



FOR OVER 50 YEARS... THE KILN TECHNOLOGY LEADER

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# B SERIES PROGRAMMATIC KILN INSTRUCTIONS

## INSTRUCTIONS FOR PROGRAMMATIC TOP LOADING ELECTRIC KILNS

You are now the proud owner of an L&L "B" Series Programmatic Kiln, engineered to give you the utmost in performance and results. This is an expensive and potentially hazardous appliance (if not used with proper caution). PLEASE TAKE THE TIME TO READ THESE INSTRUCTIONS. There is important information that you need to understand to operate your kiln safely and properly.

NOTE: these instructions cover both the old style B kilns and the new style B kilns. If your kiln model number (on the model number dataplate) has a "C" suffix (i.e. B299C) it is a new style B Kiln (which started production in late 1996). They include the larger diameter element holder (which allows for use of the optional heavy duty "Professional" elements), different wiring which allows various controls to be plugged in, and two safety cut off controls.

### CHECKING SHIPMENT

Your kiln was carefully packed and inspected prior to shipment to make sure that your kiln and accessories were in perfect condition.

When carrier makes delivery, you should immediately unpack your kiln and accessories to ascertain whether or not any damage has occurred in transit.

If damage has occurred, retain all of the packaging material, and notify the delivering carrier at once, requesting an inspection report. Retain all papers to insure that a proper claim can be filed. We will assist you in any way possible with your claim; however, filing and collecting on freight claims is the receiver's responsibility.

### FEATURES

- **UNIQUE DYNA-GLOW ELEMENT HOLDERS.** The "C" Suffix models have larger diameter element holders to make element replacement easier and to accommodate heavy duty "Professional" element option.
- **TWO BACK UP SAFETY CONTROLS:** (On "C" suffix models) Two pyrometric cone type shut off controls in series shut off the kiln if you are using the manual or turn up control. They act as back up safeties for the automatic controls. Most automatic kilns have no safety back up. This is more reliable

than a kiln sitter and timer combination because a timer can never be as accurate as a pyrometric cone. With a timer as a back up you have to calculate how long it will take to heat up the kiln. If you are wrong you could overfire or underfire.

- **POWER RELAYS:** All power is switched to the elements with power relays.
- **POWER CORD INCLUDED (ON MOST MODELS):** All single phase B Models except the B299C are rated under 50 amps and include a 50 amp NEMA 6-50P power cord. 3 phase units and B299C are direct hook up. The B299C includes branch fusing (because of its heavy amperage rating). Full power for high temperature firing is assured.
- **CONTOURED ELEMENTS FOR UNIFORMITY:** Elements are contoured for power output from top to bottom to provide good temperature uniformity without adjustment of zone switches. Elements are the finest grade of iron-aluminum-chrome alloy available.
- **FULL OPENING LID WITH SAFETY CHAIN:** The lid opens completely past the back edge to allow full access to the inside of the kiln for loading. A safety chain allows you to secure the lid to prevent accidental closing.
- **BRICK HARDENED WITH SPECIAL FACING:** L&L uses a special coating on the firebrick to help prevent brick dusting from ruining your ware. This also helps energy reflect back into the kiln which



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improves the energy efficiency and gradient uniformity.

- **LARGE DIAMETER PEEPHOLES:** 1-1/4 inch diameter peephole with insulating ceramic plugs are supplied for ventilation and cone sighting. These are full diameter all the way through the firebrick which allows greater visibility into kiln.
- **STURDY ALUMINIZED STEEL STAND:** Aluminized steel resists dangerous corrosion at high temperatures. The B299 kiln stand has a full plate of aluminized steel under the bottom brick. This allows the bottom brick to move freely while expanding and contracting.
- **SOLID STAINLESS STEEL CASE**
- **ADJUSTABLE LID PROP:** For adjustable venting.
- **HEAVY DUTY LIFTING HANDLES**
- **KILN ON/OFF SWITCH IS STANDARD**

### PREPARATION & ASSEMBLY

- Unpack kiln carefully and remove all packing material including the plywood base or skid if included. Replace bolts into legs for leveling purposes.
- Install kiln in well-ventilated area.
- Make certain floor is not flammable and install no closer than 12" to any wall.
- Make certain the area is free of moisture and is under cover and protected from the weather.
- If your kiln is equipped with a vent fan, exhaust tubing to outside. See separate vent instructions.
- Check Gemini Cut Off Control(s) for adjustment. Read Gemini instructions for instructions on this process.
- Place aluminized steel stand in your kiln location
- Place kiln on stand, making certain it is centered properly.
- **LEVEL THE KILN!** This is important because the Gemini Cut Off Control is affected by gravity. If the kiln is not properly leveled the Gemini Cut Off Control might be either too reactive or too sluggish.
- Vacuum the kiln before using it (with power disconnected from kiln).

