

GAS KILN USER'S MANUAL



Laguna
CLAY COMPANY

ETL
CM
C LISTED US
Intertek

Thank you for selecting a custom-built, Laguna Gas Fired Pottery Kiln.

The finest in workmanship and materials have been used to construct your kiln, and with proper use and care your kiln will provide decades of dependable firings.

The purpose of this manual is to acquaint you with your Laguna kiln and to provide important operational and safety information. Because Laguna kilns are custom built to the specifications of each individual customer, some photos and instructions provided in this manual may deviate slightly from your actual kiln. These discrepancies, should not negatively affect your use of the manual. As you learn to operate your kiln, remember, there is no substitute for common sense in the safe operation of this equipment. **ALWAYS PUT SAFETY FIRST!**



The ETL listing mark ensures that your new Laguna Gas Kiln is 100% certified safe by Intertek. Conforming to AGA STD 1 (American Gas Association) and Certified to CSA STD C22.2 #3 (Canadian Standards Association). This certification means that our kiln will pass city, county or state regulation without any additional testing required. ETL Intertek Certification is recognized throughout the United States & Canada as the number one safety standard for fuel burning equipment.

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IMPORTANT SAFETY INFORMATION

Keep the kiln area clear of any combustible material.

- Do NOT store any paper, wood, or any other materials that may cause a fire near the kiln.
- Do NOT store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.
- Make sure that the kiln is in a well-ventilated area. Do NOT obstruct the flow of combustion to the kiln.

Post the following instructions in a prominent location:

“IN THE EVENT YOU SMELL GAS, CONTACT YOUR LOCAL GAS SUPPLIER.”

TURN OFF ALL MANUAL GAS VALVES AND ELECTRICAL POWER TO THE KILN

EVACUATE THE AREA TO A SAFE LOCATION

DO NOT ATTEMPT TO FIRE THE KILN UNTIL YOU GET APPROVAL FROM THE GAS COMPANY.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury, or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

WARNING: When Kiln is in operation, temperature inside can exceed 2000° F. To prevent burn hazard, do NOT contact any part of the kiln except controls.

DO NOT OPEN DOOR WHILE KILN IS IN OPERATION.

WARNING: In the event of a electrical power failure or power outage, the flame safety system will turn off the gas supply to the kiln. If the power failure is momentary and the power returns, turn the gas valves to off and turn off power switch on the control box. No attempt should be made to re-start or light the kiln during a power failure.

Retain this manual for future reference.

- Electrical schematics for the kiln are located in the back of the manual.
- Installation of the kiln must conform with local codes. In the absence of local codes, the kiln installation must comply with the current edition of the National Fuel Gas Code, ANSI Z223.1, including:
 - * The kiln and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psig (3.45 kPa)
 - * The kiln must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psig (3.45 kPa).
- The kiln, when installed, must be electrically grounded in accordance with local codes, or in the absence of local codes, with the current edition of the National Electrical Code, ANSI/NFPA 70.
- If applicable, the vent line from the gas appliance pressure regulator shall be installed to vent the outdoors in accordance with local codes or, in the absence of local codes, with the current edition of the National Fuel Gas Code, ANSI Z223.1.

POWER FAILURE OR POWER OUTAGE

1. In the event of a electrical power failure or power outage, the flame safety system will turn off the gas supply to the kiln.
2. If the power failure is momentary and the power returns, turn the gas valves to off and turn off power switch on the control box.
3. To re-start the kiln, follow the safe lighting procedure outlined in the manual.
4. No attempt should be made to re-start or light the kiln during a power failure.
5. If power is lost to the controller and then restored while a profile is running, see section on "Power Failure While Running a Profile" under "Using Your Programmable Controller" in this manual.

PROLONGED POWER OUTAGE

1. If the electrical power is out for a prolonged period, and the kiln was hot during the firing, make sure that power switches are off and all the gas valves are closed. Close the slide damper on the kiln as well.

Once the kiln is cool and power is restored, make a visual check of the kiln burners and vent system to make sure that there is no damage or obstructions.

2. To re-start the kiln, follow the safe light procedure outlined in the manual.

POWER FAILURE WHILE RUNNING A PROFILE

1. Turn off all gas valves to the kiln.
2. Once power is restored, the electronic ignition and flame safety system will be off.
3. If a program was running, it will be off. This is indicated by the green "RUN" light being off.

To restart the program:

4. Note the temperature on the controller.
5. Turn off the main power switch in the control box.
6. Follow the "Safe Lighting Instructions" in this manual.
7. To re-start a profile, look at the temperature that the kiln is at and select the segment on the program that is close to that temperature.
 - For example, if the kiln temperature is 950 °F and you were running Profile 1, you can select segment P1.03.
8. Follow the "Selecting and Running a Profile" procedure in this manual to resume the firing.

**Never begin any of the lighting sequences
(Kiln Lighting Instructions) if you smell gas!
Call your local gas company or a licensed plumber to check for leaks!**

THINGS TO KNOW BEFORE USING YOUR KILN

CLEANING OF YOUR GAS KILN

1. If for any reason, your new gas kiln requires repair or service, contact:

Laguna Clay Co.

1 - 800 - 452 - 4862 or (626) 330 - 0631

14400 Lomitas Ave. Industry, CA 91746

2. Simple cleaning of the inside of you kiln is recommended after each firing.
3. Use a shop vacuum to clean any small broken fired pieces from the burner ports (shards). Inspect the kiln floor and sides and vacuum any dust.
4. Make sure that the floor under your kiln is kept clean and swept regularly.
5. Use mild soap and water to clean the outside of your kiln. Use a soft cloth to dry the sheet metal and frame.

BEFORE CLEANING, MAKE SURE TO UN-PLUG THE ELECTRICAL POWER SUPPLY TO THE KILN. IF YOUR KILN IS DIRECT WIRED, USE THE DISCONNECT POWER SWITCH TO TURN-OFF ELECTRICAL POWER.

MAINTENANCE OF YOUR GAS KILN (EVERY 3 MONTHS)

1. Depending on the frequency of your firings you should inspect the kilns burners. You can unscrew them from the brass mixer pin and make sure that the burner tubes are clean and free of any obstruction. **(See Figure 6).**
2. Check the air shutter and make sure that it turns smoothly and that it is adjusted properly. Normally, these shutters should be adjusted to approximately $\frac{1}{2}$ in. to $\frac{5}{8}$ in. open from the bottom of the metal burner tube. **(See Figure 6).**
3. Check the slide damper and make sure that it is not cracked or broken.
4. If your kiln is inside a building, check the venting system and make sure that it drafts heat and fumes to the outside and that there are no obstructions.

