeping stops with a key press.
2) **On** - this option causes a 15 second beep at complete.
3) **OFF** - with this option there is no audible beep at the end of firing.

TEMPERATURE SCALE

1) °F - this sets the controller to the Fahrenheit scale
2) °C - this sets the controller to the Celsius (centigrade) scale

MAXIMUM TEMPERATURE

With the Fahrenheit scale the maximum programmable temperatures are: With the Celsius scale the maximum programmable temperatures are:

1) 2350 °F 1288 °C
2) 2000 °F 1093 °C
3) 1700 °F 927 °C

PROGRAMMING THE OPTIONS

In order to program the above options the controller must first be turned OFF. Press and hold any key while you turn the power back ON. Continue to hold the key until **EdIt** is displayed, then release the button. NOTE: There is NO beep when keys are pressed while programming the following options.

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1) **FULL**, **On**, or **OFF** will be displayed depending on the currently selected option for Complete Beeping. Press the **UP** or **DOWN** keys to select the option you want and press **ENTER**.
2) **°F** or **°C** will be displayed depending on the currently selected option. Press the **UP** or **DOWN** keys to select the option you want and press **ENTER**.
3) **1288** will be displayed. Press the **UP** or **DOWN** keys to select the maximum programmable temperature you want and press **ENTER**. The options are now programmed. The controller will continue where it was prior to editing. The controller will fire if it was firing or be in the programming mode where it left off. NOTE: A beep will now be heard with each key press.

ENTERING AN OPTIONAL ALARM TEMP

You can make the control sound an audible sound at a specific temperature. This can be useful to alert you to do something like pay attention to the end of the firing. It is not very loud.

1) You can **ENTER** an Alarm Temperature at any time the control is not firing the kiln. It will apply to the next programme you run when you hit **START/STOP**.
2) Press the **Alarm** button in the Easy-Options Section at the bottom of the control. See **ALAr** and **9999** cycling over and over. A high value like that means the control will not sound an alarm.
3) **ENTER** a four-digit number like **1000**. (This represents 1000°C).
4) Hit **ENTER**
5) The display will say **CPL** for a few seconds and then start cycling **IdLE**, **TC2** and current temperature.

ERROR CODES

Err1	Error 1 indicates the temperature in the kiln is rising during an up ramp slower than 15°F/hr. If this rate continues for 8 minutes the firing will be stopped. Err1 may be an indication that the elements are worn or that a relay has stopped working.
ErrF	Error F indicates the temperature in the kiln is decreasing during a down ramp less than 15°F/hr. If this rate continues for 8 minutes the firing will be stopped. **ErrF** may be an indication that a relay has stuck in the on position.
Errd	Error d indicates that the kiln temperature is 100°F above the traveling set point, which is the current desired temperature in the kiln. The traveling set point will increase or decrease according to the programmed rate.
ErrP	Error P is displayed whenever there is a power interruption that is long enough to **StOP** the firing. If the power interruption is brief the kiln will continue to fire when power is restored; in this case there will no indication of a power failure. To clear the error, press any key.
tC FAIL	**tC** alternating with **FAIL** indicates the thermocouple has failed. Replace the defective thermocouple. To clear the error, press any key.
tC-	- The red and yellow thermocouple wires are reversed.

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DISPLAY MESSAGES

CPLt	Firing Cycle Complete (firing time is alternately displayed).
dELA	Delay. Displays when entering the delay time (hour: minutes) until the start of the firing.
DLy	Delay. Alternates with the remaining delay time until the start of the kiln.
°F #	Segment temperature in °F - Set temperature for a user program.
°C #	Segment temperature in °C - Set temperature for a user program. A decimal point will display in lower right corner.
EdIt	Edit the default options (beeping at complete, temperature scale, maximum programmable temperature)
Err1	Error 1, kiln was heating less than 15°/hr and it has been stopped.
Errd	Error d, kiln temperature is 50° hotter than the set point temperature. Kiln has been stopped.
ErrF	Error F, similar to Err1 but during a down ramp the temperature is decreasing less than 15°/hr. Kiln has been stopped.
ErrP	There has been a power interruption that has stopped the firing. Press any key to clear.
FULL	Beeps continuously at end of firing until a key is pressed.
HLd#	Soak time in hours: minutes at a hold temperature.
OFF	No beeping when firing is complete.
On	
rA #	Ramp Number (rate per hour of temperature increase or decrease).
rEdl	Ready to fire current program. Press START to begin firing.
SEG	Short for Segments. You can **ENTER** up to 8 segments in a program.
SStP	Skip Step (used to advance to the next ramp)
StOP	The kiln is at **IdLE** and ready to be programmed. **StOP** alternates with the current kiln temperature.
USr #	User program number displayed
tMP	Temperature (used in the Skip Step Option. The display actually looks like two “U”s upside down)
tME	Time (used in the Skip Step Option. The display actually looks like two “U”s upside down)

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THE KILN DESIGN

SECTIONAL CONSTRUCTION
The Chameleon kiln is made up of a kiln section that sits on a fixed and integrated base.

CONTROL SYSTEM
The automatic programme control uses a thermocouples to sense temperature. The control then automatically adjusts power output (turns the contactor on and off) to heat up the kiln. The programme control varies the target set point for the temperature according to various ramps and soak periods that are programmed in the control. Basic operating instructions are part of this manual.

THERMOCOUPLE
The standard thermocouple is a heavy-duty 8-gauge Type K thermocouple.

HEATING ELEMENTS IN CERAMIC HOLDERS
The heating elements are designed to have a low watt density and good stretch ratio. These are supported in hard ceramic element holders (a unique L&L feature). This will promote long element and firebrick life.

STURDY ALUMINISED STEEL STAND
Aluminized steel resists corrosion at the high temperatures. There are adjustable legs that allow you to level the kiln (important for glass fusing).

STAINLESS STEEL CASE
This resists most corrosion and strengthens construction. Stainless steel screws are used in case construction.

63 mm (2-1/2”) OF INSULATION
The insulation is a special hand picked lightweight highly insulating firebrick, which is 63 mm (2-1/2") thick (except for the top which is 76 mm (3”) thick).

LARGE DIAMETER PEEP & VENT HOLES
There is one 25 mm (1") diameter peephole for ventilation and viewing.

CE CERTIFIED
Chameleon European model kilns are CE certified.

ELEMENT SHUT-OFF SAFETY SWITCH
A locking door safety switch shuts off all power to the elements when the door is open. This positive system breaks all power and does not rely on a relay.

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LIMITED WARRANTY

(3) THREE YEAR LIMITED WARRANTY

L&L Kilns and vents are warranted to be free of defects in workmanship for a period of three (3) years, starting on the date of original purchase from an authorized L&L distributor, subject to the following terms, including but not limited to, the exclusions and limitations set forth herein. A sales receipt is required for proof of purchase. In addition, your distributor may require you to deliver defective parts for examination. DO NOT DISCARD PARTS BEFORE CONTACTING DISTRIBUTOR FOR INSTRUCTIONS. FAILURE TO ADHERE TO L&L's INSTRUCTIONS, INCLUDING THOSE CONTAINED IN THE INSTRUCTION MANUAL AND AS STATED HEREIN, WILL VOID THIS WARRANTY. L&L will replace or repair any defective part that is covered by this warranty and sent freight-prepaid to your local distributor. On-site labor is not covered by this warranty.

EXCLUSIONS AND LIMITATIONS

The following are examples of items that are not covered by and/or circumstances that will void L&L's warranties:

1. Over-firing damage regardless of cause for the over firing. IMPORTANT: We specifically warn you not to fire the kiln unattended. No kiln controls are designed to be fail proof shut off devices. L&L is not responsible for damage caused by failure of one of these controls. Kiln should not be left unattended especially during its last phase of firing when it is supposed to stop firing.
2. Reduction firing or salt glaze use of kiln.
3. Damage due to: neglect, mechanical abuse, improper storage, inadequate maintenance, improper use or freight damage.
4. Damage to the elements or element holders due to failure to properly keep the kiln clean (i.e. getting glaze all over the element holders).
5. Damage to the elements or element holders due to failure to properly keep the kiln clean (i.e. allowing glaze to make contact with the element holders).
6. Severe corrosion due to improper venting of kiln fumes or exposure to the ambient conditions, including but not limited to rain, snow, dust, and salt air.
7. Damage due to improper electrical installations or use of improper voltage.
8. Firebrick cracking or chipping for any reason. Firebrick is naturally fragile and will chip and crack over time.
9. Failure to report defect within ten (10) days after it becomes manifest or known.
10. Any alteration of parts or design that vary from factory designs.
11. Use of elements and/or other parts other than those supplied by L&L or it's authorized distributors.
12. Thermocouple Protection Tubes are not warranted against breakage.
13. L&L's warranty is strictly limited to repair or replacement of defective items. Kilns cannot be returned.
14. Dealers and Distributors are not authorized by L&L to modify and/or assume any other obligations or liabilities other than those expressed in this limited warranty and any such additional obligations are null and void.

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15. EXCEPT AS SPECIFICALLY WARRANTED HEREIN, KILNS ARE SOLD AS IS. L&L MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, COVERING THE GOODS SOLD AND SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Purchaser acknowledges that certain conditions or circumstances may be created or incurred by Purchaser or user over which L&L has no control, including, but not limited to, climatic conditions, improper use, and inadequate maintenance. Purchaser, as a condition of purchase or use, assumes responsibility for and releases L&L from all liability arising out of the use of the kilns attributable to such causes.
16. L&L SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOST PROFITS, LOSS OF USE, OR OTHER ECONOMIC LOSSES. Purchaser agrees that L&L's total liability for any damages or remedies arising hereunder shall be limited to direct damages in an amount not exceeding the purchase price paid, and the provisions set forth herein constitute the exclusive remedy against, and the entire liability of, L&L in connection therewith. Any action for breach of contract or negligence must be commenced by Purchaser within one (1) year after the cause of action has accrued.

ONE YEAR ELEMENT & THERMOCOUPLE WARRANTY

Elements and thermocouples are warranted for one year with the following exceptions:

1. Glaze damage to element caused by accidentally scraping edges of unfired glazed ware against element groove and causing unfired glaze to contaminate element, which causes obvious damage to elements with resultant element failure.
2. Firing of kiln to higher than 1100°C (2200°F).
3. Damage to elements caused by explosion of ceramic object. This may cause small pieces of clay to contaminate the element and cause failure.

SERVICE

TROUBLESHOOTING

See the separate TROUBLESHOOTING SECTION in the Reference Manual

ELECTRICAL SPECIFICATIONS & WIRING DIAGRAMS

See the Wiring Diagram.

REPLACEMENT PARTS

Parts can be obtained from your local distributor. See PARTS LIST in Reference Manual.

CRACKS IN THE TOP & BOTTOM

It is quite normal to get hairline cracks in both the top and the bottom firebricks. They are caused by the expansion and contraction of the firebrick as it heats and cools. As long as the bottom is fully supported by the stand the cracks in the bottom will not adversely affect the operation of the kiln. It generally does not make sense to cement these hairline cracks.

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REGULAR KILN MAINTENANCE

AFTER EACH FIRING

1. Unplug the kiln or turn off at the fused disconnect box.

2. Check element holders and walls for glaze, clay chips or anything that could melt at a high temperature. If melted clay or glaze comes in contact with an element, a rapid failure could result. To clean holders, a good shop vacuum will handle dust and loose crumbs. A very gentle chisel or grinder may help with glaze contamination on element holders, but remember that the elements themselves are quite brittle when they are cool. Replace the contaminated holder if you cannot clean it. Remove any glaze that has splattered on the firebrick or shelves. (USE SAFETY GLASSES WHEN DOING THIS BECAUSE GLAZE CAN BE LIKE BROKEN GLASS). Vacuum afterward. Make sure vacuum is grounded and periodically touch some grounded metal surface away from the kiln to discharge the energy while vacuuming (to protect control from static electricity).

3. Make sure the floor of the kiln and the tops of the shelves are coated with kiln wash. Kiln wash will keep running glaze from ruining a kiln shelf or the floor of the kiln. (Do not coat the undersides or the sides of the shelves because you do not want the kiln wash to fall off into the kiln).

4. Keep a kiln log of firings. Tracking the performance of your kiln over time may turn out to be an extremely valuable tool if you ever need to diagnose future problems.