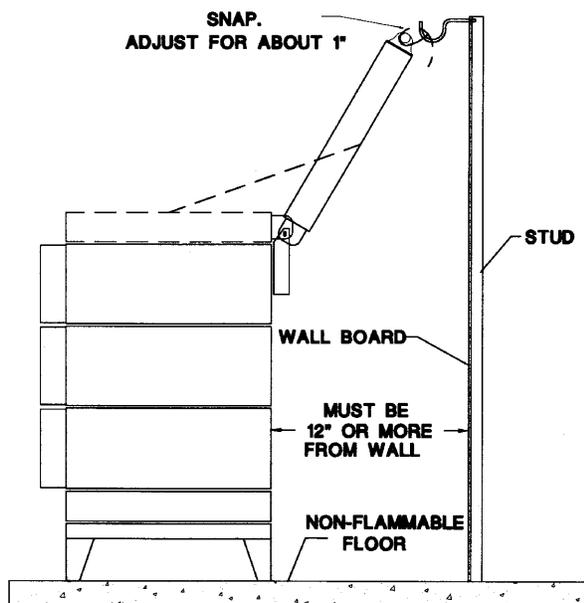
### IMPORTANT CAUTIONS

1. **The B Series kilns are rated for use to 2350°F (1287°C) (Cone 10).** DO NOT FIRE ANY HIGHER THAN THIS. The elements, element holders and firebrick will melt.
2. Have electrical installation performed by an electrician or other qualified technician. There is danger of electric shock.
3. Do not allow children near the kiln at anytime.
4. Kiln surface is extremely hot and will burn you if touched.
5. **BE SURE YOUR GEMINI CONTROLS ARE PROPERLY ADJUSTED.** Overfiring could result. Note that the GEMINI controls could have gone out

6. Do not leave the kiln while firing. **NO AUTOMATIC SAFETY DEVICE IS FOOLPROOF! BE ESPECIALLY CAREFUL ABOUT ATTENDING THE KILN WHILE IT IS SUPPOSED TO SHUT OFF.**
7. Kiln should be located at least 12" from any wall.
8. The floor should be protected from the heat if it is combustible. **IMPORTANT NOTE:** If kiln overfires certain materials such as glass or glazes can reach superhot temperatures because they become electrically conductive and can melt. This can burn through the kiln bottom and, if there is a combustible floor, cause a fire. Be sure to protect against this possibility.
9. Check temperatures around the kiln when it is at high fire to be sure that you are not creating an unsafe condition.
10. Do not let the kiln's power cord or wire connection come in direct contact with the kiln side. The kiln could melt the cord covering and potentially cause a short circuit.
11. Before opening kiln make sure that on/off switch is in OFF position (so there is no power to elements). Make sure kiln is cooled down so you won't get burned.
12. Do not put sealed containers or combustible materials in kiln.
13. Keep all flammable and combustibles away from kiln. Examples are solvents, curtains, rags, etc.
14. Operate in a well ventilated area.
15. Never load moist greenware in your kiln. The expanding water vapor in the ware could cause the ware to explode, damaging your kiln interior.
16. Read the control instructions as well as these and other general instructions that come with your kiln - **BEFORE OPERATING THE KILN!**
17. Use dark glasses to view inside the kiln through the peepholes when firing.
18. Do not open the kiln lid unless the kiln is turned off (except for carefully controlled troubleshooting tests).
19. Do not apply kiln wash to the brick sides, element holders or undersides of kiln shelves.
20. Do not operate kiln with deteriorated wiring. Be sure to check this periodically.
21. Keep lid closed when not operating the kiln. Otherwise the weight of the lid over time may force the hinge and stainless wrap to move down. This will affect the way the lid closes and may cause the lid
22. Do not use silica sand in the kiln (some people like to use this as a work support medium). The silica sand will attack the elements and thermocouples. It can migrate in the kiln from expansion and movement due to heat. It can also get into the Gemini cone control device(s). If you must use sand to support or stabilize your load try alumina oxide sand. Also consider ceramic fiber blanket.

## DOOR CHAIN SAFETY SYSTEM

A special safety system is supplied with your kiln. This is a door safety chain. It secures the lid in an open position when you are loading or unloading the kiln and insures that the lid can not accidentally come down on you. **YOU MUST INSTALL THIS FOR YOUR SAFETY'S SAKE.** See the below diagram.



## REGULAR KILN MAINTENANCE

To keep your kiln in top operating shape, we recommend the following minimum housekeeping:

### **WEEKLY OR AFTER EACH FIRING**

1. Check element holders for possible contamination (pieces of clay, glaze, etc.). Replace if necessary. Contamination may cause abnormal element failure.
2. 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.
3. Make sure bottom and shelves are coated with kiln wash. Brush off or vacuum off any loose particles from the kiln shelves.
4. Check each shelf for cracks (you don't want a kiln shelf to break when loaded and cause a disaster in the kiln).
5. Check pyrometric cone safety shut off control sensing rod for free and centered travel. Correct if movement is sluggish. Check rod and cone supports for straightness (replace if bent). Check supports and rod to make sure that only a thin layer of kiln wash coats them. Too much can interfere with proper operation. If any nonremovable materials

accumulate replace the supports and/or sensing rod.

6. Plug up peepholes.
7. Observe thermocouples (if used) for excessive corrosion which could lead to thermocouple failure.

### **MONTHLY(15 FIRINGS)**

1. Vacuum out kiln and element holders, repair any firebrick problems. **USE THE SOFT BRUSH ATTACHMENT ON YOUR VACUUM CLEANER.**
2. Check temperatures around kiln (at the high end of use).
3. Check kiln plug and outlet box for excessive heat during firing (at the high end of use).
4. Check pyrometric cone safety shut off controls with a test cone. Adjust if necessary.
5. Repair any firebrick chips or gouges.

### **SEMI-ANNUALLY (90 FIRINGS)**

1. Check element resistance. Replace elements if resistance is more than about 9% of stated nominal resistance (see chart in back of instructions). or firing time has increased substantially.
2. Check tightness of case and retighten if necessary.
3. Check 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).
4. Check power connection terminals in the kiln for tightness. (Be sure to do this with the power disconnected (unplugged) for the kiln). If these terminals connections get loose heat can be generated and cause a fire.

## WARRANTY

See separate warranty for details on warranty. We can only be responsible for defects in the kiln itself. L&L purchases the shelves used in the kilns, and again, cannot assume any responsibility for defects or imperfections. Note that it is completely normal to experience hairline cracks in the firebrick. As the kiln heats up and expands this does not create a problem with the kiln. See the Troubleshooting Guide for more information.