ABOUT YOUR NEW LAGUNA GAS KILN

ANATOMY OF YOUR GAS KILN

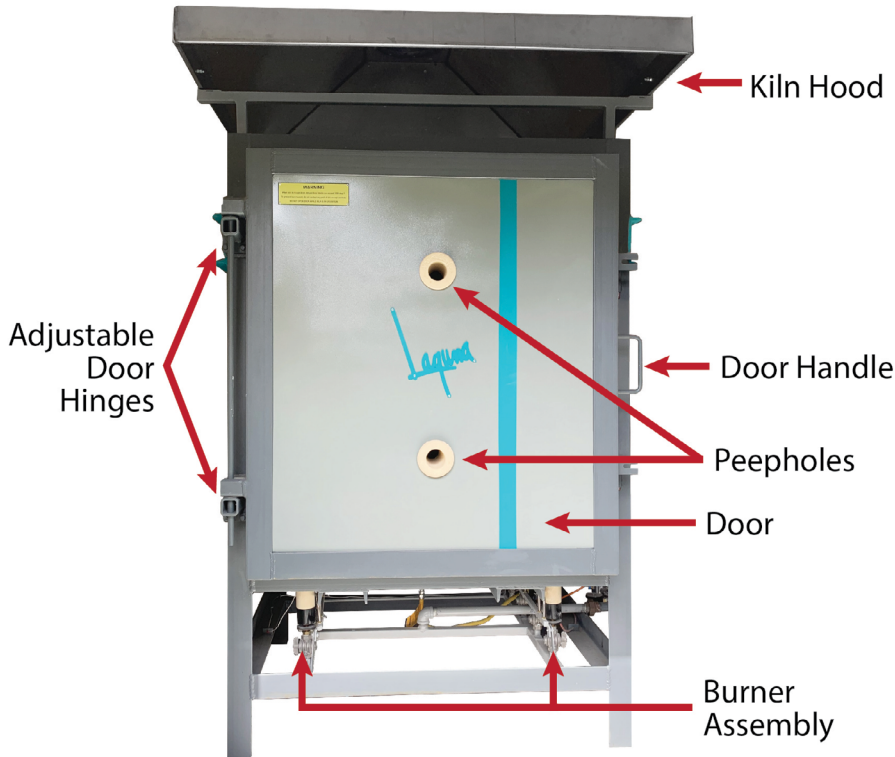


Figure 1
A Labeled diagram of a Laguna Gas Kiln's outside components

Note: See respective sections for more details on each component.

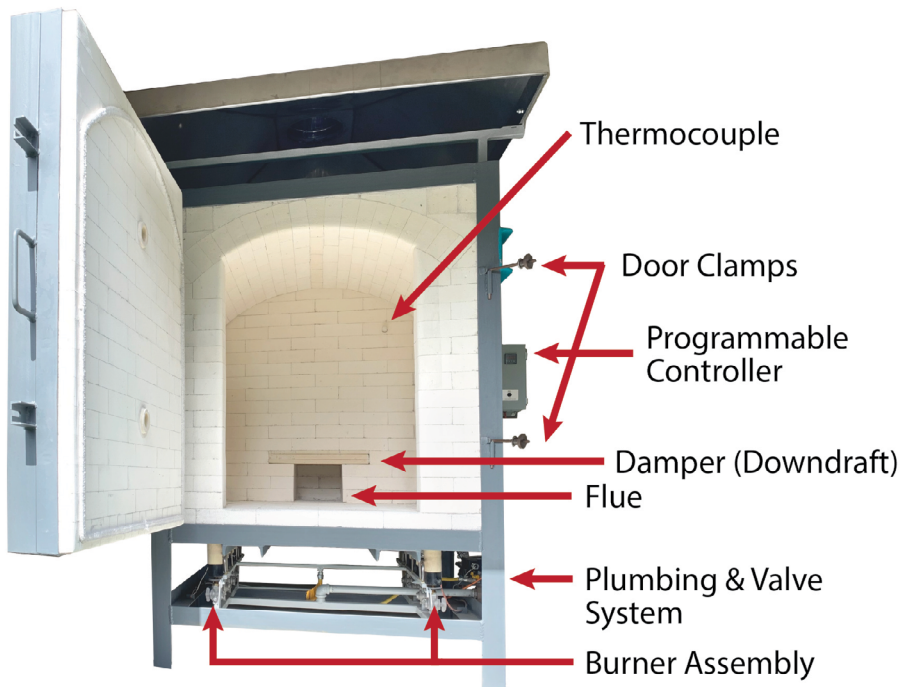


Figure 2
A Labeled diagram of a Laguna Gas Kiln's inside & outside components

Note: See respective sections for more details on each component.

FUEL SUPPLY

Your kiln can be successfully fired with either natural gas or propane (often referred to as LP gas). The specification plate on the kiln indicates which gas supply the kiln's original burners were designed to accommodate. If a change is made to a different gas supply, burners can be easily modified by substituting the natural gas orifices in each burner with the smaller LPG orifices or vice versa (**Figure 3**). Orifices can be purchased through Laguna Clay Co., or contact your local gas company for the location of a source in your area. Burner orifices are specifically formulated for the kiln size and type of fuel being used.

GAS PRESSURE

There are two types of pressure to be considered. The Pounds per Square Inch of pressure (PSI) in the gas line and the inches of Water Column pressure (WC) of the gas entering your kiln. The natural gas pressure into most residences and small commercial businesses is typically one (1) PSI or less. The gas company regulates this pressure at the meter. The second measurement of pressure is in "inches of water column" which provides a precise measurement of low gas line pressure at the point of entry to the kiln's burners. This can be read with the Pressure Gauge on your gas kiln (**Figure 5**). A minimum of 6 in. water column pressure is required to fire a natural gas kiln properly.

GAS SUPPLY LINE (PLUMBING)

The size of your kiln in BTUs (indicated on the specification plate mounted on the kiln), the kiln's distance from the building's gas meter and the number of 90° turns or "elbows" in the gas line will dictate the diameter of the gas line required to carry an adequate volume of gas from the main gas meter to your kiln's burners. The licensed plumbing contractor installing the kiln will be able to assess these three variables and provide the proper size line.

PROPANE (LPG)

If you are firing with propane (LPG), you will want to contact your local supplier to determine the size of the tank required for your kiln. A two-stage regulator should also be used with LPG – the first stage regulating the pressure from the tank down to approximately 5 PSI (pounds per square inch), and the second regulator reducing the pressure to approximately 15 in. of WC. As with natural gas, the size of the gas line is critical. Your local LPG supplier will help with this information, and a licensed plumbing contractor should perform the necessary work.

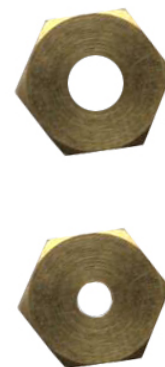


Figure 3

Samples of orifices for Laguna burners for natural gas and propane. These have approximately between a 1/8" - 1/16" aperture. Orifices are specifically formulated for the kiln size and type of fuel used.