AFTER 10 FIRINGS

1. Check temperatures of the power lead at the receptacle while the kiln is at its hottest. If these are hotter than normal, it could be a sign of a loose or corroded connection, or possibly the wire gauge used in the power hook-up is the wrong size for the amount of current being drawn by the kiln. Immediately diagnose and fix this because it could cause a fire.

2. Check plug for oxidation or any burn marks, discoloration or melted spots. If you see this replace the plug (and possibly the receptacle) before using the kiln again. Make sure the receptacle feels tight when you press the plug into the outlet. A loose receptacle indicates worn springs, which will lead to overheating. NOTE: you can put an oxidation inhibitor on the prongs.

3. Repair any firebrick problems.

AFTER 30 FIRINGS OR ANNUALLY

1. Check element resistance. You will need a digital multimeter (see the Troubleshooting Guide). Keep track of this information.

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2. Check tightness of case and retighten if necessary. (the case will expand and contract during each firing and may eventually become loose. Brick also shrinks slightly with use - especially if used at the higher temperatures like cone 10).

3. Check internal wires for deterioration or oxidation. Replace any that seem brittle or where the wire insulation has deteriorated or fallen off. Check terminals for oxidation (discoloration). If you are near salt air or if you notice corrosion on the stainless exterior of the kiln for whatever reason (like certain fumes generated by your work) then do this far more frequently.

4. Check power connection terminals in the kiln and control box for tightness. Be sure to do this with the kiln unplugged. If these terminal connections get loose heat can be generated and this can cause a fire.

5. Check thermocouple connections for corrosion, tightness and oxidation as well. A bad thermocouple connection can change the accuracy of the temperature reading, which could cause an overfiring.

When replacing electrical components, replace the electrical connectors. At the very least check for discoloration (an indication of oxidation).

CHECK THERMOCOUPLE CALIBRATION

Thermocouples will drift in reading over time. This could potentially lead to an overfiring before the thermocouple actually fails. Although you cannot easily check thermocouple calibration, the general accuracy of the entire kiln system can be checked by firing with witness cones.

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L&L Chameleon KILNS

HARD CERAMIC ELEMENT HOLDERS

Only L&L Kilns have exclusive hard ceramic holders that prevent dusting in the kiln

- A Unique Feature on All L&L Kilns. Protects interior firebrick from cracked and broken routed element channels.
- No pins required to hold elements in place.
- Improves firing efficiency - hot elements are not insulated from the interior of the kiln by insulating firebrick. There is only 4.75mm (3/16”) of dense non-insulating ceramic separating the hot element from the kiln interior.
- Kilns are easier to repair - much easier to change elements with less chance of damaging kiln.

IT’S WHAT MAKES L&L KILNS UNIQUE FOR 60 YEARS

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Chameleon Kiln

Using the 3 Key Bartlett Digital Controller

Starter Projects for Fusing & Slumping

With Step-By-Step Instructions

By Marty Dailey

BEGINNING GLASS PROJECTS FOR CHAMELEON HOBBY KILN

After gaining knowledge in basic fusing and slumping the Chameleon Kiln will provide the new glass artist with the perfect tool for successful fusing and slumping.

This gallery of photos shows some projects which can be made using a Chameleon Kiln.

Introduction

This pamphlet will present two starter projects which provide step by step instruction in the operation of the Chameleon Kiln.

- In the first project we will create a necklace.
- The second project we will create a plate.

There is no substitute for a formal basic fusing and slumping coarse which provides instruction in safety in working with glass and glass tools along with the fusing and slumping instruction.

This project starter pamphlet is not intended to replace a formal basic fusing class; it is a guide for the digital controller operation. The assumption is made that you have the following basic knowledge and skills.

1. You have read and understand the operation manual for safe installation and operation of the Chameleon Kiln.
2. Studio safety practices
3. How to cut glass
4. How to shape glass with a small tabletop glass grinder
5. Glass has a characteristic referred to as C.O.E. and glass with different C.O.E.s CANNOT be mixed and fused together. There are two primary glass C.O.E.s used by warm glass artists.
    i. C.O.E. 90 which is Bullseye Glass and Uroboros Glass
    ii. C.O.E. 96 which is Spectrum Glass and Uroboros Glass
6. How to properly clean glass
7. Clear Glass (you can see through it, has no color)
8. Transparent Glass (you can see through it, comes in many colors)
9. Opal Glass (cannot see through, it is a solid color)
10. Dichroic Glass

Kiln Preparation

Location – Safety considerations

- Refer to Chameleon Kiln operation manual.

Leveling

- You want to have a level kiln shelf when firing. If the shelf is not level the glass will distort due to gravity. You do not level the kiln but rather level the kiln shelf. Position the kiln where you want to use it then put the shelf posts inside the kiln and the kiln shelf on the shelf posts (never put a ceramic kiln shelf flat on the floor of a kiln – it may thermoshock and break). Use a “torpedo level” (this is a level which is about 10 inches long). Place the level in the center of

the kiln shelf pointing from the left front corner to the right rear corner then shim the base of the kiln. Now rotate the level so it is pointing from the right front corner pointing to the left rear corner then shim the base of the kiln.

Kiln Wash

- You can use powdered kiln wash which you mix with water or you can use thin fire shelf paper instead. Some artists use Lava Cloth instead of the kiln wash or thin fire shelf paper. Lava Cloth leaves a texture on the back of the glass.

Controller

- Refer to the Chameleon Kiln operation manual.

Flash / quick cooling

- With a digital controller there is no need to flash cool the kiln during fusing.

Glass Preparation

Choosing Glass

- Thin glass is approximately 1.6mm thick. (1/16 inch)
- Standard thickness glass is approximately 3mm thick. (1/8 inch)
- The projects below lists glass we have chosen for those projects. You may choose any color glass you wish. Be sure the C.O.E. (coefficient of expansion) is the same for all glass used for your project.

Cutting & Grinding

- Cut your glass to the size you desire for your jewelry pieces. Plates and bowls should be cut to the appropriate size for the mold you are using.
- Remember when using a grinder you will have a rough edge on the glass after grinding which may show as a gray band around the glass after fusing. Using diamond sanding pads with water to smooth the edges after grinding will reduce or prevent this gray band around the glass.
- Always follow eye and respiration safety procedures when cutting and grinding glass.

Cleaning

- Clean finger prints, oil and other blemishes from your glass before you place it in the kiln. Do not use any glass cleaner or soaps. Use tap water by itself. Using cleaners and soap will leave a film on the glass which will show up after the glass is fired. You can use isopropyl alcohol to remove oils and other blemishes then use water.

Making holes

- There are several ways to put holes in glass for jewelry. We only discuss using the fiber paper (looks like white felt) for the project below.

Attaching findings

- Findings are pins and bails. Pins are pin backs which have a safety clasp. Bails are loops through which a chain or cord may pass for necklaces.

Assembly on shelf outside kiln vs. inside kiln

- For our projects we assemble the glass on the kiln shelf while the shelf is inside the kiln. Some artists assemble the glass on the kiln shelf outside the kiln and then place the shelf into the kiln with the glass already on it. We do not do this because you usually have to glue the glass pieces in place with each other so they do not move while transfering the shelf from the work table and placing it inside the kiln.

The following information is not to replace the instructions provided in the Chameleon Kiln owner's manual. Refer to the owner's manual for complete information in the safe operation and features of the digital controller.

Notes:

- The firing schedules below are for use with Bullseye, Uroboros, or Spectrum Glass. They are not for use with float or borosilicate glass.

Fused Glass Pendant

This project consists of three layers of glass.

- The first layer is called the "Base", which will be the bottom or back of the project.
- The second layer is the artistic design portion of this project.
- The third layer of glass is called the "Cap"; it goes on the top and is usually clear glass.

1. Cut a piece of "Base Glass" (thin black-1/16" -1.6mm) 1" (25.4 mm x 1 ½" (38.1mm)

2. Cut a piece of "Cap Glass" (thin clear-1/16" – 1.6mm) slightly larger (1/8" 3.2mm length & width) than the "Base Glass".
3. Select and cut the design portion glass. We chose 2 pieces of dichroic glass for this project, however many artists are now using bright colors of opal glass instead of the dichroic. You may use the glass of your choice for this project.

- Be sure you have applied kiln wash to the shelf and allowed the shelf to completely dry out.
- Clean glass then assemble in the kiln on the kiln shelf.
- If you want a hole through your pendant assemble the pendent with a small piece of fiber paper. (Ceramic paper looks like white felt). Cut the fiber paper so it is 1/8" (3.2mm) square by 2" (50.8mm) long and then position it horizontally across the base glass so you will have a hole through the glass when the top pieces fuse to the base glass. This is done by placing the fiber paper on top of the base glass, then the design elements, and then the cap on top of the fiber paper.
- If you do not want a hole through the glass simply place the glass in the kiln. Following fusing the glass you will glue a bail to the back of the pendant.
- Close the kiln and program the digital controller with your firing sequence. There are many firing sequences one can use from a simple single segment to very complex multiple segments.
- The following single segment will perform fine for this project. See Appendix A for step-by-step operation of the Bartlett 3 key digital controller for this project.

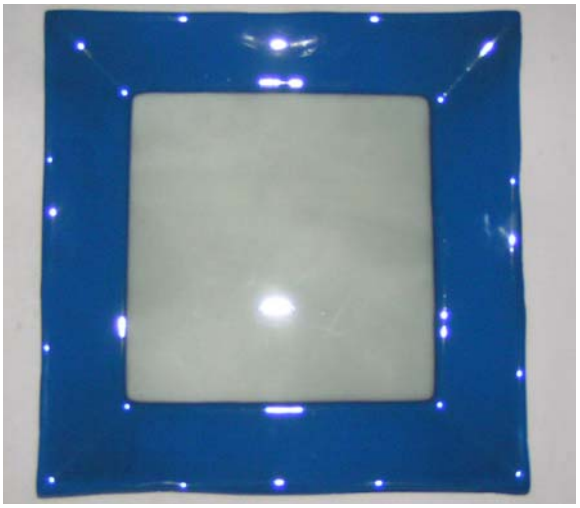
4. Ramp at 300°F(165°C) per hour
5. Soak at 1425°F (775°C)
6. Soak for 15 minutes
7. Let the kiln cool down to 100°F (38°C) before opening and removing your project.

- Remove the fiber paper from the pendant and clean with plain water after removing from the kiln.

Or

- Clean with plain water after removing from the kiln and glue the bail to the back of the pendant.
- Place your silver chain through the hole or bail.
- Your finished jewelry project is now ready to be worn.

Fused & Slumped Glass Plate



Note: the white spots are light reflections

This project consists of two layers of glass.

- The first layer is called the “Base”. The base glass is the bottom or back of the project.
- The second layer is the artistic design portion of this project.
- We selected a Future Form Mold for a 10 inch square Ruffle Sushi Plate. (Model: G-1015). You may choose any mold you like for your project.
- We selected standard thickness (3mm) medium blue opal glass as our base glass. We cut the base glass to 10 inches square to fit our mold.
- We selected standard thickness (3mm) off white opal glass as our design element. We cut our design element 6 inches square. This size was chosen because it is the same dimension as the flat bottom portion of our plate.
- Note: We chose not to “cap” this project. The two layers of standard thickness glass for this size plate will be strong enough. However, if you are using other design elements you may want to clear cap your project to give it added strength plus it will give the appearance of depth when looking at the design elements.
- Clean your glass then assemble in the kiln on the kiln shelf. We were careful to center the off white design element in the center of the blue base glass.
- Close kiln and program digital controller for your firing sequence. There are many firing sequences one can use from a simple single segment to a very complex sequence with 8 segments.
- The following two segment sequence will perform fine for the fusing portion of this project. See Appendix B for step-by-step operation of the Bartlett 3 key digital controller for this project.