Be sure to read and fill out the warranty form that is given with each kiln. Return the lower portion to our company, for filing purposes.

## SERVICE FOR YOUR KILN

L&L kilns are designed to be as easy to work on and fix as possible. Most of our customers are comfortable doing their own service. The TROUBLESHOOTING GUIDE provides many helpful tips and suggestions. You can also call your local distributor, most of whom service the kilns they sell. If they don't they may be able to direct you to a local kiln service person. Also try your local yellow pages. L&L may also be able to recommend a local service person. If you can't find a person experienced specifically in kiln repair, then a good



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electrician is often more than adequate to repair most of the types of problems that commonly occur. Some of the more difficult problems occur within the instrument panel. The panel can be removed and sent to the factory for repair. We are happy to answer technical questions on the phone. **HOWEVER; PLEASE TAKE THE TIME TO READ THESE INSTRUCTIONS AND THE TROUBLESHOOTING GUIDE BEFORE CALLING THE FACTORY FOR HELP. ALSO WE CAN NOT GIVE YOU ADVICE OVER THE PHONE ON HOOKING UP YOUR KILN TO YOUR ELECTRICAL SYSTEM. YOU MUST HAVE A QUALIFIED ELECTRICIAN WHO CAN PHYSICALLY SEE WHAT YOUR SPECIFIC ELECTRICAL SITUATION IS.**

### **THEORY OF OPERATION**

A B Series electric kiln is an insulated polygonal heating device designed specifically for firing of ceramics. Coiled elements made of a special high temperature alloy (iron-aluminum-chrome) are mounted around the perimeter of the kiln. The heating elements are designed to have a low watt density (radiating watts per square inch of element surface area) and good stretch ratio (ratio of stretched length to original coiled length). These are supported in hard ceramic element holders (a unique L&L feature). The insulation is a special hand picked lightweight firebrick (K23) which is 2-1/2" thick. This firebrick resists temperatures up to about 2450°F. It is highly insulating. At 2000°F the heat loss is 786 BTU's per square foot of insulating surface area. The heat storage (or the amount of energy it takes to heat up the brick itself) is 1666 BTU per square foot of brick. The case temperature, when the kiln has reached final set point and the firebrick is saturated with all the heat it will absorb, can be several hundred degrees. After the heating elements are turned off the insulation will slowly lose its heat and the kiln and ware will cool down. In the B Series the kiln is made up of one integrated section. The case can be opened up for repair if ever necessary. The elements are graded in terms of wattage from top to bottom to achieve uniform firing from top to bottom (the heat losses are greater at the top and the bottom than in the center of the kiln). There is a temperature control (one of three types) that controls power relays that allow power to the elements. In addition, there is a pyrometric cone shut off control (designed and built by L&L Kiln Mfg.) that breaks power to the power relays when the cone softens. Elements are contoured (i.e. there is more power in the bottom and top elements) to make up for net losses in the top and bottom and hence give better uniformity without the use of zone switches.

### **KILN FURNITURE**

L&L supplies ceramic kiln furniture for all our kilns. Various size shelves are available, both in 1/2 rounds and full rounds. Kiln posts of two crosssections are available. The larger, stronger posts are fluted square

tubes approximately 1-1/2" square. The smaller posts are triangular posts. The square posts are available in 2", 4", 6" 8" 10" and 12" lengths. The triangular posts are available in 1/2", 1", 1-1/2", 2", 2-1/2", 3", 4", 5", 6", 8", 10" and 12" lengths. Three "post kits" are available which include a selection of posts. Kits for each kiln with a selection of posts and shelves are also available. See the price sheets for more information.

NOTE: Full shelves that are more than 20" in diameter may crack when fired too quickly. 1/2 shelves do not have this problem. If in doubt order 1/2 shelves. Shelves are not warranted against cracking or warping.

### **REPLACEMENT ELEMENTS**

Replacement Elements made by L&L Kiln Mfg., Inc. are designed for each individual model for long life and superior performance. Good element design is a complex balance of watt density, design voltage, stretch ratio, wire gauge, element length and material. It takes hours and years of experience to design a good element for each model. Do not expect an outside supplier with no interest in your kiln performance or long experience with L&L kilns to spend the necessary time to do this right. In the end you will not save money. **BE SURE TO SPECIFY WHICH ELEMENTS YOU NEED WHEN ORDERING.** The B14 elements are all the same but all the other models have a #1, #2 or #3 element. See the wiring diagram for details on location.

#### ***HEAVY DUTY "PROFESSIONAL" ELEMENTS***

If your kiln model has a "C" suffix (i.e. B299C) it has larger crosssection element holders. These new holders are capable of holding a larger diameter, heavy gauge element. These "Professional" grade heavy duty elements feature lower watt density than the standard elements and that, coupled with the heavier gauge wire, results in longer element life. If you are experiencing short element life because of your duty cycle (frequent firing, high temperature firing, long soak times) you should try these "professional" elements. They have the same ohm rating (resistance) as the standard elements. This means that the power rating of the kiln does not change. It also means that you can use them with the standard elements. One consideration with mixing the standard and "Professional" elements is that the "professional" elements will age more slowly than the standard elements and may have an effect on uniformity in the kiln. This is really no different than what you would experience when you change just one element and so have a new element (unaged) with older elements. The zone switches in the J Series will allow you to balance your system and compensate for this problem. Keep in mind that L&L can not keep track of which elements you have and that you must specify "Professional" elements when ordering. If you don't specify "Professional" you will get standard elements.



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### **ELEMENT HOLDERS**

The new design of the Dyna-Glow element holders allows a larger diameter element to be used. This also makes it easier to remove old elements during replacement.