PLUMBING & VALVE SYSTEM

MANUAL MAIN BURNER VALVE – leave in fully open position when firing automatically; The programmable controller can also be used to manually fire the burners. Increase or decrease percentage (%) output to the proportional gas valve.

WATER COLUMN GAUGE – allows precise measurement of gas to burners. Each line is 1/2 in. of water.

PROPORTIONAL VALVE – adjusts flow of gas to burners based on setpoint programmer during automatic firing cycle. This can be adjusted via a small screw in the side to increase or decrease the candling flames (**See Figure 10**).

RIBBON IGNITER VALVE – open manually to provide gas to ribbon igniter, which in turn ignites main burners.

MAIN SOLENOID VALVES – opens and closes automatically by receiving signals from the direct spark igniter, limit controller or setpoint programmer

MAIN GAS VALVE – entry point for all gas to kiln

PRESSURE REGULATOR – adjusts gas flow between your gas hook-up and your Gas kiln plumbing.

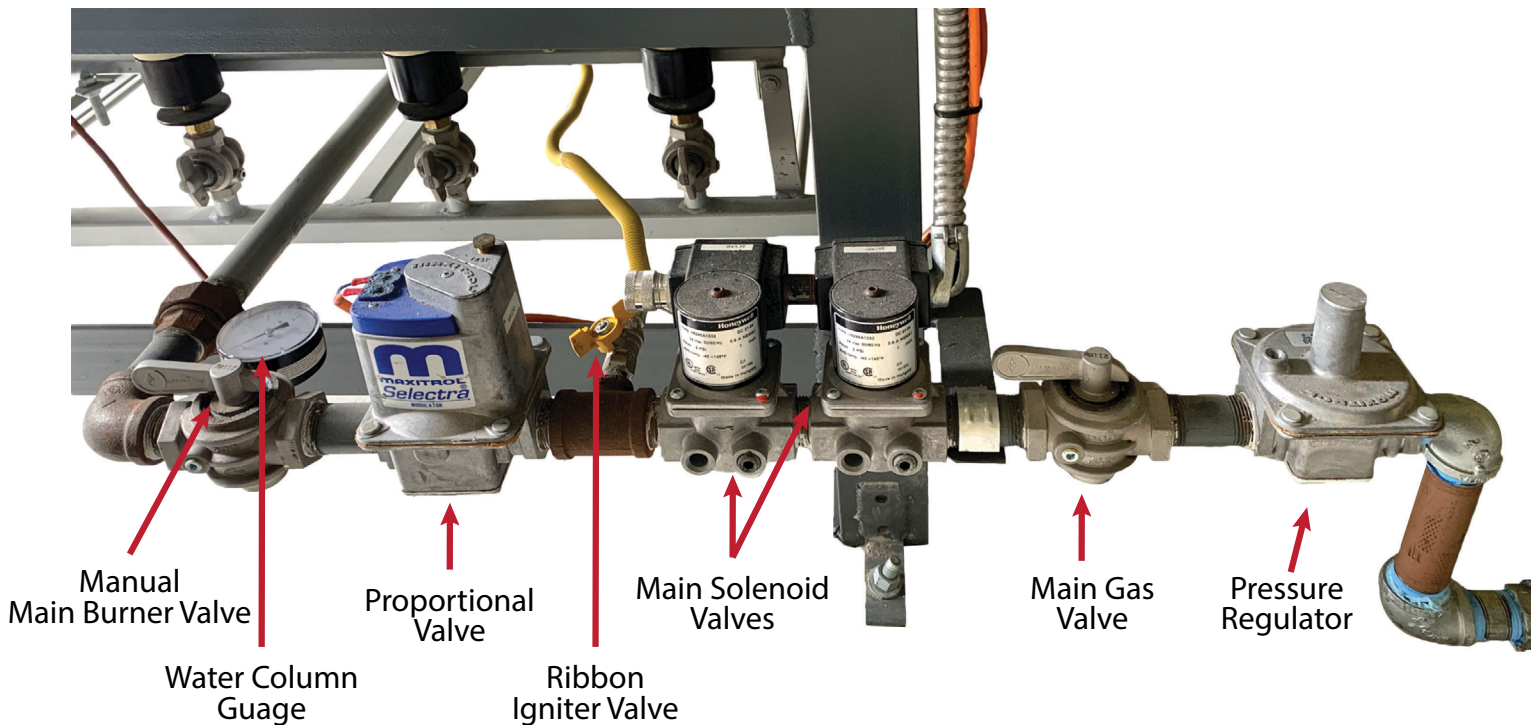


Figure 4

A Labeled diagram of a Laguna Gas Kiln Plumbing and Valve System

BURNERS

Your Laguna kiln utilizes high efficiency, natural draft, ceramic tip (**Figure 6**), venturi burners. Prior to shipping, your kiln was test fired, and the burners were adjusted to ensure the proper air-to-gas mixture. Although not likely, it is possible that during the shipping and installation of your kiln one or more of the air shutters (**Figure 6**) were inadvertently rotated changing the gas-to-air mixture and subsequently the quality of the flame.

If you want to adjust the burners, either when your kiln is new or sometime in the future, the following steps will accomplish that process:

BURNER ADJUSTMENT

1. Open the air shutter on each burner approximately $\frac{5}{8}$ inch (**Figure 6**).
2. Set the damper approximately $\frac{1}{3}$ closed (**Figure 11 & 12**).
3. Open the kiln door fully, or on a shuttle kiln pull the car out approximately 18 in. providing a clear view of all burners. You may have to view some of the burners from one side of the car and the balance of the burners from the other side.
4. Light your burners as instructed under Lighting Instructions in this manual.
5. Adjust the main burner valve to create 2 in. water column on the WC gauge (**Figure 5**). At low pressure, the gauge might need to be gently tapped.
6. Within 3-5 minutes the burners should emit a strong, steady, "pointed" flame. (**Figure 8**).
7. If burners do not emit a strong, steady, "pointed" flame, close the air shutter one full rotation.
8. If a burner still does not emit a quality flame, close the air shutter one more full rotation.
9. Once you have a quality flame on each burner, open each air shutter $\frac{1}{2}$ rotation.
10. Your burners are now ready to fire properly.