    1. Ramp at 300°F (165°C) per hour

2. Soak at 1450°F (790°C)
3. Soak for 15 minutes
4. Ramp down at 200°F (110°C) per hour
5. Soak at 100°F (38°C)
6. Soak for 30 minutes
7. Remove when cool enough to handle with your hands

- This 2 segment program has a cool down and annealing phase. We chose to include the cool down segment so you would have an example of entering 2 or more segments. This project would fire fine with a single segment.
- **Note:** While the kiln is fusing the glass prepare your mold by cleaning and applying kiln wash to the surface. Kiln wash provides a coating so glass will not stick to the mold when firing. After applying the kiln wash you can place the mold on top of the kiln, while the glass is fusing the heat from the kiln will dry the mold.
- Following the fusing cycle and the kiln has cooled down remove the project from the kiln and clean any residual kiln wash off the glass.
- Place the mold in the kiln then place the fused glass on the top of the mold. Be sure that the glass is centered on the mold and there is no glass hanging over the edge of the mold. Centering is extremely critical when using round molds, if not centered properly the glass may shift during the firing resulting in a strange looking bowl.
- The following two segment sequence will perform fine for the slumping portion of this project. See Appendix C for step-by-step operation of the Bartlett 3 key digital controller for this project.

8. Ramp at 200°F (110°C) per hour
9. Soak at 1250°F (675°C)
10. Soak for 15 minutes
11. Ramp down at 200°F (110°C) per hour
12. Soak at 100°F (38°C)
13. Soak for 30 minutes
14. Remove when cool enough to handle with your hands

- This 2 segment program has a cool down and annealing phase.
- Your finished plate project is now ready for use or display.

Appendix A

Step By Step Fusing Sequence For Jewelry

1. Toggle the ON /Off switch to the ON position.
2. The controller will display “ErrP”
3. Press the “Enter” key. The display will flash between “IdLE” and a number, this is the temperature inside the kiln.
4. Press ”Enter” key. The display will have “USr” with a number from 1 – 4. The controller is asking which user program you wish to use. There are 4 user programs you may choose from. You can set USr 1 for a fusing project and you can set USr 2 for a slumping project, as an example.
5. Press the “UP” or “DOWN” key until the display has a 1. You have chosen to use USER 1 program.
6. Press “Enter” key. The display will flash between “dELA” and a number with a decimal point.
7. Press the “UP” or “DOWN” key until the display has 00.00
8. Press “Enter” key. The display will flash between “SEG” and a number. The controller is asking how many segments you want to use for your firing. You can choose from 1 to 8 segments. We will use 1.
9. Press the “UP” or “DOWN” key until the display has a 1.
10. Press “Enter” key. The display will now flash “rA 1” and a number. It is asking for the ramp rate in degrees per hour.
11. Press the “UP” or “DOWN” key until the display has 300. You have instructed the controller to heat at 300°F (165°C) per hour. This means after 1 hour the kiln will be at room temperature plus 300°F (165°C), after 2 hours it will be at room temperature plus 600°F (330°C), and so forth.
12. Press “Enter” key. The display will now flash “°F 1” and a number. It is asking for the soak temperature.
13. Press the “UP” or “DOWN” key until the display has 1425. You have instructed the controller to heat to 1425°F (775°C). This means that the kiln will heat at a rate of 300°F (165°C) per hour and go to 1425°F (775°C), taking 4.75 hours.
14. Press “Enter” key. The display will now flash “HLd 1” and a number with a decimal point 2 digits to the left, You may have a number which looks like 12.30 or 1.20 or 0.20. The decimal point separates minutes from hours. Hours to the left of the decimal point and minutes to the right of the decimal point. The controller is asking for the soak time period for the first segment.
15. Press the “UP” or “DOWN” key until the display has “00.15”. You have instructed the controller to soak for 15 minutes at 1425°F (775°C).

16. Press “Enter” key. The display will have “rED 1”. You have finished programming User 1 for this fusing project.
17. Press “Start” key. (it is the same key as the “Enter” key). The controller will now start the kiln and perform the firing sequence you have just entered.
18. Allow the kiln to cool down to at least 100°F (38°C) before removing your piece.

Do NOT open the kiln and “peek” at the glass when the kiln is less than 1000°F (535°C); doing so may cause the glass to thermoshock and break.

The above glass firing sequence has instructed the kiln to do the following.

- Heat at 300°F(165°C) per hour, go to 1425°F (775°C), stay at that temperature for 15 minutes then stop firing.

Note: We did not enter an annealing segment because the kiln cools slowly that the jewelry pieces will pass through the annealing temperature range slow enough to anneal.

The digital controller has the above firing sequence in its memory as USER 1. It will remember this firing sequence even after the kiln is turned off. You can edit and change the firing sequence any time.

Appendix B

Step By Step Fusing Sequence For Plates & Bowls

1. Toggle the ON /Off switch to the ON position.
2. The controller will display “ErrP”
3. Press the “Enter” key. The display will flash between “IdLE” and a number, this is the temperature inside the kiln.
4. Press ”Enter” key. The display will have “USr” with a number from 1 – 4. The controller is asking which user program you wish to use. There are 4 user programs you may choose from. You can set USr 1 for a fusing project and you can set USr 2 for a slumping project, as an example.
5. Press the “UP” or “DOWN” key until the display has a 1. You have chosen to use USER 1 program.
6. Press “Enter” key. The display will flash between “dELA” and a number with a decimal point.
7. Press the “UP” or “DOWN” key until the display has 00.00
8. Press “Enter” key. The display will flash between “SEG” and a number. The controller is asking how many segments you want to use for your firing. You can choose from 1 to 8 segments. We will use 2.
9. Press the “UP” or “DOWN” key until the display has a 2.

10. Press “Enter” key. The display will now flash “rA 1” and a number. It is asking for the ramp rate in degrees per hour.
11. Press the “UP” or “DOWN” key until the display has 300. You have instructed the controller to heat at 300°F(165°C) per hour. This means after 1 hour the kiln will be at room temperature plus 300°F(165°C), after 2 hours it will be at room temperature plus 600°F (330°C), and so forth.
12. Press “Enter” key. The display will now flash “°F 1” and a number. It is asking for the soak temperature.
13. Press the “UP” or “DOWN” key until the display has 1450. You have instructed the controller to heat to 1450°F (790°C). This means that the kiln will heat at a rate of 300°F (165°C) per hour and go to 1450°F (790°C), taking 4.8 hours.
14. Press “Enter” key. The display will now flash “HLd 1” and a number with a decimal point 2 digits to the left, You may have a number which looks like 12.30 or 1.20 or 0.20. The decimal point separates minutes from hours. Hours to the left of the decimal point and minutes to the right of the decimal point. The controller is asking for the soak time period for the first segment.
15. Press the “UP” or “DOWN” key until the display has “00.15”. You have instructed the controller to soak for 15 minutes at 1450°F (790°C).

You have entered the first segment. You are now entering the second segment.

1. Press “Enter” key. The display will now flash “rA 2” and a number. It is asking for the ramp rate in degrees per hour for the second segment.
2. Press the “UP” or “DOWN” key until the display has 200. You have instructed the controller to cool at 200°F (110°C) per hour.
3. Press “Enter” key. The display will now flash “°F 2” and a number. It is asking for the soak temperature.
4. Press the “UP” or “DOWN” key until the display has 100. You have instructed the controller to cool down to 100°F (38°C). This means that the kiln will cool at a rate of 200°F (110°C) per hour and go to 100°F (38°C), taking 6.75 hours.
5. Press “Enter” key. The display will now flash “HLd 2” and a number with a decimal point 2 digits to the left, You may have a number which looks like 12.30 or 1.20 or 0.20. The decimal point separates minutes from hours. Hours to the left of the decimal point and minutes to the right of the decimal point. The controller is asking for the soak time period for the first segment.
6. Press the “UP” or “DOWN” key until the display has “00.30”. You have instructed the controller to soak for 30 minutes at 100°F (38°C).
7. Press “Enter” key. The display will have “rED 2”. You have finished programming User 1 for this fusing project.

8. Press “Start” key. (it is the same key as the “Enter” key). The controller will now start the kiln and perform the firing sequence you have just entered.
9. Allow the kiln to cool down to at least 100°F (38°C) before removing your piece.

Do NOT open the kiln and “peek” at the glass when the kiln is less than 1000°F (535°C); doing so may cause the glass to thermoshock and break.

You have entered the second and final segment. The digital controller has the above firing sequence in its memory as USER 1. It will remember this firing sequence even after the kiln is turned off. You can edit and change the firing sequence any time.

Note: The digital controller does not understand heating or cooling. It only understands what temperature it is at and what temperature it is to go to. Thus it will adjust the firing to go to the destination temperature.

The above glass firing sequence has instructed the kiln to do the following:

- Heat at 300°F(165°C) per hour, go to 1450°F (790°C), stay at that temperature for 15 minutes then cool at 200°F (110°C) per hour, go to 100°F (38°C) and stay at that temperature for 30 minutes then stop firing.

Appendix C

Step By Step Slumping Sequence For Plates & Bowls

1. Toggle the ON /Off switch to the ON position.
2. The controller will display “ErrP”
3. Press the “Enter” key. The display will flash between “IdLE” and a number, this is the temperature inside the kiln.
4. Press ”Enter” key. The display will have “USr” with a number from 1 – 4. The controller is asking which user program you wish to use. There are 4 user programs you may choose from. You can set USr 1 for a fusing project and you can set USr 2 for a slumping project, as an example.
5. Press the “UP” or “DOWN” key until the display has a 1. You have chosen to use USER 1 program.
6. Press “Enter” key. The display will flash between “dELA” and a number with a decimal point.
7. Press the “UP” or “DOWN” key until the display has 00.00
8. Press “Enter” key. The display will flash between “SEG” and a number. The controller is asking how many segments you want to use for your firing. You can choose from 1 to 8 segments. We will use 2.
9. Press the “UP” or “DOWN” key until the display has a 2.

10. Press “Enter” key. The display will now flash “rA 1” and a number. It is asking for the ramp rate in degrees per hour.
11. Press the “UP” or “DOWN” key until the display has 300. You have instructed the controller to heat at 300°F (165°C) per hour. This means after 1 hour the kiln will be at room temperature plus 300°F (165°C) , after 2 hours it will be at room temperature plus 600°F (330°C), and so forth.
12. Press “Enter” key. The display will now flash “°F 1” and a number. It is asking for the soak temperature.
13. Press the “UP” or “DOWN” key until the display has 1250. You have instructed the controller to heat to 1250°F (675°C). This means that the kiln will heat at a rate of 300°F(165°C) per hour and go to 1250°F (675°C), taking 4.2 hours.
14. Press “Enter” key. The display will now flash “HLd 1” and a number with a decimal point 2 digits to the left, You may have a number which looks like 12.30 or 1.20 or 0.20. The decimal point separates minutes from hours. Hours to the left of the decimal point and minutes to the right of the decimal point. The controller is asking for the soak time period for the first segment.
15. Press the “UP” or “DOWN” key until the display has “00.15”. You have instructed the controller to soak for 15 minutes at 1250°F (675°C).

You have entered the first segment. You are now entering the second segment.

16. Press “Enter” key. The display will now flash “rA 2” and a number. It is asking for the ramp rate in degrees per hour for the second segment.
17. Press the “UP” or “DOWN” key until the display has 200. You have instructed the controller to cool at 200°F (110°C) per hour.
18. Press “Enter” key. The display will now flash “°F 2” and a number. It is asking for the soak temperature.
19. Press the “UP” or “DOWN” key until the display has 100. You have instructed the controller to cool down to 100°F (38°C). This means that the kiln will cool at a rate of 200°F (110°C) per hour and go to 100°F (38°C), taking 5.75 hours.
20. Press “Enter” key. The display will now flash “HLd 2” and a number with a decimal point 2 digits to the left, You may have a number which looks like 12.30 or 1.20 or 0.20. The decimal point separates minutes from hours. Hours to the left of the decimal point and minutes to the right of the decimal point. The controller is asking for the soak time period for the first segment.
21. Press the “UP” or “DOWN” key until the display has “00.30”. You have instructed the controller to soak for 30 minutes at 100°F (38°C).
22. Press “Enter” key. The display will have “rED 2”. You have finished programming User 1 for this slumping project.
23. Press “Start” key. (it is the same key as the “Enter” key). The controller will now start the kiln and perform the firing sequence you have just entered.

24. Allow the kiln to cool down to at least 100°F (38°C) before removing your piece.

Do NOT open the kiln and "peek" at the glass when the kiln is less than 1000°F (535°C); doing so may cause the glass to thermoshock and break.

You have entered the second and final segment. The digital controller has the above firing sequence in its memory as USER 1. It will remember this firing sequence even after the kiln is turned off. You can edit and change the firing sequence any time.