Any number of element replacements will not affect the hard ceramic element holders or brick walls, unlike other kilns where elements are pinned into the soft firebrick grooves. All pinning problems are eliminated and full firing space is always insured.

Dyna-Glow element holders secure and protect the elements so that the elements can not accidentally come out and cause damage to themselves, the kiln or your ware. Yet, replacement is simple.

Dyna-Glow element holders reflect the infra-red heat instantly into the kiln and therefore operate at a lower temperature relative to the internal kiln temperature. They require less firebrick insulation to be cut out. This means L&L Kilns are more efficiently insulated than other kilns of this type. This results in better, more accurate firing, lower electrical cost, lower case temperatures and, most significantly, longer element life.

Dyna-Glow element holders have a hard smooth surface. This allows the elements to expand and contract freely. No loose particles will fall in the kiln and ruin ware. Element life is longer because elements do not get easily snagged and bunched up (which causes hot spots and burn outs).

**See the TROUBLESHOOTING GUIDE for information on how to replace elements and element holders.**

### **POWER SUPPLY**

#### **POWER CORD MODELS: Single Phase B14C, B18C, B23C, B239C**

These models have 72" 50 amp power cords with NEMA 6-50P male plugs. All these models are rated under 50 amps. These can get plugged into a NEMA 6-60F female receptacle (available from L&L if you can't find it locally).

#### **DIRECT HOOK UP MODELS: All three phase units and B299C**

All direct hook up models have a power connection board (with grounding lug) in the instrument/control panel. An electrician needs to wire these kilns direct to a fused power circuit. See electrical specifications at end of instructions for details.

#### **VOLTAGE**

B Series kilns are wired to work on either 240 Volt Single Phase, 240 Volt three Phase, 208 Volt Single Phase or 208 Volt Three Phase. Some non-US kilns (sold to

countries with 380 Volt power systems) work on 220 Single Phase. It is important that the kiln be hooked up to the proper voltage. 208 volt kilns hooked up to 240 volt power supplies will generate too many amps. 240 volt kilns hooked up to a 208 volt power supply will heat up about 25% slower than they should and may not reach the higher temperatures. Although it is possible to hook a single phase kiln to one leg of a three phase supply it will cause an unbalanced load on your electrical supply. **CHECK WITH A QUALIFIED ELECTRICIAN.** It is best to get a three phase kiln for a three phase power supply. In addition to the power wires there is, on all L&L kilns, a ground wire. The ground wire is not used as a neutral (i.e. no electricity normally flows through the ground). **BE SURE TO GROUND THE KILN PROPERLY USING THE GROUND WIRE.**

#### **ELEMENT VOLTAGE**

The elements on all B Series kilns work on line voltage (208,220 or 240 volts). Elements may be wired in series or parallel depending on the kiln. See your wiring diagram.

#### **POWER HOOK UP**

From the wiring diagram, have your electrician install the proper receptacle and safety switch at your kiln location. Note that L&L has available 50 Amp NEMA 6-50F receptacles from stock if you can't find them locally. Have receptacle placed in such a manner that the plug-in cord can in no way touch the body of the kiln. (NOTE: Grounding is normally provided in NEMA 6-50 type hook ups). Some models hook up permanently to power supply. Be sure that your fuse ampere capacity is enough to carry the electrical load required. Also, ensure that your power lines are heavy enough to carry the required electrical load. Anticipate future needs (such as adding an extension) to save yourself from future electrical installation costs. If this is being used in an industrial application or environment be sure to follow lock out/tag out requirements and procedures. Be sure to ground kiln properly.

#### **WHY PROPER GROUNDING IS IMPORTANT**

All electrical appliances should be properly grounded. This can be to either a cold water pipe or proper system ground in your building. If there is ever a short circuit (where the electricity flows through to the case or control panel and where you might touch it) you could be electrocuted if the kiln is not grounded. This is especially important with the high line voltage used on kilns. The higher the voltage the more easily it could flow through your body. In addition, because of the heat generated in a kiln, wires are subject to potential deterioration over time and expansion and contraction can move insulators and cause short circuits. **BE SURE TO REPLACE ANY DETERIORATED WIRES!**

### **FUSES**

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**MODEL B299C:** The B299 includes branch circuit fusing (with 30 amp fuses) because of its high amperage rating.

**ALL OTHER MODELS:** There are no fuses for these models.

### **L&L GEMINI PYROMETRIC CONE SHUT OFF DEVICE**

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This is a safety back up device; however, they can and do fail. L&L does not recommend unattended firings. SEE THE SEPARATE GEMINI INSTRUCTIONS FOR MORE INFORMATION ON HOW TO SET AND ADJUST THIS CONTROL DEVICE.

### **PUT KILN WASH ON THE CONE SUPPORTS AND SENSING ROD FOR ACCURATE CONE ACTION.**

This control is the shut-off system for your kiln, and must be properly set to prevent over-fire of your kiln. With your kiln you have received two (2) 020 test cones for the initial test. You do not have to use 020 cones for the test but these are the ones that are provided. **Do not run this test until you have done the recommended first firing.**

In testing, you will use high heat only. If you have the manual control set the switch for 100%. If you have the Automate II control set this on position #9 (the fastest setting). If you have the Dyna-Trol set its cone setpoint at a cone level that is at least two cones higher than the cones you put in the Gemini device. Otherwise the test cones will never bend. Use the Fast Bisque preset program.

If, at the end of 2 hours, the Gemini device has not turned off the kiln, turn it off manually. It probably needs an adjustment. Check the Gemini instruction manual book for instructions on how to make this adjustment.