Figure 5
A close up of the Water Column Gauge on a Laguna Gas Kiln

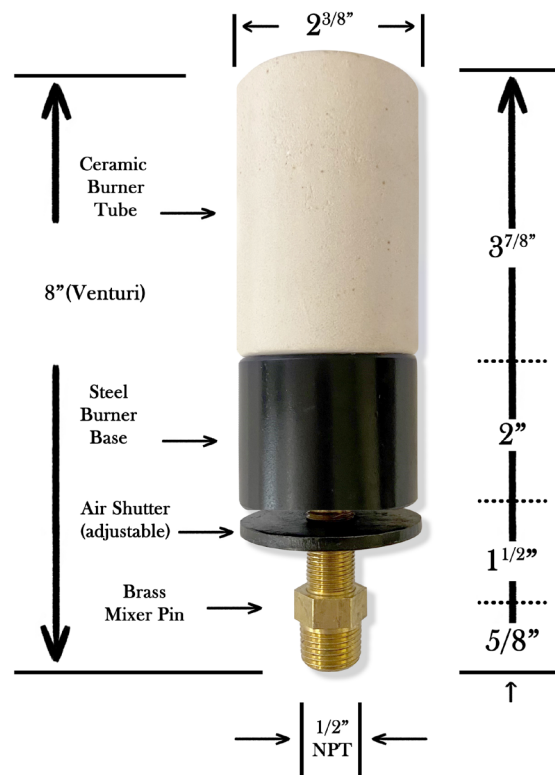


Figure 6
A close up diagram of a Laguna Ceramic Tip Burner.

The kiln's rate of temperature increase (degrees per hour) relates directly to the amount of gas flowing through the main burner valve (**Figure 4**) to the burners. By adjusting the main burner valve from wide open (the valve handle parallel to the gas line) to closed (the valve handle perpendicular to the gas line) you will control the volume of gas to the burners and subsequently the temperature of the firing.

The adjustment of your burners and the kiln's damper (below) will allow you to fine tune the firing atmosphere to your individual requirements.

Visually check your burners before each firing for foreign matter that may have fallen into them during your previous firing. Remove such debris with needle-nose pliers, a shop vacuum or disassemble the burners for a thorough cleaning.

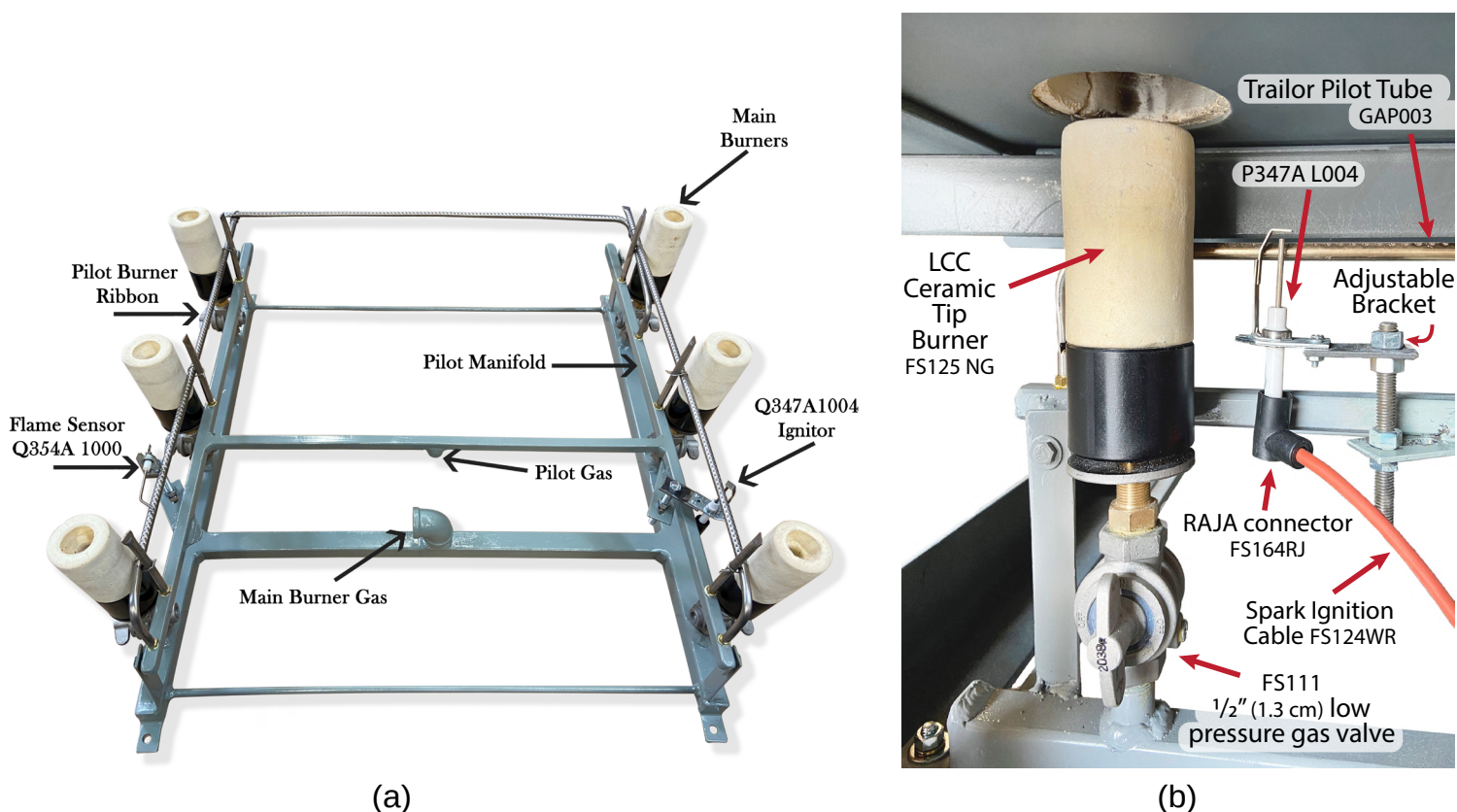


Figure 7

(a) A labeled diagram detailing the overall parts of a Laguna Gas Kiln Burner system and (b) a detailed diagram of the individual components of the Burner System.



Figure 8
An example of a good candling flame on all 8 burners of a Laguna Gas Kiln.



Figure 9 (a)
A Pressure Regulator for natural gas shown with the top adjustment screw exposed. Screwing this "down" will increase gas pressure, and "up" will decrease gas pressure. This regulator will only need adjustment once upon installation.



Figure 9 (b)
A two-stage regulator. LPG Regulator designed to reduce tank pressure (can be as high as 100+PSI) down to 5 PSI, 1st stage. The 2 Stage reduces the 5 PSI pressure down to Low pressure with a maximum of 15 inches of water column pressure.

Figure 10

A Proportional Valve shown with the rear adjustment screw exposed. Adjusting this requires a small, flat-head screwdriver. Screwing it "in" will lower gas pressure, and "out" will increase gas pressure. This valve will only need adjustment once when setting your "low fire" or candling flame size. Note: this valve does not operate higher than 2 psi (pounds per square inch) of pressure.