Note: The digital controller does not understand heating or cooling. It only understands what temperature it is at and what temperature it is to go to. Thus it will adjust the firing to go to the destination temperature.

The above glass firing sequence has instructed the kiln to do the following:

- Heat at 300°F (165°C) per hour, go to 1250°F (675°C), stay at that temperature for 15 minutes then cool at 200°F (110°C) per hour, go to 100°F (38°C) and stay at that temperature for 30 minutes then stop firing.

Chameleon
KILNS

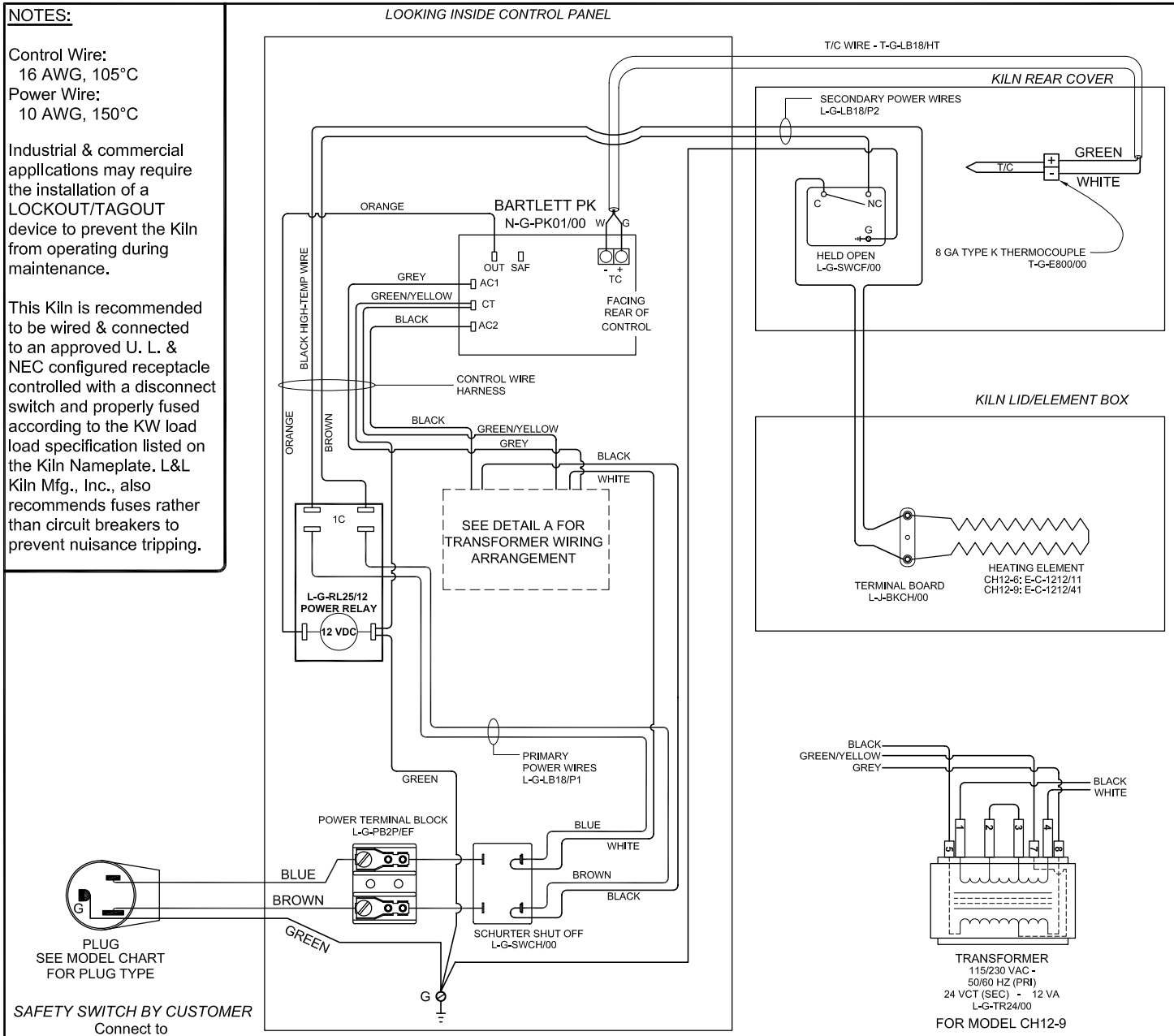
WIRING DIAGRAM

NOTES:

Control Wire:
16 AWG, 105°C
Power Wire:
10 AWG, 150°C

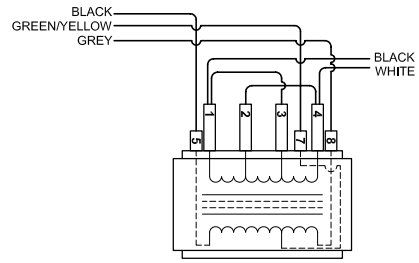
Industrial & commercial applIcations may require the installation of a LOCKOUT/TAGOUT device to prevent the Kiln from operating during maintenance.

This Kiln is recommended to be wired & connected to an approved U. L. & NEC configured receptacle controlled with a disconnect switch and properly fused according to the KW load load specification listed on the Kiln Nameplate. L&L Kiln Mfg., Inc., also recommends fuses rather than circuit breakers to prevent nuisance tripping.



SAFETY SWITCH BY CUSTOMER
Connect to
120 Volt, 2 Wire, Single Phase - or
240 Volt, 2 Wire, Single Phase - or
220 Volt, 2 Wire, Single Phase - or
208 Volt, 2 Wire, Single Phase
50 or 60 Cycles.

TRANSFORMER
115/230 VAC -
50/60 HZ (PRI)
24 VCT (SEC) - 12 VA
L-G-TR24/00
FOR MODEL CH12-9



TRANSFORMER
115/230 VAC -
50/60 HZ (PRI)
24 VCT (SEC) - 12 VA
L-G-TR24/00
FOR MODEL CH12-6

DETAIL A
TRANSFORMER WIRING ARRANGEMENT

MODEL CH12-6
120 Volts

VOLTAGE	120		
WATTS	2150		
FULL LOAD AMPS	L1	L2	L3
	18	18	XXX
POWER SUPPLY	FUSE	WIRE	
	20	10 AWG	
PLUG US	NEMA 5-20P		
PLUG UK	N/A		
PLUG EU	N/A		

MODEL CH12-9
208-240 VOLTS (220 NOM.)

VOLTAGE	208-240 (220 NOM.)		
WATTS	2850		
FULL LOAD AMPS	L1	L2	L3
	13	13	XXX
POWER SUPPLY	FUSE	WIRE	
	15 / 16	10 AWG	
PLUG US	NEMA 14-30 (L-G-CHUS/31)		
PLUG UK	BS1363, H05VV-F3G1.5 3 X 1.5 MM2 (L-G-CHUK/31)		
PLUG EU	CEE 7/7, H05RR-F3G2.5 3 X 2.5 MM2 (L-G-CHEU/31)		

REV. #	DATE	REVISION DESCRIPTION
-	-	-
-	-	-
A	12/20/06	ADDED PLUG SPECIFICATIONS
0	09/12/06	FIRST ISSUE

DRAWING NO.	SHEET OF	REV		TITLE	SCALE	DATE	DRAWN BY	FILE NAME	MADE FROM
K221-151	1/1	A	L&L Kilns hotkilns.com 8 CREEK PARKWAY PO BOX 1898 BOOTHWYN, PA 19061	MODEL CH12 CHAMELEON 1 PHASE WIRING DIAGRAM	1 = 8	09/12/06	D.J.C.	L:\E\L\LLKILN\CHAMELEON\K221-151.dwg	NEW

L:\E\L\LLKILN\CHAMELEON\K221-151.dwg, 12/20/2006 07:06:44 AM, dave

Chameleon KILNS

PARTS LIST

PARTS LIST
THE CHAMELEON KILN (EUROPEAN VERSION)

HOW TO ORDER PARTS

How to Place an Order
Order parts from your local distributor.

Prices
Prices in this parts list are in US dollars. However, your local distributor will have prices listed in the proper currency for you.

Have the Nameplate Information
You can get Model Number, Serial Number and Voltage information about your kiln from the Data Nameplate affixed to your kiln. Please have this available when ordering parts.

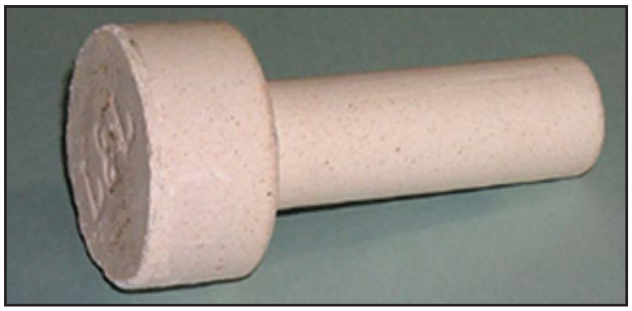
ELEMENT

E-C-1212/41 .....$65.00
The Chameleon 230 Volt element. There is one element in the kiln.

PEEPHOLE PLUGS

C-G-PEEP/00 .....$8.50
Peep Hole Plugs 25mm (1") OD x 125mm (5") Long. These have a stepped head to act as a heat lock around the perimeter. These are also used to plug the vent holes on the top of the kiln.

Below is a C-G-PEEP/1O peephole plug:



ELEMENT TERMINAL BOARDS

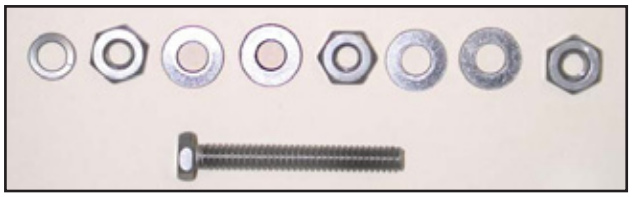
TERMINAL BLOCKS

L-J-BKCH/00.....$25.00
Element Connection Board. Comes with terminal hardware (two terminal posts) and mounting screws to mount onto the kiln.

Below is the front of a L-J-BKCH/00 element connection board:

M-G-TSET/00 .....$3.75
Element Board Terminal Set. Price is for the whole set. Includes: One #10-24 SS bolt 1-1/4" long, One SS lock washer, Three #10-24 SS nuts, Four #10 SS flat washers. **There are TWO sets used per terminal board.**

Below is the complete Element Board Terminal Set:



M-A-SMS3/00.....$0.40
#8 x 1-1/2" long Stainless Steel Sheet Metal Screw. #8 X 1 1/2" Phillips Pan Head. These are used to attach thermocouples to the kiln and to attach Element Terminal Blocks to kiln. (12 used on a 3 section kiln, 8 used on a 2 section kiln)

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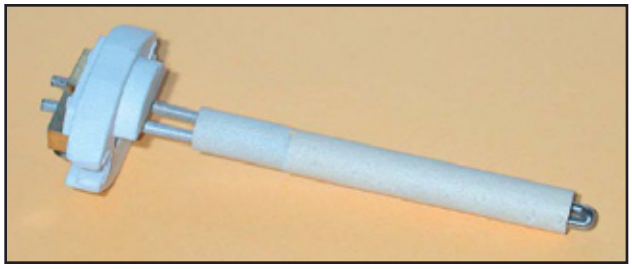
PARTS LIST
THE CHAMELEON KILN (EUROPEAN VERSION)

THERMOCOUPLES

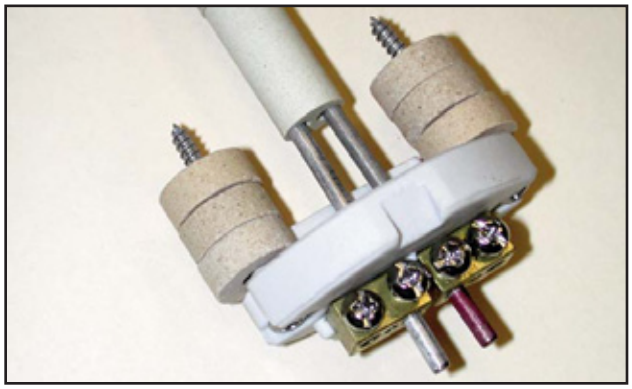
T-G-E800/00 .....$30.00
8 Gauge Type K Thermocouple with ceramic terminal block. Mounting kit is not included.