Be sure to read the section in the Gemini instruction book about Witness Cones. This is the most accurate method of determining temperature in the kiln.

### **OPTIONAL TRU-VIEW PYROMETER**

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An optional pyrometer with single thermocouple can be used with the B kilns. This is recommended if you are using the manual control or the Fireright Automate II Turn Up Control. The pyrometer is made so that it can be attached to the kiln or hung on a wall. We recommend that it be hung on the wall. After the installation of the thermocouple place a match at the thermocouple to see that it reads up-scale. If the needle reads down-scale, reverse the thermocouple lead wires.

### **PYROMETER ACCURACY**

You can check out the pyrometer against the cones. The most accurate readings are the cones. If your pyrometer is inaccurate do not make any adjustments, as the inaccuracy does not vary. When a cone goes over, simply note where the needle of the pyrometer is reading, draw a line at that point on the glass and mark the cone equivalent. From that point on, you are reading accurately with the cone.

### **THERMOCOUPLES**

L&L sells mostly Type K Chromel-Alumel thermocouples. These work by creating a slight millivoltage at the junction of the two dissimilar metals. This millivoltage varies proportionately with temperature. The thermocouple ends insert into a junction block. Into this junction block is also inserted precisely calibrated lead wire of varying lengths. The wires must touch with nothing in between and each wire must be of the correct polarity. See the Troubleshooting Guide for more information. Both standard 14 gauge thermocouples and heavier duty 8 gauge thermocouples are available from L&L. L&L recommends the 8 gauge thermocouples when you are firing frequently to higher temperatures. (8 gauge is a thicker wire size and will last longer than the 14 gauge).

### **OPTIONAL VENT-TORR VENT SYSTEM**

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See separate brochure for more information. The Vent-Torr kiln ventilation system by L&L Kiln Mfg., Inc. vents harmful fumes away from a kiln to the outside. Fumes are generated by carbonaceous materials in clay, china paints and glazes containing oils, glue from decals, and certain glazes and other miscellaneous products.

The Vent-Torr vent system includes a bypass/collection box that gets mounted to your kiln, a blower system and exhaust pipe that gets mounted to your wall and 15 feet of flexible connection duct. The bypass/collection box features an adjustable damper that allows you to control how much vacuum the vent system pulls on your kiln. This is important because you only want to vent the minimum required to exhaust the fumes and not any more heat (and energy) than necessary.

See the separate installation and operation instructions for the VENT-TORR ventilation system.

VENT-TORR downdraft ventilation system is produced under license from The Edward Orton Jr. Ceramic Foundation and is covered by US Patent Nos. 4,863,374 and 4,978,295.

## **“PLUG & PLAY” AUTOMATIC CONTROLS**

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### **CHANGE - UPGRADE - REPLACE - REPAIR - ANYTIME!**

(Available on the “C” suffix Models only). The basic control is a manual input switch. The next step up is the FireRight Automate II Turn Up Control. Or you can get a PerfectFire or Bartlett THP600 program control. All control systems plug into the same four wire connector. They all control the same relays inside the kiln panel. Control service problems are quickly and easily handled. You can upgrade or change controls at anytime. **NOTE:** All these controls are available on the older models but they must be installed by the factory and can not be easily changed in the field (although it is possible to do).

### **TO CHANGE THE CONTROL**

Four screws hold the control mounting plate to the control panel. Remove these four screws and pull the panel out towards you. A plug attached to four wires plugs into another four wire cord coming from the kiln panel. Be sure that the proper color wires are connecting to the same color wires when connecting this plug. All proper power transformers necessary for the operation of that particular control are included on the control plate that comes out. If you are sending the control back for repair to the factory send the whole panel with control and components attached.

### **MANUAL INPUT CONTROL**

This is the simplest control available. The input switch is adjustable from 22% of on time to 100% of on time. Put it on low for drying and low firing and then turn it up to a higher position to heat the kiln up to final temperature. The pyrometric cone shut off switches will then turn kiln off (one acts as a back up safety.) We suggest use of an optional pyrometer to know what temperature you are at.

### **FIRERIGHT AUTOMATE II TURN UP CONTROL**

The "FireRight" AutoMate II turn up control is a simple and easy to use semi-manual control. It allows you to set the amount of time it will take the kiln to heat up. It is a self-incrementing percentage timer. The control automatically proportions power contactors according to its internal program. In the beginning of the cycle the on time will be short but get longer as the cycle progresses. It also allows you to hold the kiln at various percent settings for extended periods (such as on "low" for a dryout period.) This is an electronic control; however, it does not use a thermocouple feedback and has no way of knowing what actual temperature the kiln is at. It is a vast improvement over a manual input control because it allows the turn up of the kiln to be automated. It is also less expensive than the more elaborate program controls. We suggest use of an optional pyrometer to know what temperature you are at.

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### **DYNA-TROL MULTI-PROGRAM DIGITAL PROGRAM CONTROL**

This program control has proven to be a reliable and easy to use program controller. The DYNA-TROL features digital display, start up delay up to 99 hours, 99 minutes, a simple cone fire mode which includes 4 firing speeds, up to 8 segments (cooling or heating ramps with an optional hold per segment), 6 separate repeatable storable programs, cone/temperature equivalent look up table, temperature alarm, program review and/or change of program during firing, and thermocouple burnout protection. Kiln temperature is indicated during heating and cooling. Display is in degrees F or C. This control allows you to soak at a low temperature for a long time (i.e. you can have an automatic drying period) and then automatically ramp up to your high fire at different rates. It also allows a controlled cool down to avoid heat shock. See separate instruction sheet for more information.