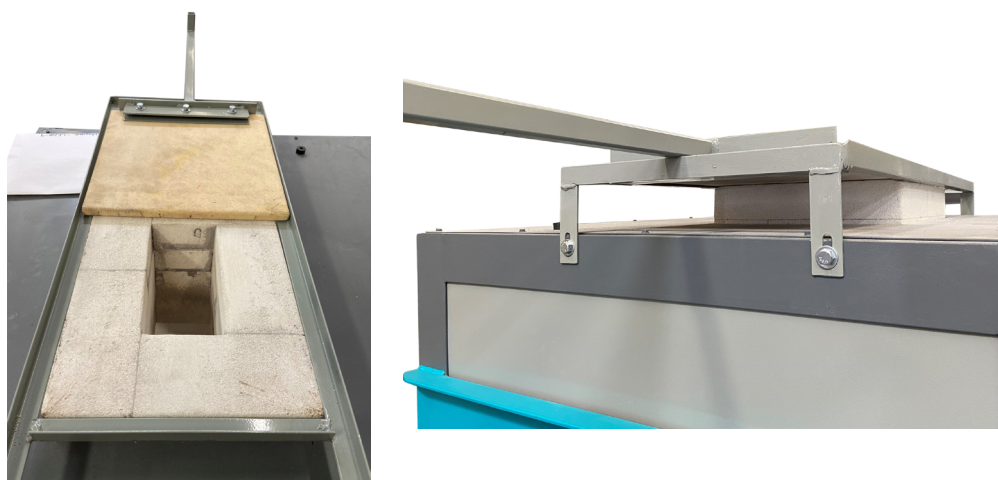


Adjustment
Screw
inside brass
fitting

DAMPER

Your updraft kiln is equipped with an adjustable slide damper immediately above the flue (**Figure 11**), and in the case of a downdraft kiln, slotted into the back of the flue (**Figure 12**). By sliding the damper toward the kiln and away from the kiln you will control the kiln's atmosphere. By "trial and error," you will learn the idiosyncrasies of your kiln, and you will achieve amazing control over your firings. You should start your kiln with the damper $\frac{1}{3}$ closed, and push the damper closed, inch-by-inch (or smaller increments), over the course of the firing to help even the temperature and regulate the kiln's atmosphere. The damper is marked for your convenience.

The damper should never be closed completely during a firing. Once a firing is complete and the gas is turned off, the damper can be fully closed by pushing in the damper fully until it stops.



(a)

(b)

Figure 11 (a, b)

An up-draft Laguna Gas Kiln shown from the top of the kiln (a) and the side (b). Both views show how the damper would slide across the flue opening (a) to adjust to allow for more or less air during the firing. The damper should never be fully closed during firing.



(a)



(b)

Figure 12 (a, b)

A down-draft Laguna Gas Kiln shown on the inside (a) and the outside/back of the kiln (b). In a down-draft kiln, heat from the burners travels throughout the kiln and out the opening shown in (a), called a flue. The damper (b) can be moved in and out to allow for more or less air during the firing. The damper should never be fully closed during firing.

LOCATION & INSTALLATION

Many counties and municipalities regulate kiln installations, whether the installation is inside or outside. So before spending time and money constructing the “perfect spot” for your new kiln, call your local building department and discuss your plans.

UPON RECEIVING YOUR KILN

Upon delivery of your kiln, it will be crated and wrapped. Make sure to disassemble the packaging carefully. You will likely need the aid of a forklift or pallet jack to unload your kiln and move it into its final position. Make sure to remove all packaging material before beginning any of the installation and lighting procedures, including the arch support and packaging material inside your kiln.



Figure 13 (a)

The inside of a Laguna Gas Kiln being prepped for shipping. The inside of the kiln, as well as the arch is fully supported with a wooden frame.



Figure 13 (b)

A crated Laguna Gas Kiln ready to be shipped. The kiln is secured and sealed shut before being crated onto the pallet.

WHERE?

From a safety perspective, the placement of your kiln is extremely critical. It should be placed on a level, stable, non-combustible surface. That surface should be without obstruction, not only under the kiln, but also in front of the kiln where loading and unloading will take place. With a car or shuttle kiln, this includes the area on all sides of the car when the car is withdrawn from the kiln.

Once you have positioned your kiln in the best possible location, adjust the leveling bolts on each kiln leg until the floor of the kiln is perfectly level.

CLEARANCE

It is recommended that you allow a minimum of 4 ft. clearance from walls built of combustible material and 3 ft. from noncombustible walls. In addition to safety considerations, be sure to allow adequate accessibility to all sides of the kiln for future cleaning and repairs.

VENTING

An adequate air supply is critical to proper ventilation and combustion in your kiln. Be sure the kiln room you select provides an adequate air supply.

Kilns located inside a building must be vented. This usually includes a kiln hood which is mounted approximately 6 in. above the kiln and which overhangs the outside walls and flue of the kiln by a minimum of 4 - 6 inches.

The hood not only vents the heat emitted through the flue, but it captures much of the kiln's ambient heat radiated from burners, peep holes, etc. Again, advice should be sought from your local building department, and a licensed HVAC contractor should perform the work. The ideal material for the hood is stainless steel. (Refer to Typical Hood Installation).



Figure 14 (a)

A kiln hood mounted over a Laguna Gas Kiln. For adequate ventilation, the hood must overhang a minimum of 4 inches (10 cm) around the perimeter of the kiln, and be no more than 18 inches (45 cm) above the kiln.

UNDER THE STARS

Many kilns are installed outdoors. While outdoor installation mitigates some of the venting issues dealt with inside, there are still necessary precautions required to protect your kiln. Most outdoor installations include a noncombustible corrugated steel roof installed 6 - 8 feet above the flue. The roof size should be adequate to protect the kiln from blowing rain or snow. Moisture is the “enemy” of the steel, firebrick and electrical components of your kiln. Mount a hood above the flue and vent it through the roof. Be sure to install a “flue cap.”

The ideal material for the hood is stainless steel; galvanized steel will deteriorate fairly quickly under the kiln’s intense heat.

A “full” hood as described for indoor use is not necessary since ambient heat radiated from the kiln will easily dissipate in the outside air. A security/safety perimeter fence is recommended to prevent access to the kiln area by children or other unauthorized individuals.