Below is a T-G-E800/00 8 Ga Thermocouple:.



T-G-MKIT/00.....$7.50
Mounting Kit for Thermocouple. Includes two screws and six 6.4mm (1/4") high ceramic standoffs.

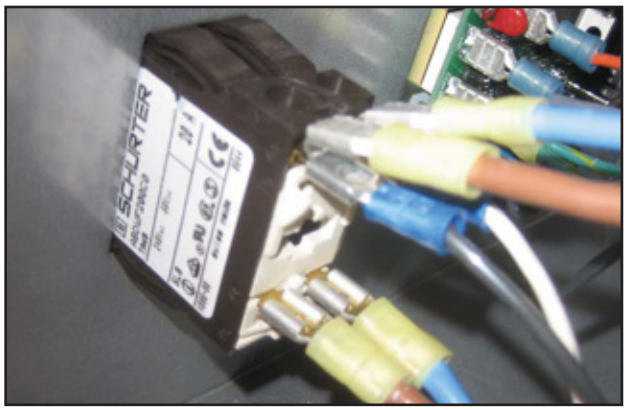
Mounting kit for thermocouples shown with a thermocouple:



ON/OFF SWITCH

L-G-SWCH/00 .....$60.00
On/Off Toggle Switch.

Below is the L-G-SWCH/00 On/Off Switch:



ELEMENT CUT-OFF SWITCH

L-G-SWCF/00.....$59.00
Element Cut-Off Switch.

Below is the L-G-SWCF/00 Element Shut-off switch:

CONTROL BOARD

N-G-PK01/00 .....$190.00
PK Bartlett Electronic Control Board. This is the version WITHOUT any offset programmed into it.

Below is the N-G-PK01/00 Board viewed from the front.

THERMOCOUPLE LEAD WIRE

T-G-CH12/EU $17.00
Thermocouple Lead Wire. This goes from the control board to the thermocouple. This is color-coded for European standards.

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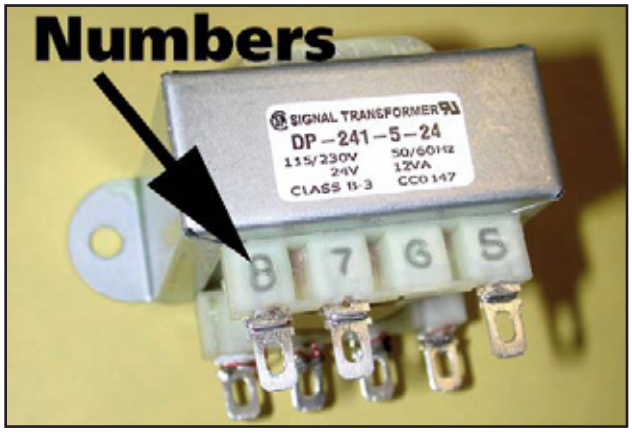
PARTS LIST
THE CHAMELEON KILN (EUROPEAN VERSION)

CONTROL TRANSFORMER

L-G-TR24/00 .....$33.50
12 VA Control Transformer

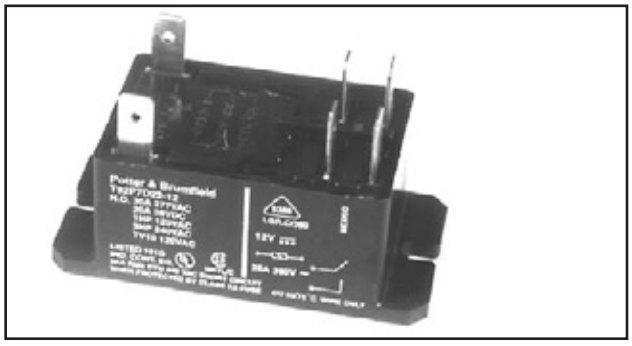
Below is the L-G-TR24/00 12VA Control transformer. The arrow points to the terminal numbers that correspond to the wiring diagram:



POWER RELAY

L-G-RL25/12 .....$29.50
25 Amp Enclosed Power Relay, 12 Volt Coil.

Below is a 25 Amp enclosed power relay:

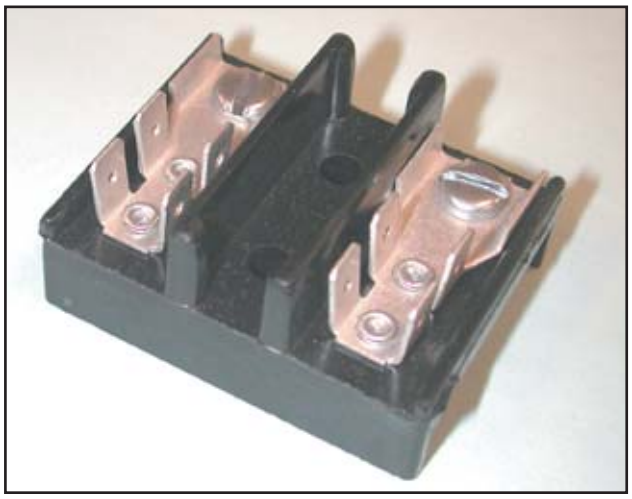


POWER TERMINAL BLOCK

The Power Terminal Block is the main terminal that the Power Cord gets attached to. The wires feed from this block to the Power Relay and Control Transformer.

L-G-PB2P/EF $23.50
Single Phase Power Connection Block 2 pole.

Below is a L-G-PB2P/EF 2 pole Connection Block:



POWER CORDS & WIRING

L-G-CHUK/31 .....$40.00
Power Cord for 220V UK Chameleon. Includes 13 amp fuse in plug.

L-G-CHEU/31 .....$40.00
Power Cord for 220V EU Chameleon. Rated for 15 amps.

L-G-CHWH/31 .....$45.00
Wire harness for 230 Volt Chameleon CH12-9

L-G-BUSH/EF $2.75
Hyco Bushing to protects wires as the go through holes from the base to the elements and door cut off switch. There are two of them.

L-G-CRBS/00 .....$7.50
Cord bushing that holds the cord into the back of the CHameleon.

Below is L-G-CRBS/00 Cord Bushing:

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PARTS LIST
THE CHAMELEON KILN (EUROPEAN VERSION)

CERAMIC ELEMENT HOLDERS

Hard ceramic element holders are one of the unique features that make L&L Kilns so long lasting and valuable. See the Troubleshooting Section for details on replacement if ever necessary.

Below is C-E-EH60/00 #541 element holders shown in the firebrick with an element in place:

ELEMENT HOLDER PRICES

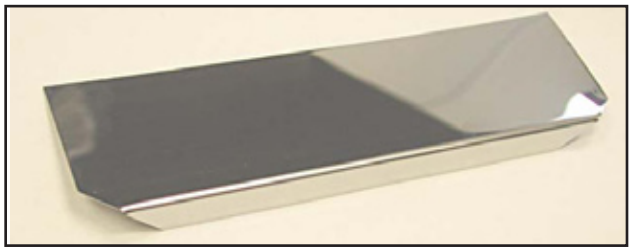
C-E-EH60/00 .....$4.50
152 mm (6") 541 Keyhole Slot Element Holder for top. There are a total of 12 of these.

FIREBRICK

TOPS AND BOTTOMS

P-C-TOPX/41 .....$200.00
Top with stainless steel band, firebrick, element holders, element and element terminal board.

P-C-CH9X/BT.....$80.00
Bottom Brick



SINGLE SIDE BRICKS

F-G-BRCK/25.....$5.00
Sidebrick with no hole. 63mm **(**2-1/2") x 114mm (4-1/2") x 228 (9") BRICK

F-C-BRPH/C9.....$9.00
Sidebrick with peephole. 63mm **(**2-1/2") x 114mm (4-1/2") x 228 (9") BRICK with hole drilled for peephole

STAINLESS STEEL TOP CLIPS

These are the thin stainless steel clips that get attached to the lid band and help hold the brick in place. Two are sandwiched together in each spot.

S-C-CLIP/00.....$5.00
Stainless Steel Top Clip

Below is shown a stainless steel angle clip used to hold firebrick into top band:

CEMENT & BRICK REPAIR

CEMENT & BRICK FACING

M-G-0050/00 .....$9.00
Hi-Temp Cement (1/2 pint). This is Brick Cement is the actual cement we use to cement our tops and bottoms together.

M-G-0050/PH $18.00
Special Phosphate Bonded Cement (1/2 pint). This is a type of cement with extremely good bonding properties - perfect for repairs.

M-G-F050/00 .....$9.00
Facing (1/2 pint) Facing is the special coating we formulate to harden and coat the firebrick.

BRICK REPAIR KIT

M-G-BKIT/00.....$30.00
Brick Repair Kit. This is a special kit which includes a 1/8 pint of very special phosphate bonded firebrick cement, 1 quart of firebrick dust, 1 small firebrick piece, ½ print brick facing and detailed instructions. With this kit it is possible to repair many firebrick problems (such a gouges) to almost like new condition.

CERAMIC FIBER

F-G-FIBR/PR $6.00
(per linear foot x 22cm / 8-1/2" wide) Non-RCF ceramic fiber PAPER 3mm (1/8") thick. This is a non-hazardous version of ceramic fiber. It is used to wrap the outside of the bricks.

F-G-FIBR/00 .....$18.50
(per linear foot x 60cm 24" wide) Non-RCF ceramic fiber BLANKET. This is a non-hazardous version of ceramic fiber. It is soluble in the human body (i.e. lungs). It will withstand about 1250 Deg C - beyond which it will shrink and/or melt. This is great for stuffing around thermocouple holes and general gasketing. One linear foot is 60cm (24") wide by 30cm (12") long by 2.5cm (1") thick.

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PARTS LIST
THE CHAMELEON KILN (EUROPEAN VERSION)

MISC DOOR HARDWARE

HANDLES

M-G-HNDD/00 .....$9.50
Lid Handle and Section Handle. Zinc plated.

Below is the M-G-HNDD/00 handle:

M-G-HNDL/00 .....$14.50
Lifting Handles. Chest handles. Zinc plated. 88mm (3-1/2") Wide

Below is the M-G-HNDL/00 handle:

DOOR CHAIN

M-G-CNDR/CH $10.00
This is the chain that attaches the door to the kiln. This attaches to the kiln and lid with #6 1/2" Philips Head stainless screws.

Below is the M-G-CNDR/CH chain :

HINGE PARTS

S-C-HNGE/00.....$25.00
Door Hinge Part. Includes the parts that attach to the door.

S-C-HNGE/C9 .....$35.00
Door Hinge Part. Includes the parts that attach to the kiln.

S-G-PINX/14.....$9.00
Hinge Bar. The hinge pin to a solid 9.5mm (3/8") roundbar with holes drilled in the end for cotter pins.) The pin is 10" long and is chrome plated.

S-G-COTT/00 .....$1.00
Cotter Pins (two in a set). Price is for two.