### **KILN WASH**

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Kiln wash the floor of the kiln and the upper sides of the shelves only. Apply the kiln wash to the thickness of a post card or 1/16th of an inch. The only purpose of kiln wash is to prevent any glaze that drips from a piece from sticking to the floor or shelves. This saves both the piece and the floor or shelves. If dripping should occur, simply remove dripping and cover the spot with new kiln wash. Kiln wash is a powder mixed with water to a light creamy consistency.

### **FIRST FIRING OF THE KILN**

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On the first firing of the kiln fire it empty except for shelves and posts. Be sure all elements are firmly set in their holders before firing. For kilns with the manual control fire the kiln on low (setting #2) for two hours to bake out any moisture. Then set to medium (setting #5) for two hours and then increase enough to reach final temperature. Fire it to cone 5 (2150°F). If you have the Automate II set the timer for setting #1. If you have the DYNA-TROL program control fire the following program: Using the “Easy-Fire” mode fire on Slow Bisque to Cone 05 with a “candling” setting of 4 hours. This first firing will bake out the brick, oxidize the elements and act as a final test of the kiln’s operation before real use. Keep note of how long it takes to fire your first real load under normal conditions. This will give you a benchmark to determine when the elements begin to “slow down.” After this first firing be sure to do a test firing for the Gemini cone device back up controls.

### **SOAKING**

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Sometimes it may be desirable to “soak” at your end temperature for unusual glaze effects. The program control can be used to accomplish this.

### **COOLING**

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If your kiln is cooling too rapidly for good glaze results, or if the cooling is so rapid that cracking occurs on certain large pieces, it is recommended to cool under power. You will need the Bartlett THP-600 program control to control your cool down.

### **LOADING KILN WITH GREENWARE**

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When placing greenware in kiln, all pieces may touch each other. Place lids on the pieces they go with when firing to bisque, this will prevent possible distortion. It is important to place tallest pieces on the center of the shelf and work outward to the shortest pieces. This will give you complete heat circulation. Be sure the ware is totally dry before firing (unless you use a very long drying cycle). Moisture in the work can cause cracking or even an explosion. Always use low and medium heat for one hour each, than high heat to maturity. The low heat can be used a great deal longer if desired, as its only purpose is to thoroughly dry the ware and to start the expansion of the ware to take place, so that the higher heat will not affect the ware. By using low heat, then medium heat, and finally high heat the danger of cracking or distortion is reduced. All switches are put on low heat at one time: this also is true for medium and high heat. Put peephole plugs into peepholes after the low firing is over. NOTE: HEAVY GREENWARE MAY TAKE LONGER TO DRY. EXERCISE CAUTION!

### **LOADING KILN WITH GLAZE WARE**

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When placing ware into the kiln to be glaze fired, we suggest that the pieces should be placed 1/2" apart, so that when they are heated and expanded (which all pieces do when being fired) there is no danger of them touching each other. If pieces are placed too close together, they may touch and stick to each other, thereby ruining both pieces of ware.

Except for placing ware the proper distance from each other and stiling the ware for heat circulation, follow the instructions for the firing of greenware. It is still important to go through low, medium, and high heats to get perfect results. Be certain when placing ware in the kiln, that no piece in expanding, can touch the rod of the kiln sitter, as this would prevent the kiln sitter from turning off the kiln even though the cone bends properly.

### **OVERGLAZE FIRING**

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When firing overglazes such as Gold, Palladium, Mother of Pearl, China Paints, etc. the kiln must be vented during the firing up to 1100°F before the lid is fully closed. Leave the peepholes open during the venting period and prop the lid up about 2" (NOTE: this is if you are not using a vent system such as an L&L VENT-TORR vent system). Turn the switches on low

for 1/2 hour, medium for 1/2 hour and high to maturity (This is to prevent thermal shock to your ware). Since the temperature to which you are firing is not really that high some ceramists like to fire these items with venting throughout the complete firing.

### **SPARE PARTS**

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If you are operating in a production environment it is imperative that you stock certain spare parts if you must prevent down time. Do not rely on L&L to be your emergency supplier. While we do our best to ship parts quickly and to keep all parts in stock we can not be responsible for your downtime. We recommend the following parts be kept on hand:

- Complete set of elements
- Complete set of fuses
- One power contactor
- Spare program control
- Spare thermocouple
- Several element holders
- 1/2 pint firebrick cement
- 1/2 pint grout
- 1/2 pint facing

### **REPLACING FIREBRICK**

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TURN OFF ALL POWER BEFORE PROCEEDING TO PREVENT ELECTRIC SHOCK

#### **TO REPLACE A BOTTOM**

- Remove lid if necessary

#### **METHOD #1**

- Turn kiln upside down and place on soft surface (such as cardboard or microfoam) so as not to damage firebrick seal surface.
- Remove kiln side seam screws (only those to bottom brick level).
- Remove bottom brick and reverse if OK and in one piece. If deteriorated, replace with new bottom. Do not replace old bottom if broken in two or more pieces. Make certain that bottom contacts side bricks closely (there should be no gaps).

#### **METHOD #2**

- Leave kiln as is.
- Remove all the screws around the base of kiln but none of the screws along the side seam.
- With two or more people lift the kiln up. The bottom should stay put while the kiln moves up. Be careful that the side bricks do not slip down while you are doing this.
- Lift kiln over a new brick bottom on the floor next to your kiln.
- Reinsert the screws around the bottom.

#### **TO REPLACE SIDE BRICKS**

- First determine if brick to be replaced is one that element ends penetrate.