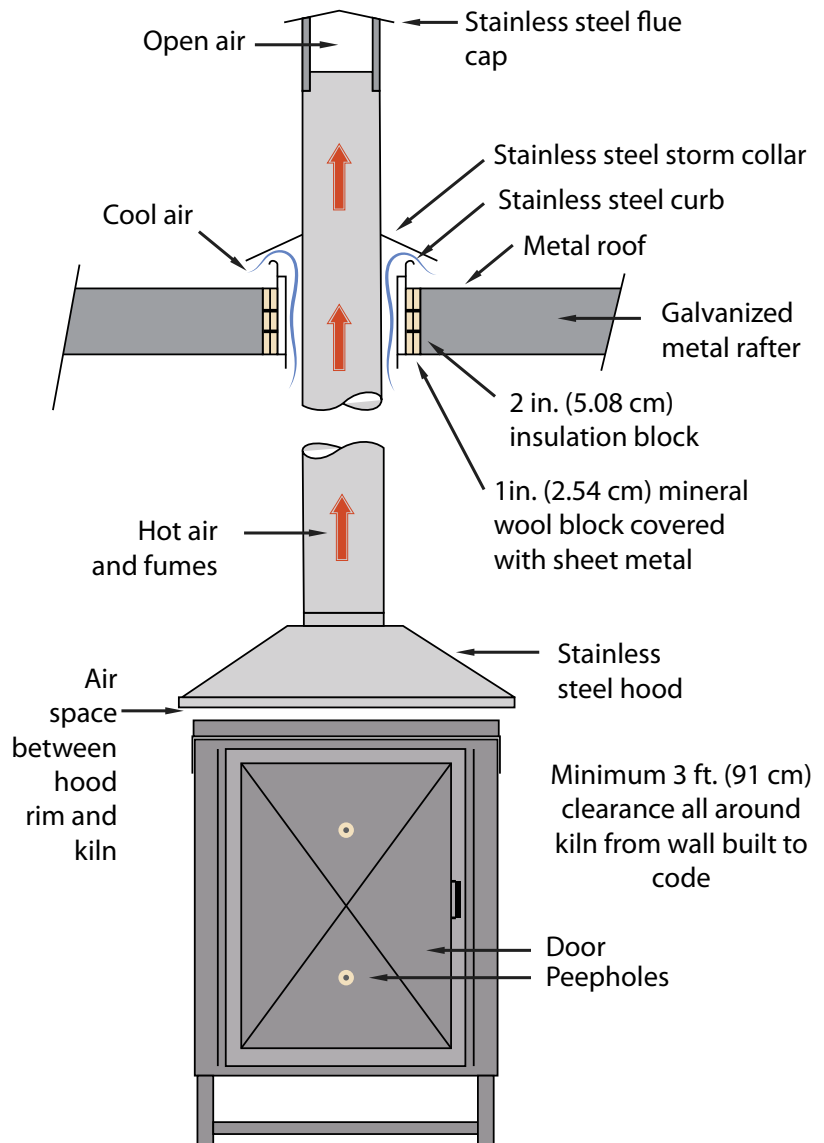


Figure 14 (b)

A diagram showing a sample kiln hood's construction.

USING YOUR PROGRAMMABLE CONTROLLER

L91 HIGH LIMIT/ SHUT-OFF CONTROLLER

A maximum kiln temperature (set-point temperature) is programmed into the controller (from 0° to 2400° F), and once the kiln's temperature exceeds this figure, the controller sends a signal to the solenoid valve (see **Figure 4**) automatically shutting down the gas supply to the kiln. The high limit/shut-off controller is an excellent safety feature, but it is not a “firing computer”.

Although a comprehensive instruction manual for your controller is included with your kiln (inside the control panel or online), the following instructions summarize the functions you will use most often. Your high limit/ shut-off controller set point has been pre-set at the factory to 2350° F assuming a maximum firing temperature of 2350° F. If you desire to reprogram the set-point temperature, follow the instructions provided below.

SETTING THE HIGH LIMIT / SHUT-OFF CONTROLLER

Our facility has pre-set the limit temperature on the FDC L91 to 2400 ° F. If you want to change the factory set limit temperature, follow these steps:

1. After power-up, press and hold the SCROLL key for 4 seconds. You will be in the set-up mode. The controller will read "INTP". (See **Figure 15**).
2. If the “LOCK” light is illuminated press and hold Reset key for about 5 seconds (or until “LOCK” turns off).
3. Press the SCROLL key until you see "HSP.H". It will flash "2350". (See **Figure 16**).
4. Use the UP or DOWN (▲ ▼) arrows to change the temperature to the value you want. Most people select a temperature a few degrees (10°-15°) above the maximum, desired firing temperature. This will protect you from an accidental meltdown, but it will not interfere with your standard firing procedure.

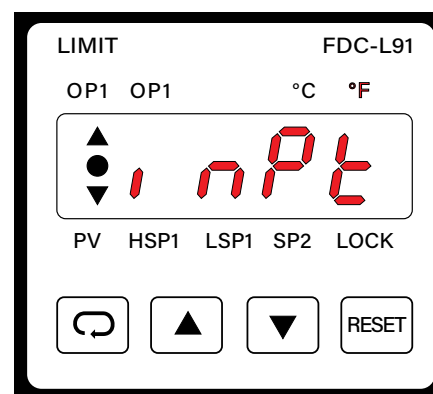


Figure 15

The L91 High Limit controller screen reading "INTP".

- Press the RESET key to exit the set-up mode and return to the current temperature in the kiln. The controller is now reset to your maximum limit temperature.

* NOTE: Always refer to complete instruction manual for detail operating information. (Located inside control panel or online)

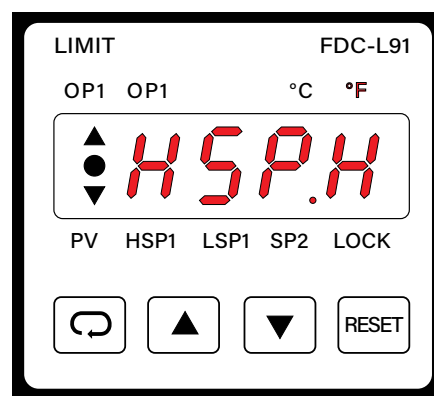


Figure 16

The L91 High Limit controller screen reading "INTP".

Your new Laguna gas Kiln may be equipped with a Programmable Controller. Your P41 Digital Controller has already been equipped with 4 common firing programs and one factory test program (**detailed under section "Firing Schedules Already Programed to Controller" in this manual**) including:

- P1 Cone 05 Slow Bisque
- P2 Cone 06 Glaze
- P3 Cone 5 Glaze
- P4 Cone 10 Glaze

UNDERSTANDING THE P41 CONTROL PANEL

MAIN POWER SWITCH – powers up both controllers

L91 LIMIT CONTROLLER – protects kiln from exceeding maximum programmed temperature

P41 SET POINT PROGRAMMER – allows you to set nine programs of up to 64 segments. See "Maximum Program Capacity" under "Getting to Know the P41 Digital Controller". for helpful hints in programming.