HEARTH PLATES AND POSTS

H-C-1212/00.....$22.00
12" X 12" Ceramic Hearth Plate

C-G-T005/00.....$1.55
1.2 cm (1/2") Triangular Post

C-G-T010/00.....$1.60
2.5 cm (1") Triangular Post

C-G-T010/00.....$1.80
5 cm (2") Triangular Post

C-G-T010/00.....$2.35
10.2 cm (4") Triangular Post

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Chameleon KILNS

TROUBLESHOOTING & FIXING THE CHAMELEON KILN (EUROPEAN VERSION)

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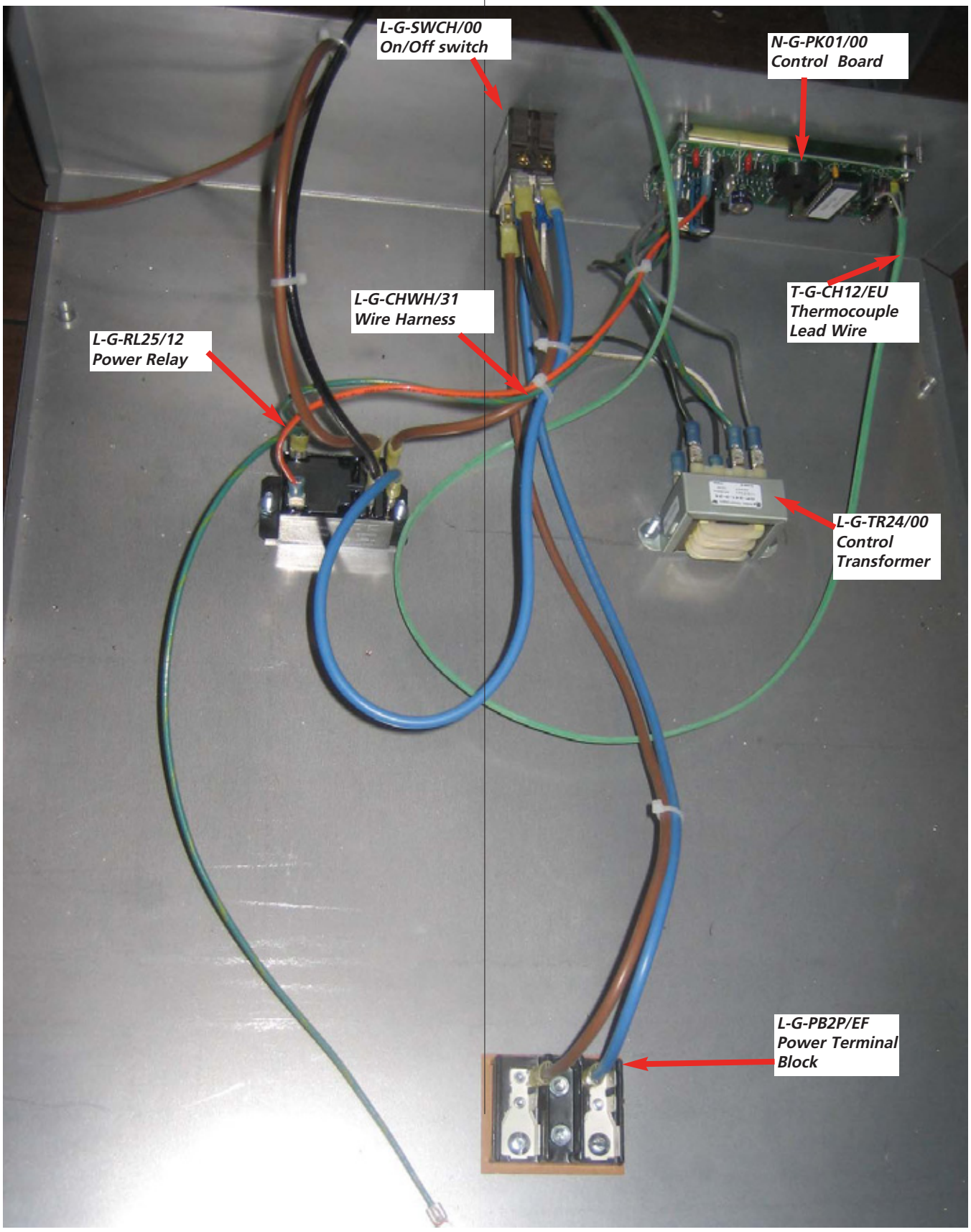
TROUBLESHOOTING & FIXING
THE CHAMELEON KILN (EUROPEAN VERSION)

Photo of inside a control panel



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TROUBLESHOOTING & FIXING THE CHAMELEON KILN (EUROPEAN VERSION)

CAUTION - ELECTRICITY CAN KILL

Many of the tests described in here are performed under power. They should be done ONLY by someone who is familiar with electrical safety such as an electrician or trained maintenance person. We identify any test that is live with a **CAUTION** statement. We describe these tests in detail so that an electrically trained person who doesn't specifically understand kilns can do the troubleshooting - the level of simplicity described is not meant as an invitation to harm the untrained. **AS LONG AS THE KILN IS UNPLUGGED YOU ARE SAFE.**

GET A DIGITAL MULTIMETER!

We recommend the purchase of a digital electrical multi-meter. Without it you are only guessing at the origin and severity of an electrical problem based on how the kiln is acting. Be forewarned however: Testing electrical circuits is very dangerous and potentially deadly if you do it incorrectly. It could result in electrocution! If you don't feel comfortable doing this hire an electrician or get someone to do it who is qualified. That being said - many of the tests described in here just require testing for resistance - which is done with the kiln unplugged. **AS LONG AS THE KILN IS UNPLUGGED YOU ARE SAFE.**

AN EASY-TO-USE TROUBLESHOOTING GUIDE

This troubleshooting guide is written specifically for the Fuego and the Robin kilns. We have tried to thoroughly illustrate it to guide you through step-by-step to solve most of the potential problems you might encounter. It is organized by symptom and potential causes and solutions. There are two major sections. The first section tells you how to diagnose the problem. The second section provides detailed explanations on how to change components and fix various problems.

LIVE TESTS

Some tests are done live. These should be done only by someone experienced in working with electricity. You are dealing with over 200 volts which can easily electrocute you.

Some of the tests involve removing the control panel from the kiln and taping off the power leads and then plugging it in.

CONTROL DISPLAY DOESN'T SHOW ANYTHING

On/Off Switch

1) Make sure the On/Off Switch is turned on. Turn it on and off. This switch is also a circuit breaker so turning it on and off may reset it.

Plug & Cord

1) Make sure the power cord is plugged into the receptical. Reseat plug. Make sure it is held firmly and that the springs inside the receptical seem to be working.

2) With power off examine the electrical cord. Look for burned or melted areas and breaks or pinched sections. Look closely at the head of the plug. If there is an internal problem with the wires and the plug parts you won't be able to see it but you may detect a softening or melting of the plastic at the plug head. Look for oxidation or substantial discoloration or even burnt spots on the prongs. Replace plug and cord if this is questionable. Open up the head of the plug and check the connections inside.

3) With panel removed from kiln, power leads taped off, and panel plugged in check voltage at the Power Terminal Block. If you see no voltage there then you know something is wrong with the power source. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

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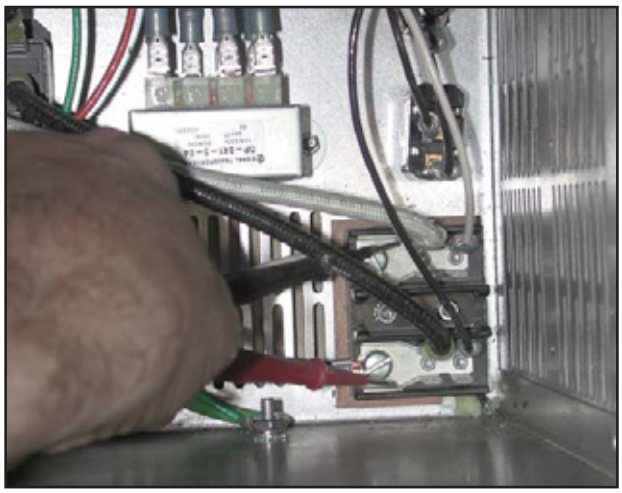
TROUBLESHOOTING & FIXING
THE CHAMELEON KILN (EUROPEAN VERSION)

Checking voltage at the Power Terminal Block:



Circuit Breaker / Power Source

1) Check circuit breaker or fused disconnect switch to make sure it is turned on. Sometimes circuit breakers need to be turned on and off to reset them.

2) Check voltage at the receptical. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

3) If you have a fused disconnect check the fuses with your voltmeter for continuity. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

4) Make sure fuses or circuit breaker is the proper amperage and type. If your fuse keeps blowing try changing it with a slow blow fuse. If a circuit breaker keeps blowing it may need to be replaced.

5) Test for voltage at the main power supply as close to the kiln as possible. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

Internal Wiring

1) Unplug kiln and remove panel. Remove the inner insulated panel and look inside at the wires. Make sure that all the wires inside the control panel are connected. See photograph on page 2 and also the Wiring Diagram.

Short Circuits

Do all the following with the kiln unplugged.

1) Check for short circuits. Look for any signs of burnt wires. This might indicate a short circuit. A way this might happen, as an example, is that frayed wires at the end of a wire connector might touch each other.

2) Check for worn wires that may have shorted against the case. Examine wire insulation. If the wire insulation has become frayed the wires could short to the metal casing which is electrically grounded.

3) Look for dirt. Some dirt (such as carbon compounds) are electrically conductive. This is generally not the case with ceramic materials but some can be. Vacuum out panel if you see dirt.

NOTE: Usually a short circuit will trip the circuit breaker for the kiln or the fuses in the fused disconnect switch if you have one. You will then not see any display on the control. Turn your circuit breaker on and off, and check fuses on the fused disconnect and control fuse.

Control Transformer

CAUTION: These tests should only be done by an experienced person familiar with electricity and its dangers.

1) If none of these solve the problem then you could have a bad control transformer. To check the transformer operation test with your digital multimeter. It should read 220 to 240 volts across terminals 4 & 1 (where the black & white wires come into it) and 24 volts across terminals 5 & 8 (where the gray and black wires come out). This is a live test so be very careful not to touch any of the wires - remember there is 220 to 240 volts in the panel and this can electrocute you. See photo below. If you are not getting proper voltage (or any voltage from the transformer and you are getting it to the transformer then you need to replace the transformer.

2) If there is 220 to 240 volts coming into the control transformer (terminals 4 & 1, black & white wires) and there is no voltage coming from the transformer then you have a bad control transformer and it needs to be replaced.

3) The voltage across the top center tap (terminal #7, green-yellow wire) and either of the two top end taps (terminal #8, grey wire or terminal #5, black wire)

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should be between 12 and 16 volts.

4) The voltage across the two top end taps (terminal #8, grey wire or terminal #5, black wire) should be between 24 and 32 volts.

Checking input of the Control Transformer across terminals 4 & 1 (DANGER-live test:):

Checking output of the Control Transformer across terminals 5 & 8 (DANGER-live test:):

5) If there is no voltage coming into terminals 4 & 1, white & black, then test for it at the Power Terminal Block where the power cord comes in. If there is power there then look for a bad connection or wire between the power connection block and the transformer, i.e. a bad switch or wire. If power is not there then go further back on the line and measure the voltage. Keep going until you find voltage, then look for the problem between that point with the voltage and the last point checked that had no voltage.

Control Board

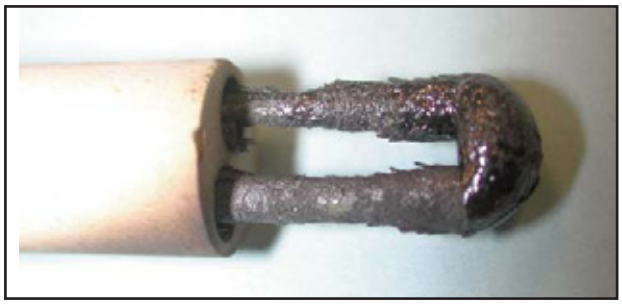
1) If the transformer is OK and you know you have voltage going to the control board but the control still shows no display then the control board needs to be replaced.

DISPLAY READS FAIL and tC

FAIL will be seen flashing along with a **tC** indicating the thermocouple has failed.

1) Check thermocouple end. Examine end carefully. Sometimes there can be a crack that opens up while the kiln is hot but appears to be normal when the kiln is cold. If the end of the thermocouple looks severely corroded and you are getting Error codes then it is best to replace the thermocouple. NOTE: You have to open up the Element Cover Box and remove the thermocouples to check the ends.

A thermocouple end that will still work but is getting close to creating a problem:



2) Check thermocouple circuit. For instance check where the thermocouple lead wires go into the ends of the thermocouples. Are the wires loose? Tighten the screws on the ends of the thermocouples to be sure you have a tight connection. Check for corrosion. Check where the thermocouples connect to the control. Try pulling off each connection and reseating it. This can scrape away corrosion that may have built up. Check for melted wires.

3) If none of this works try testing the control board. Put a small jumper like a paperclip across the thermocouple terminals directly on the control board. If the control now reads room temperature then you have a bad thermocouple wire (or bad thermocouple). If it does not read room temperature then the control is definitely bad and needs to be replaced.

4) If you have a bad thermocouple replace it with a new one.

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TROUBLESHOOTING & FIXING THE CHAMELEON KILN (EUROPEAN VERSION)

DISPLAY IS NORMAL BUT KILN WON'T HEAT UP

Programming

1) Make sure you have programmed the kiln properly and it is supposed to be firing. Read the instructions.

Wiring

1) Unplug kiln. Remove panel. Check all power wires for firm connections.