## B SERIES INSTRUCTIONS

- If so remove elements involved, taking care not to break the brittle elements. Straighten element twisted ends. Even with your best efforts you may not be able to avoid damaging element. Be prepared to replace element if necessary.
- Determine if brick is nearer top or bottom for positioning kiln upside down or not.
- Position kiln right side up or bottom side up depending on position of necessary replacement. Be sure to place kiln on soft surface (such as cardboard or microfoam) if you place kiln upside down.
- Remove just enough side seam screws to allow removal of damaged brick. Replace only those brick that are damaged with new brick. Replace old brick that are O.K. in old positions. Make certain of "up" or "down" orientation of element holders!
- Tighten case to align screw holes. It may be necessary to tighten case with a tourniquet method to align screws. Place a loop of clothes line or something like that around kiln at affected screw point level and by twisting loop with a sawed off broom handle or similar stick, tighten loop until screw holes are aligned. Replace screws.
- If you are replacing brick that require element end penetration, then drill holes for element penetration with about 1/16" diameter drill. Ream the hole about 1/2" into the brick to allow ceramic insulator insertion (you can ream with a drill).
- If replaced brick is a peephole position type, peephole may be drilled with 1" hole saw. Use low speed drill at very low speed.
- Replace elements and lid.
- Touch up brick with L&L facing cement. Wet brick with water before applying any cement to brick with 1/16" thick application between firings.

### **REMOVING THE INSTRUMENT PANEL FOR REPAIR**

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#### **REMOVING THE WHOLE PANEL**

1. Turn off power to the kiln. either unplug the kiln (if a plug type unit) or turn off power from your disconnect (and lock out if possible).
2. Remove the screws that attach the instrument panel from the kiln body.
3. Pull the panel forward to allow access to the electrical connections on the "Gemini" control.
4. Disconnect wires from the Gemini(s) and mark or identify for latter reattachment. This is important so that you do not get wires mixed up.
5. For those models that are direct power attachment disconnect the power wire from the power connection block at the bottom of the control panel.
6. Disconnect the wires to the element connections and mark and identify them for latter reattachment.
7. The panel, if it is to be sent back to the factory, it should be carefully packaged in bubble wrap and properly boxed and sent to our shipping address.

Be sure to alert us before sending a panel and be sure to include a note about the problem you are having.

#### **REMOVING THE CONTROL ON AN OLDER B SERIES KILN**

1. Unscrew the control face from the control panel.
2. Disconnect all the wires coming to the control and carefully mark where they go for latter reattachment.

#### **REMOVING THE CONTROL ON THE NEWER "C" SUFFIX B MODELS**

1. Remove the four screws that hold the control assembly onto the control panel. (Do not remove the control itself from the assembly plate).
2. Unplug the four wire connector from the plug.

### **TROUBLESHOOTING**

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See the separate **TROUBLESHOOTING GUIDE** included with these instructions. **BE SURE TO READ THIS ALONG WITH THE SUGGESTIONS FOR IMPROVING ELEMENT LIFE. THERE ARE MANY HELPFUL POINTERS AND SUGGESTIONS.**

### **FOR MORE INFORMATION ABOUT FIRING CERAMICS**

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L&L Kiln Mfg. Inc. has available a book called Electric Kiln Ceramics written by Richard Zakin and published by Chilton. This is an excellent in depth review of clays, glazes and techniques developed exclusively for use in an electric kiln. Electric Kiln Ceramics begins with an introduction to the electric kiln and the various clays and glazes best suited to its use. Both commercial and homemade clays and glazes are discussed, and recipes are provided for slips and glazes for different firing temperatures. Special glazes (wood ash, majolica, tzu chou, and crystal glazes), the application of oxidation surfaces (intaglio glazing, painting, wax resist, and sgraffito methods), and loading and firing are also explored in depth. Health and safety information and advice on routine maintenance are included. More than 200 color and black and white photographs illustrate contemporary electric kiln ceramic work.

### **PYROMETRIC CONES**

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Pyrometric cones are made of clay and other minerals and are precisely formulated to soften when fired in a kiln. They will bend over when they have absorbed a certain amount of heat. The amount of heat is related to both time and temperature. They mirror fairly accurately what goes on in ceramic body and so can be a more reliable guide to firing than a thermocouple instrument. Differing materials in the cones result in different firing temperatures. The cones you are likely to use in an L&L kiln are numbered from Cone 022 to Cone 10 (coldest to hottest). The number is imprinted on the cone. Usually clay and glaze comes with a rec-



## B SERIES INSTRUCTIONS

ommended cone to fire to. Be careful not to drop or expose to moisture your cones. There are two sizes, large and small. The small cones (1-1/8" tall) are used in the Pyrometric Shut Off Controls. The large cones (2-5/8" tall) are often used in the kiln as a visual check of what is going on. When locating the large cones be sure they are placed so that their normal 8° angle is maintained. Typically you will place another cone of the next higher number next to the main cone. This cone should not quite bend over while the main cone should be bent totally over. Keep the cones a few inches away from the peephole site so it is not affected by cold drafts. Wear protective glasses when viewing inside the kiln.

### TEMPERATURE EQUIVALENTS OF ORTON PYROMETRIC CONES

NOTE: the rate of temperature rise is during the last several hundred degrees of firing. Table is courtesy of The Edward Orton, Jr. Ceramic Foundation. Note that the kilns tend to slow down considerably in the higher temperature ranges to perhaps 50°F to 100°F per hour.