PILOT STARTER BUTTON – ignites the pilot

POWER LIGHT INDICATOR – indicates whether power is on or off to the controllers

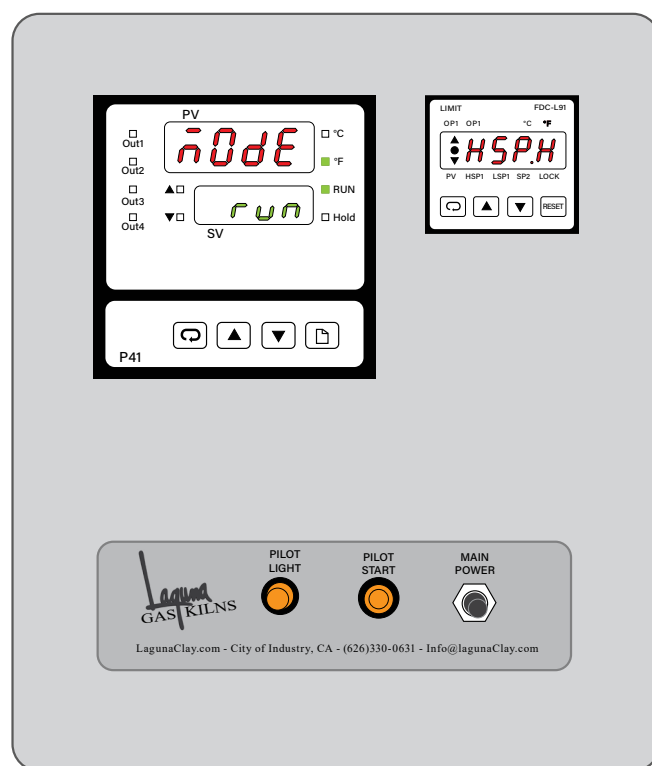


Figure 17

A Laguna Gas Kiln Control Panel. The P41 Set Point Programmer screen reads "mode" and "run". The L91 Limit Controller is shown reading "HSP.H".

KEYS AND DISPLAY OF THE P41 DIGITAL CONTROLLER

UPPER DISPLAY - Displays process value (a reading of the temperature inside the kiln), menu symbol, and error code, etc. This display illuminates in red.

LOWER DISPLAY - Displays the set point value (also called the ramp temperature, it is the temperature the kiln is attempting to reach at that given point), the parameter value, or the control output value, etc. This display illuminates in green.



SCROLL KEY:

This key is used to select a parameter to be viewed or adjusted.



UP & DOWN KEYS:

These keys are used to increase or decrease the value of a selected parameter.



They are sometimes used to navigate between modes (run, stat, etc.), or, when pressed together, they might return you to the STAT mode.



PAGE KEY:

This key is used to select a desired page of parameters. It is also sometimes held down to activate or deactivate a certain mode.

■ °C / °F LIGHTS:

One of these lights when green, indicates the unit of temperature you are using.

■ RUN LIGHT:

This light, when green, indicates there is a profile currently running. When flashing, the profile is in delayed state.

■ HLD LIGHT:

This light, when green, indicates the profile is currently holding. When flashing, it is in holdback state.

▲ ■ Ramp LIGHTS:

- ▼ ■ When ▲ light is green, this indicates the profile is running a ramp up segment.
- When ▼ light is green, this indicates the profile is running a ramp down segment. When both (▲ ▼) are green, the profile is running a dwell segment. When both are off, the profile is being held or is in static mode. When both are flashing, the profile is completed.

* NOTE: Always refer to complete instruction manual for detail operating information.
(Located inside control panel or online).

GETTING TO KNOW THE P41 DIGITAL CONTROLLER

The terminology listed here is what you are most likely to encounter when using this controller with a Laguna Gas Kiln. Always refer to complete instruction manual for detail operating information. (Located inside control panel or online).

PROFILE - Used interchangeably with "Program" or "Firing Program". Your controller can hold up to 9 profiles, each with up to 64 segments. All profiles begin with segment 0. NOTE: Profiles can NOT be linked together.

MAXIMUM PROGRAM CAPACITY:

Profiles 1-4 can have a maximum of 16 segments.

Profiles 5-7 can have a maximum of 32 segments.

Profiles 8 & 9 can have a maximum of 64 segments.

SEGMENT - Each segment can be configured as a ramp segment, a dwell (also referred to as soak) segment, or an end segment.

TYPES OF SEGMENTS IN DETAIL:

RAMP - This type of segment is either a linear increase or decrease in set point value (i.e. temperature). This can be at a set rate (ramp rate) or in a set period of time (ramp time). The ramp rate or the ramp time and the target set point are specified for each segment when creating or modifying a profile.

DWELL (SOAK) - The set point (i.e. temperature) remains constant for a specified period of time.

END - The profile ends in this segment.

PROFILE MODES

RUN - In run mode, the profiler varies the set point according to the stored profile values. This mode is indicated by the RUN light on.

HOLD - In hold mode, the profile is "frozen" at its current point. In this state, you can make temporary changes to any profile parameter (e.g. a target set point, a dwell time, or the time remaining in the current segment). Such changes will only remain effective until the profile is reset and run again, when they will be overwritten by the stored profile values. This mode is indicated by the HOLD light on.

HOLDBACK - Holdback indicates that the process value is lagging the set point by more than a preset amount (holdback band, HBBB) and that the profile is on HOLD, waiting for the process to catch up. This mode is indicated by the HOLD light flashing.

STATIC - In static mode, the profiler is inactive and the controller acts as a standard controller with the set point determined by the value set in the lower display. This mode is indicated by both RUN and HOLD lights off.

MANUAL - In manual mode, the profiler is inactive and the heating and cooling output values can be adjusted at the lower display by the UP and Down keys. This mode is indicated when both RUN and HOLD lights are off, and Upper display flashing. Lower display shows *H _ _ _* or *ℓ _ _ _*.

OFF - In off mode, the profiler is inactive and all the outputs are disabled. This mode is indicated by both RUN and HOLD lights off, upper display shows OFF and flashes.

END - The profile is complete. This mode is indicated by both RUN and HOLD lights flashing.

TYPES OF PARAMETERS

COMMON TO ALL PROFILES:

StAr - set point value at start of profile

End - set point value at end of profile

dLAY - delay time before profile start

APPLY TO A SPECIFIC PROFILE:

PrOf - profile number selected for view

Hbbd - holdback band

StSP - start set point value

rāP.u - unit for ramp segment

dLL.u - unit for dwell segment

APPLY TO EACH SEGMENT OF A SPECIFIC PROFILE:

SGno - segment number

SGtY - segment type








tGSP - target set point

rt.r.r - ramp time or ramp rate





dLL.t - dwell time

USING THE PROGRAMMABLE CONTROLLER

RUNNING A PROFILE

1. Turn on panel power
2. Press the  SCROLL key until the lower (green) display shows the profile and segment numbers in green (example: P4.01, is Profile 4, Segment 1). (See Figure 18).
3. Press the  UP or  DOWN keys to select the profile and segment numbers you want to run (example P4.01 (*P4.01*)). (See Figure 18).
4. Press the  PAGE key until you see "mode" (*mode*) in the upper display. (See Figure 19).
5. Press the  UP or  DOWN keys to select "run" (*run*) in the lower display. (See Figure 19).
6. Press and hold the  PAGE key (for about 5 seconds) until you see a green light next to "run". The controller is now running the firing profile you selected. (See Figure 19).