2) Pull off and reseat all the spade connector connections of the power wires to rub off any oxides and to ensure a good connection.

Control Board Outputs

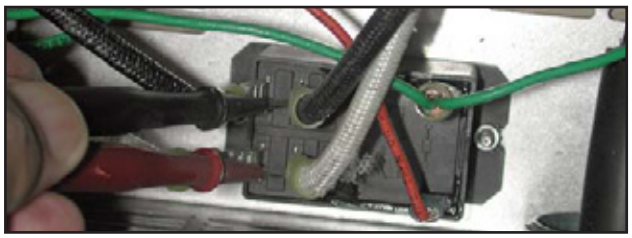
1) It is possible that the the internal switches on the control board could be bad. You can test that by checking to see if you find voltage (12 volts DC) between the output contacts (AC1 & AC2 marked on the control board) ground (any green-yellow wire). **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

Bad Power Relay

1) You should be able to hear the relay going on and off with a soft clicking noise when you first turn on the kiln and it is supposed to be heating up. If not try turning the kiln off and then back on again and restarting the program. Of course if you don't hear the relay it only tells you that it isn't firing. The problem could be in the control for instance not telling the relay to fire. If you do hear the relay and the kiln is not heating then you know the problem is in the power circuit AFTER the relays.

2) Check output from Power Relay. With panel off kiln and panel plugged in and firing check the output of the Power Relay. You should see 220 to 240 volts at the output when the relay is engaged. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers.**

Checking output of relay:



Bad Element

See next section.

KILN FIRES TOO HOT OR COLD

Hold Times

Be very careful with hold times. Even a fairly short hold time of 10 minutes can dramatically increase the amount of heat work and hence the cone that the kiln fires to. On the other hand you can use the hold time to increase the heat-work to compensate for underfired work. Just test this in small increments. There is a great program available for free from Orton's web site that allows you to calculate this with some precision.

Thermocouple Drift

Thermocouples drift in their accuracy with time. You may have to make further adjustments in the final set point temperatures that you fire to over time.

KILN STALLS

1) If for some reason the thermocouple wire touches the hot kiln case they may melt and fail. The result of this is that the kiln can "stall out", say **CPLt** prematurely or display any other number of other random error codes. It may refuse to increase in temperature, and the kiln will just run on and on. If it is re-started it may work fine for a while. What happens is that the millivolt signal in the TC wire goes to ground, or the two wires in the TC wire are 'electrically' connected by the stainless steel melting through the insulation and the 'temperature' is then taken right there, not in the kiln. However, the signal received can be so foreign to the microprocessor that the kiln will just stall. The Thermocouple Lead Wire needs to be

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replaced.

2) Thermocouples close to end of their useful life can cause some of these same problems.

3) Sometimes excessive ambient temperatures (over 50°C / 125°F) around the control can cause stalling too.

4) Corroded connection points can also cause stalling.

KILN FIRES SLOWLY

Bad or Wrong Voltage

1) Check your voltage. Do this at the receptical or at your fused disconnect box. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers. You need to see what the voltage is when the kiln is firing.** Low voltage will make the kiln fire considerably slower. Check voltage at your panel and where the kiln is connected. Check the voltage when the kiln is firing and when it is not firing. Sometimes the high amperage draw of the kiln will cause a voltage drop at the kiln. A voltage drop of 5 to 10 volts is not uncommon and is to be expected. If your voltage drop is more than that then you may have a problem with your electrical supply.

2) Make sure no other large electrical appliances such as a clothes dryer or electric oven are on when you are operating your kiln. This may cause a voltage drop which would slow the kiln down.

3) Voltage may vary in your area depending on season and time of day. Frequently there are "brown outs" during the summer months in some areas. This is when the electric utility reduces the voltage. Try firing at night after peak electrical use hours. You can use your Delay feature to do this easily. Find out from your local utility company when the end of the peak period of electrical use is. Some utilities offer preferential rates for using electricity at night because it is cheaper for them.

4) Check to see what the wire size of your circuit is. If it is very long (more than 50 feet) from your main circuit box then the wire size might need to be higher (#8 instead of #10 wire).

Element Aging

1) Elements age when fired and the elements increase in resistance. When they increase in resistance the amount of power they develop decreases. See the section on “CHECKING ELEMENT RESISTANCE” at end of this guide.

2) Replacing only one element may cause an unbalance in firing.

3) Empty the kiln. Then turn kiln on until elements are red. Open the door carefully and observe the elements to see if they all seem to be glowing about the same amount.

4) Elements expand and grow with age. The length and the coil diameter increase. Meanwhile the atmosphere in the kiln slowly eats away at the metal of the element. Although the total resistance usually increases as the elements age, sometimes it decreases, or reverses itself. This usually only happens when the elements are very old but have not yet failed completely. Visually inspect your elements for the above conditions and do a resistance check. If you see this it may be time to change elements.

Power Relays

1) Power Relays may cause poor transfer of power to elements when they have been used for a long period of time. It is not always a total failure - which is of course harder to troubleshoot. If this is suspected replace the relay.

Bad Wiring

WIRES WILL GET HOT

Unlike many other appliances that use electricity (like motors) kilns are called a “resistive load.” This means that there will be a continuous pull of steady electrical power for many hours. Even with properly sized wire this will generate SOME heat in the wires. If you look carefully you will see that we have OVERSIZED our internal power wires far in excess of their rated capacity. In addition all our power wire is rated for very high temperatures. The larger the wires the less resistance in the wires and the cooler they will operate.

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1) Have an electrician check your wiring. Make sure your wires are of the proper size and that all connections are good.

2) Check your circuit breaker for proper operation. These sometimes go bad over time.

3) If all the elements are firing and the kiln is still firing too slow check the amperage draw of the kiln under a full load. you should read around 13 amps. **CAUTION: This test should only be done by an experienced person familiar with electricity and its dangers. You need to see what the voltage is when the kiln is firing.**

Wiring in the Kiln

1) Unplug kiln.

2) Trace wiring for missing or bad connections.

3) Check wiring against wiring diagram.

4) Check for corroded connectors or connectors that have frayed wires. Replace if you see this.

Element Connections

1) The holes where the elements go through the firebrick walls are too large. This could cause too much heat to escape from the kiln thereby overheating the element terminals. This can be remedied by lightly stuffing non-RCF ceramic fiber in the element holes. (See the Parts List for for non-RCF fiber). You can stuff this in from the inside of the kiln using a sharp tool like a very small screw driver.

2) Check to see if the element ends are twisted properly. They should be twisted clockwise around the terminal screw. If the twist is too loose this could generate extra heat at the element ends. Check for corrosion on the terminal. If there is corrosion sometimes you can remove it with a wire brush.

Photo of element terminal with element end twisted around it properly:

3) The element connection hardware may not be tight enough. A loose connection can generate heat and cause oxidation of the hardware which in turn will cause a worse electrical connection (because of resistance) and more heat. Replace with new hardware.

Heat Leakage & Vents

1) Make sure peephole plug is in.

2) If your lid or bottom is cracked check to see if it seems to be leaking much heat at high temperatures. Patch or replace if extreme. (SOME IS OK).

KILN HEATS TOO FAST

Voltage

1) Check your voltage. Some people may have high voltage like 245 volts where you should nominally have 220 to 240 volts.

Elements

1) Check element ohms and compare with factory values. (See CHECKING ELEMENT OHMS).

2) Make sure the elements are wired properly. **Check the wiring diagram.** IF THE ELEMENTS ARE WIRED IN PARALLEL RATHER THAN SERIES THE KILN WILL OVERHEAT QUICKLY.

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TROUBLESHOOTING & FIXING
THE CHAMELEON KILN (EUROPEAN VERSION)

ERROR MESSAGES

Error codes can appear at any time during the firing. They always refer to a problem that, if allowed to continue, could end with unknown or even disastrous results. **Errd, Err1, ErrP** and the **FAIL** message make the most frequent appearances.

Errd

Error d indicates that the kiln temperature is 60°C (100°F) above the traveling set-point, which is the current desired temperature in the kiln. The traveling set-point will increase or decrease according to the programmed rate.

1) Something is too close to, or is touching the thermocouple. Allow almost an inch between everything for thermal expansion. Adjust load and re-fire the kiln.

2) The Thermocouple Lead Wire has melted against the kiln case. The wire must be replaced.

3) The thermocouple is about to fail. Perform a physical inspection, or just re-start the kiln and monitor it carefully.

4) Element(s) just burned out. Perform an ohms test for more information.

5) The relay has just failed.

6) There is a bad connection point somewhere. This will become more of a possibility as the kiln ages. Examine all points carefully for melting, corrosion, discoloration and/or bad electrical smell.

Err1

Error 1 indicates the temperature in the kiln is rising during an up ramp slower than 3°C/hour. If this rate continues for 20 minutes the firing will be stopped. **Err1** may be an indication that the elements are worn or that a relay has stopped working.

1) If **Err1** is the error code on the screen when you check on the firing, then for some reason the kiln could not generate enough heat to counter the heat loss. If the kiln can get no hotter (even though all the elements appear to be on and the program is not holding), then **Err1** is what you will see. **Err1** can mean either you need new elements or a new relay. An ohms test and a voltage test can tell you which it is. If you recently changed locations, power supplies, elements, or did any repairs, then closely examine what changed between your last successful firing and this one. There may be some other issue besides bad elements or a bad component.

2) In re-wiring the power supply you may not have used thick enough copper wire (line, conduit and connection points will be very hot).

3) The elements are the wrong resistance. Check new elements with your multimeter just to be safe. Mistakes can happen.

4) If you rewire anything improperly or incorrectly the potential for anything from a blown breaker to just no power at all is possible. (Using wire with a temperature rating of less than 150°C for the power wiring can seriously limit the life of the circuitry and can be dangerous as well, especially when the wires are close to the kiln. Use a wire diagram and trace every wire to check yourself).

ErrP

Error P is displayed whenever there is a power interruption that is long enough to stop the firing. If the power interruption is brief the kiln will continue to fire when power is restored; in this case there will no indication of a power failure. To clear the error, press any key.

This error can also happen as a result of RF noise that resets the microprocessor. If this is suspected, the control panel should be returned to L&L for testing and possible modification.

ErrF

Error F indicates the temperature in the kiln is decreasing during a down ramp less than 8°C (15°F)/hour. If this rate continues for 8 minutes the firing will be stopped. **ErrF** may be an indication that a relay has stuck in the on position.

tC-

Error tC- indicates that the white and green thermocouple wires are reversed. Make sure they are right all the way through the circuit. White is positive. Green is negative.

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FAIL

See the section in these Troubleshooting Instructions called **DISPLAY READS FAIL and tC.**

Can you restart the kiln after it stops because of Error Codes?

You can try to restart the kiln after getting an error code. Some messages, like flashing **ErrP** and **FAIL**, will not necessarily turn off the kiln. Depending on the problem though, re-starting it may or may not let it finish the firing, or even start up again. An **Err1** at the end of the firing will re-start but will probably re-occur in about 22 minutes.

Worst Case Scenario for Restarting After an Error Code

Keep in mind that you run the risk of over-firing if you re-start while the kiln is very close to the final temperature. A pyrometric cone melts with the proper combination of time and temperature. Add more time and you don't need as high a temperature, go to a higher temperature and you don't need as much time. When an error code shuts down the kiln near your final temperature (within about 50 degrees) and you do not know exactly how long it has been cooling, or what temperature it reached before the error code appeared, you run the risk of having too much unaccounted for time in your time-temperature equation.

If you have cones in the kiln that you can see through the peepholes, then use these after you re-start and turn off the kiln manually when the target cone bends over.

If you do not have cones visible then you can gamble and estimate a final temperature based on how many degrees per hour the kiln has risen, including the time it was off.

In reality, however, an **Err1** that close to the end of a firing probably means you need new elements. So re-starting the kiln will probably not enable it to climb much higher in temperature. Keeping track of the time, let it run, and when it shows **Err1** again just keep re-starting it until the firing finishes. Meanwhile call and order new elements.

In general though, Error Codes mostly appear after the kiln has been disassembled and set back up improperly, has had its power supply altered (like moving to a new studio with different voltage), or has had an element or a thermocouple burn out.

REMOVING PANEL FOR SERVICE

1) It is easy to access the inside of the control panel for troubleshooting. In addition it is easy to remove this panel and send it back to the factory for inspection and/or repair.