Cone Number	Deg F Equival at 108°F per hour temp rise	Deg F Equival at 270°F per hour temp rise	Type of Ware
022	1069°F	1086°F	
021	1116°F	1137°F	
020	1157°F	1175°F	
019	1234°F	1261°F	Overglaze Colors,
018	1285°F	1323°F	Enamels and Gold
017	1341°F	1377°F	
016	1407°F	1458°F	
015	1454°F	1479°F	
014	1533°F	1540°F	
013	1596°F	1566°F	
012	1591°F	1623°F	
011	1627°F	1641°F	
010	1629°F	1641°F	
09	1679°F	1693°F	
08	1733°F	1751°F	
07	1783°F	1803°F	Low Fire Fritted Glazes
06	1816°F	1830°F	Lead Glazes and
05	1888°F	1915°F	Low Fire Earthenware
04	1922°F	1940°F	
03	1987°F	2014°F	
02	2014°F	2048°F	
01	2043°F	2079°F	
1	2077°F	2109°F	
2	2088°F	2124°F	Semi-Vitreous Ware
3	2106°F	2134°F	
4	2134°F	2167°F	
5	2151°F	2185°F	
6	2194°F	2232°F	
7	2219°F	2264°F	China Bodies, Stoneware
8	2257°F	2305°F	and Porcelain
9	2300°F	2336°F	
10	2345°F	2381°F	

## ELEMENTS

SEE YOUR WIRING DIAGRAM TO DETERMINE WHERE IN THE KILN THE VARIOUS NUMBERED ELEMENTS ARE PHYSICALLY LOCATED. The #1 Element has the most power, then the #2 and finally the #3 element has the least amount of power of all three types. The graded power of the elements helps the uniformity of the kiln. The higher power elements are used near the top and bottom where most of the heat loss is. In all but the B14C there are 3 different types of elements. The "Number of Elements Per Type Per Kiln" refers to the number of each type of element. For instance in a B299C there are (2) #1 elements, (2) #2 elements and (5) #3 elements for a total of (9) elements in the entire kiln.

NOTE: "Overseas" voltage is typically based on 380/3/50 volts with 220 Single phase being used. The 220 volts is distinctly different from US 240 single phase and L&L has designed special elements for this condition. In addition there are some 380/3 and 460/3 "Y" connection kilns that have been made. Check your nameplate for voltage. BE SURE TO SPECIFY IF THE ELEMENTS ARE SPECIAL.

MODEL NUMBER AND ELEMENT NUMBER	VOLTAGE	NUMBER OF ELEMENTS PER TYPE PER KILN	OHMS PER ELEMENT
B14C	208	4	13.40
B14C	240	4	17.80
B18C - #1	208	2	5.30
B18C - #2	208	2	3.70
B18C - #3	208	2	3.00
B18C - #1	240	2	7.00
B18C - #2	240	2	5.00
B18C - #3	240	2	4.00
BA23C - #1	208	2	7.10
BA23C - #2	208	2	5.00
BA23C - #3	208	2	9.01
BA23C - #1	240	2	9.40
BA23C - #2	240	2	6.60
BA23C - #3	240	2	12.00
B239C - #1	208	2	19.70
B239C - #2	208	2	27.90
B239C - #3	208	2	8.65
B239C - #1	240	2	24.20
B239C - #2	240	2	34.40
B239C - #3	240	2	10.67
B299C - #1	208	2	14.60
B299C - #2	208	2	20.70
B299C - #3	208	5	2.56
B299C - #1	240	2	19.40
B299C - #2	240	2	27.50
B299C - #3	240	5	3.41



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### ELECTRICAL SPECIFICATIONS

MODEL	DIAM	HGT	QTY OF CIRCUITS	VOLTS	PHASE	WATTS	AMPS	QTY OF NLN30 or NON30 FUSES	QTY OF RELAYS
<b>B14C (208/1)</b>	14-3/8"	13-1/4"	1	208	1	3236	15.5	0	1
<b>B14C (240/1)</b>	14-3/8"	13-1/4"	1	240	1	3236	13.5	0	1
<b>B18C (208/1)</b>	17-1/2"	22-1/4"	2	208	1	7200	34.6	0	2
<b>B18C(240/1)</b>	17-1/2"	22-1/4"	2	240	1	7200	30.0	0	2
<b>B18C (208/3)</b>	17-1/2"	22-1/4"	2	208	3	7200	30.0	0	2
<b>B18C (240/3)</b>	17-1/2"	22-1/4"	2	240	3	7200	26.0	0	2
<b>BA23C (208/1)</b>	23-3/8"	22-1/4"	3	208	1	9600	46.2	0	3
<b>BA23C(240/1)</b>	23-3/8"	22-1/4"	3	240	1	9600	40.0	0	3
<b>BA23C (208/3)</b>	23-3/8"	22-1/4"	3	208	3	9600	30.0	6	3
<b>BA23C (240/3)</b>	23-3/8"	22-1/4"	3	240	3	9600	26.0	6	3
<b>B239C (208/1)</b>	23-3/8"	29"	3	208	1	10,000	48.0	0	3
<b>B239C (240/1)</b>	23-3/8"	29"	3	240	1	10,800	45.0	0	3
<b>B239C (208/3)</b>	23-3/8"	29"	3	208	3	10,000	31.2	6	3
<b>B239C (240/3)</b>	23-3/8"	29"	3	240	3	10,800	29.2	6	3
<b>B299C (208/1)</b>	29"	29"	3	208	1	13,500	64.8	6	3
<b>B299C (240/1)</b>	29"	29"	3	240	1	13,500	56.2	6	3
<b>B299C (208/3)</b>	29"	29"	3	208	3	13,500	42.2	6	3
<b>B299C (240/3)</b>	29"	29"	3	240	3	13,500	36.5	6	3

NOTES: The "C" Suffix designates the new style B Kilns which started production in 1996. They include the larger diameter element holder (which allows for use of the optional heavy duty "Professional" elements), different wiring which allows various controls to be plugged in, and two safety cut off controls. The heavy duty "Professional" elements have the same ohm ratings as the standard duty elements. Elements can be changed at any time and can even be mixed (standard with professional).