2) Unplug the kiln.

3) Unscrew the screws on the side of the stand.

4) Slide the panel towards the back. YOu will run into some resistance as you do this because of the wire bushings that go up to the back of the kiln and also the screws for the lifting handles. Work around these as best you can. Remove them only if you have to.

REPLACING CONTROL

CAUTION: The controller contains electronic components which are sensitive to static electricity. Before handling the controller dissipate any static charge you may have by touching metal on the kiln or some other grounded object.

1) Unplug kiln.

2) Remove the control panel.

3) Pull off the spade connectors from all the connection points on the back of the control. Loosen the screws that hold down the thermocouple wires and pull out the wires from under the screw heads. It is OK to remove the screws if this is easier for you. First note where all the wires go. These are all clearly marked with color coding on the Wiring Diagram.

5) Pull old control out. Put new control in and screw in place with the small mounting screws. Replace wires on proper connectors.

6) Be careful to get the white TC wire on the negative terminal and the green TC wire on the positive

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terminal on the control board. NOTE: The terminals on the control are painted RED for negative and YELLOW for positive.

7) Double check that the proper color coded wire goes to the proper terminal:

Orange = OUT, Gray = AC1, Green-Yellow = CT, Black = AC2

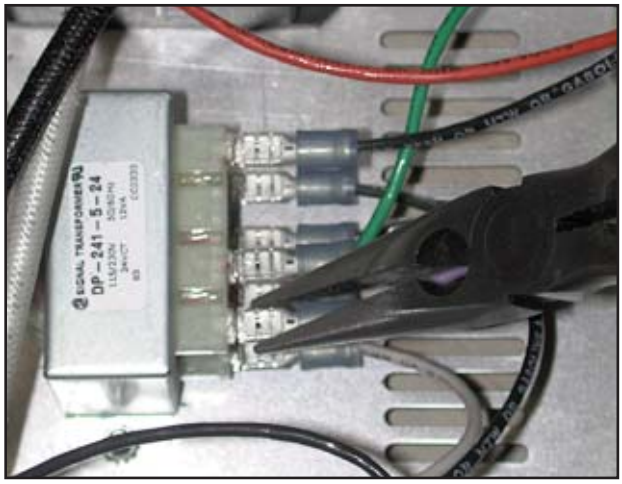
REPLACING TRANSFORMER

1) Unplug kiln.

3) Remove the control box.

3) Using needle nose pliers pull off the wires from the transformer. THIS CAN BE TRICKY. It can take a good bit of force sometimes to remove these little spade connectors. You will probably not be able to do it with just your hands. Also the spade connectors on the transformer are not very strong. Take your time. Of course, if you are replacing a bad transformer it doesn't matter if you damage it.

Picture showing wires being pulled off the control transformer.



4) Unscrew the two nuts that hold the control transformer onto the panel and remove the transformer.

5) Before installing the new transformer put the small jumper wire onto terminals #2 and #3 on the bottom row of terminals. Note the little numbers by the contacts.

REPLACING POWER RELAY

1) Unplug kiln.

2) Remove the control box and remove the insulation panel.

3) Pull off the wires to the relay. Everything is color coded and marked so you can refer to the wiring diagram when replacing if you forget where the wires go.

4) Remove the nuts from the studs that hold the relay in place. Remove old relay and replace with new one.

5) Visually inspect the wire connectors. Do they look corroded or "cooked"? Are the wires frayed? Any corrosion on the wire itself? If any of this is questionable you should replace the appropriate wires.

6) Reconnect all wires. Visually inspect to make sure the spade connectors are down as far as they can go and feel to see that they are tight (a gentle tug should not remove one). If they are loose for some reason remove the wire and slightly squeeze the spade connector with pliers to tighten it.

IMPORTANT: The slip on wire connectors can not be loose or corroded. If there is a bad connection then heat will be generated and the component that they slip onto (relay, terminal strip, etc) may overheat and fail. If you squeeze the slip on terminal to make it tighter - be sure to squeeze it evenly so that one side is not tight and the other loose. If there are any doubts about the integrity of the wire or the connector replace the whole wire or harness.

REPLACING SWITCH

1) Unplug kiln.

2) Remove the control box.

3) Remove the wire connectors from the switch terminals. Pay attention to and make a diagram for yourself of how they will go back on.

4) Unsnap the switch from its hole and install a new one. Reconnect wires. See wiring diagram if you have questions.

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TROUBLESHOOTING & FIXING
THE CHAMELEON KILN (EUROPEAN VERSION)

REPLACING THERMOCOUPLES

1) Unplug kiln.

2) Remove the hinge pin and set door off to the front. Then remove back hinge box.

3) Remove the Thermocouple Lead Wire from the Thermocouple.

4) Unscrew the Thermocouple from the kiln (these are #6 x 1-1/2" screws)

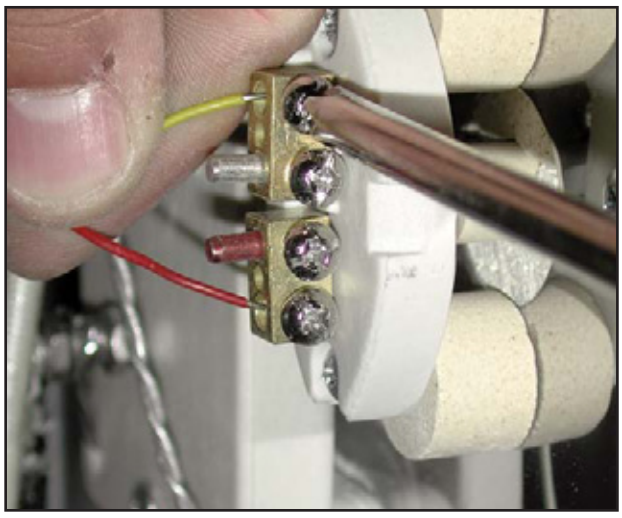
5) Remove Thermocouple.

6) Install a new Thermocouple and screw in place.

7) Replace Thermocouple Lead Wire and tighten. Be sure to get Green Wire matched to the Plus sign and the White Wire matched to the Minus sign.

NOTE: The terminals on the control are painted RED for negative and YELLOW for positive.

Tighten screws on thermocouple lead wire:



REPLACING ELEMENTS

1) Unplug the kiln.

2) Remove the hinge bar from the lid and hinge.

3) Remove the lid hinge piece.

4) Remove the safety chain that is attached to the lid.

5) Remove the Element Terminal Box on top of the kiln.

6) Remove the power wires on the element terminal bolts.

7) Using a 10mm (3/8") nut driver, ratchet wrench or adjustable wrench remove the nuts that hold the element end onto the Element Terminal Bolts.

8) Untwist the element end from around the Element Terminal Bolts.

9) Cut the elements off close to the lid top.

10) Set aside the red element connection board and flip the lid upside down.

11) Using a pair of pliers, pull the element ends out through the holes.

12) Remove the insulator bushings.

13) Slide the element holders out of the brick while simultaneously removing the element from the element holder. If the old element falls apart, remove all the pieces.

14) Be sure to check for failure points for evidence of contamination on the element holder. If the element holder is contaminated it will cause rapid failure of the new element. Replace contaminated holders with new ones.

15) Keep all of the element holders out of the brick.

16) Vacuum or brush out the channels in the brick removing all dust and debris.

17) Lay the new element into the channels in the brick; finish stretching the coiled sections of the element until they are even with the ends of the grooves in the brick.

18) Starting at one end, insert the end of the new element through the insulator bushing and through the lid until only the coil is showing.

19) Slide the holders in from the other end of the row seating the element in the holders. Repeat for the remaining rows.

20) After all the holders are in and the element is seated, pushback the last row of holders about 2 or 3 inches and insert the end of the element through the insulator bushing and through the lid.

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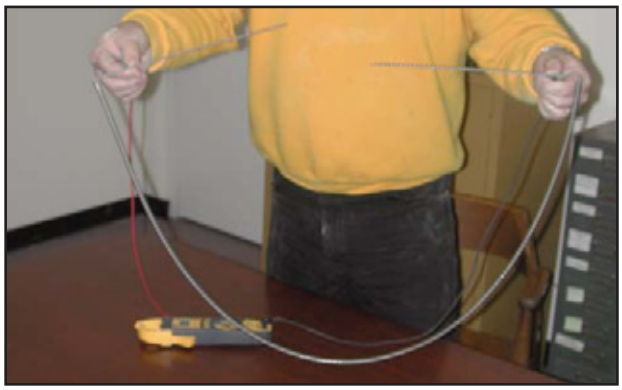
21) Flip the lid back over.

22) Feed the element ends through the red element connection board and wrap them clockwise around the element terminal bolts. One turn around the bolt is sufficient. Cut off the excess element wire and secure using washers and nuts.

23) Re-attach the power wires, Element Terminal Box, safety chain, lid hinge piece and hinge bar.

Checking resistance of the elements before you put them in. This is a good double-check and can save you a lot of trouble if there is a mistake. Put the probes on the twisted element ends about 3" from the beginning of the coil:



Detail showing how all the hardware gets assembled on the Terminal Bolt:. The hardware has not been tightened yet.:

CRACKS IN THE LID & BOTTOM

1) It is quite normal to get hairline cracks in both the lid and the bottom firebricks.

2) They are caused by the expansion and contraction of the firebrick as it heats and cools.

3) As long as the bottom is fully supported by the stand the cracks in the bottom will not adversely affect the operation of the kiln.

4) The stainless steel clips we use in our lids also help keep these natural cracks from normally becoming a problem.

5) It generally does not make sense to cement these hairline cracks.

6) You can tighten the stainless steel band.

This crack is OK:

TIGHTENING STAINLESS BANDS

1) The brick will shrink slightly over time. This is more pronounced when using the kiln at higher temperatures like cone 10.

2) If the bricks shrink too much they will become loose.

3) Tighten the case by turning the screws of the case clamps. Do this 1/4 of a turn at a time on each of the clamps. Keep a balanced tightening (i.e don't tighten one clamp too much at one time). Slow is good.

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Tightening the bands:

4) You can do this on the bands around the top and bottom also. This will help maintain the integrity of those slabs even if there is a crack.

REPLACING FIREBRICK IN SIDES

1) If you need to replace a firebrick piece in one of the sections do the following. While it does not require a great deal of experience to accomplish it does take time and patience.

2) Loosen up the adjustable clamps that hold the stainless steel wrapping. Loosen them just enough to allow the brick to slide out with slight hand pressure (so that the other bricks stay in place). NOTE: If you don't have the section on a flat surface then the bricks will all come out of proper alignment at this point.

3) Slide the bad brick(s) out and put in new brick(s).

4) Retighten the clamps on the wrap. Alternately tighten the bottom and top clamp so that you don't cock the stainless casing.

5) Sand off the top surface of the firebrick to match the surface of the other firebricks. Sandpaper will work fine. Reface with facing (See Parts List).

DRILLING OUT HOLE FOR PEEPHOLE

1) Some of the bricks that you may need to replace will need to have holes drilled in them in the field. These holes can not be drilled in the factory because the alignment would not be perfect.

2) To drill out for peepholes use a 26mm (1") diameter drill bit or hole saw. You can also drill with a smaller drill and then file out with a round hasp type file. In all cases the peephole can be drilled perpendicular to the stainless case. You may have to remove the bit several times and clean it out as you drill deeper. It is a good idea to have someone help you by watching from the side to make you you are keeping the drill perpendicular.

3) Drill slowly through the firebrick using the prepunched hole in the stainless steel.

4) Before drilling, as a precaution, you can measure down from the top of the brick to the top of the existing hole in the stainless steel case. This measurement on the inside will show you where the top of the drill bit will protrude. Adjust your angle of drilling accordingly.

DRILLING OUT FOR THE ELEMENT CONNECTIONS

1) Use a 3 to 5mm (approx. 1/8” to 3/16") diameter drill bit and drill out from the center of the hole in the stainless steel case. Do this slowly with a speed control..

CHECKING ELEMENT OHMS

1) Unplug kiln.

2) Open the box where the element connections are.

3) Disconnect the power wires from the elements terminals (or at least one of them).

4) Using your Multimeter set on Resistance or Ohms check resistance across the two main Power Lead Wires. The ohms should read 16.35.

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