STOPPING A PROFILE

1. Press the  PAGE key until the upper display reads "mode" (*mode*). (See Figure 20).
2. Press the  UP or  DOWN keys to select "Stat" (*Stat*) in the lower display. (See Figure 20).
3. Press and hold down the  PAGE key until the green light next to the RUN goes out. The controller is no longer running a firing program.

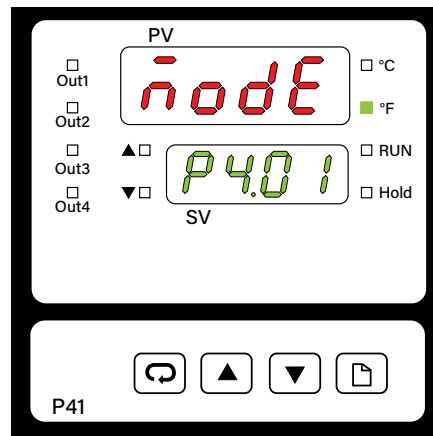


Figure 18

The P41 Set Point Programmer reading "mode" and "P4.01" (Profile 4, Segment 1).

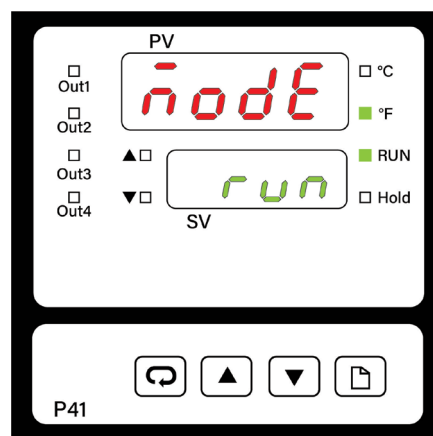


Figure 19

The P41 Set Point Programmer reading "mode" and "run".

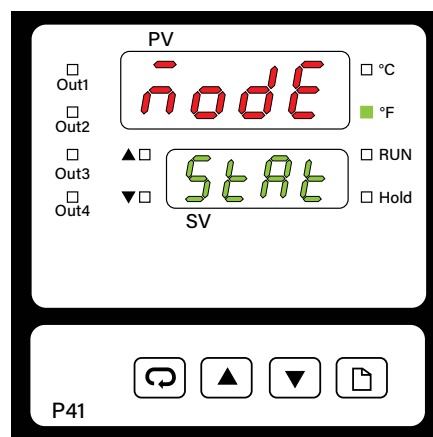






Figure 20

The P41 Set Point Programmer reading "mode" and "Stat".

MODIFYING A PROFILE

1. From the *StArT* mode, Press the  PAGE key until you see "ProF" (*PrOf*) in the upper display. (See Figure 21).
2. Press the **▲** UP or **▼** DOWN keys until the profile you want to modify is displayed in the bottom display.
3. Press the  SCROLL key until the top display shows "SG.no" (*SGno*, segment number).
4. Press the **▲** UP or **▼** DOWN keys until the segment number you want to modify is displayed in the lower display (See Figure 21).
5. Press the  SCROLL key until the parameter you want to modify is displayed (See "Types of Parameters" under "Getting to Know the P41 Digital Controller") .
6. Press the **▲** UP or **▼** DOWN keys to modify the value in the lower display.
7. Press the  PAGE key to save the value.

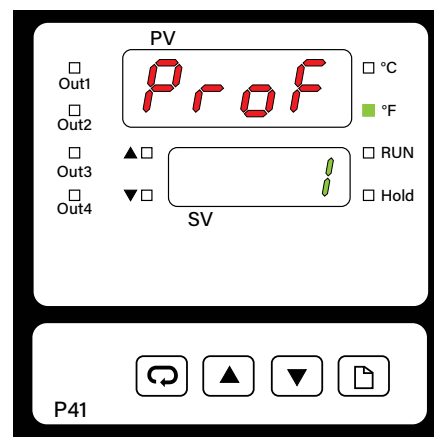



Figure 21

The P41 Set Point Programmer reading "Prof" (Profile) and "1" (Profile number 1).

VIEWING A PROFILE

To create or view a profile stored in your digital controller, press the page key two times in order to get to the profile page. The profile page will be indicated by "ProF" in the upper display, and the lower display will indicate the number of the currently selected profile (1-9).

While a profile is running, you can easily view the status of a profile in progress by pressing the  SCROLL key from the home page. This will cycle through the PFSG (profile and segment number), TIME (time remaining for the current segment), and CYCL (cycles remaining for the current profile).








CREATING A NEW PROFILE IN YOUR DIGITAL CONTROLLER

When creating a new firing program, you'll have to know the following information before entering it into your Digital Controller:


- Number of segments
- Type of segments
- Parameters for each segment


For more details on these, see section on "Terminology of the P41 Digital Controller" in this User Manual as well as the following directions.

To Enter a New Profile Into Your Digital Controller:





1. Turn on panel power
2. Press the  **PAGE** key
3. Press the  **PAGE** key
4. Use ▲ ▼ (UP & DOWN keys) to choose desired Profile number
5. Press  **SCROLL** key to select
6. **Hb.bd** (*Hbbd*) (hold back band) should appear at the top (this is used when setting an automatic dwell in the program and in most cases it is not needed)
 - a. Use ▲ ▼ (UP & DOWN keys) to select or skip
 - b. Press  **SCROLL** key to select
7. **St.SP** (*StSP*) (Start Setpoint) should appear (this is the temperature that the first segment will start counting from).
 - a. Use ▲ ▼ (UP & DOWN keys) to select desired setpoint (we recommend ambient temperature or 50 °F for consistency)
 - b. Press  **SCROLL** key to select
8. **rMP.u** (*rMPu*) (Ramp Unit) should appear (this is where you select the type of ramp units you will use for your program)
 - a. Use ▲ ▼ (UP & DOWN keys) to select desired Ramp unit type
 - **1HR** (*1Hr*) sets the Degrees per Hour that your ramp segment will advance (recommended)
 - **1Min** (*1Min*) sets the Degrees per Minute that your ramp segment will advance
 - **MM.SS** (*MMSS*) sets the amount of Minutes and Seconds it will take your segment to hit set temperature
 - **HH.MM** (*HHMM*) sets the amount of Hours and Minutes it will take your segment to hit set temperature
 - b. Press  **SCROLL** key to select
9. **dLL.u** (*dLLu*) (Dwell Unit) should appear (this is where you select the type of dwell units you will use for your program)
 - a. Use ▲ ▼ (UP & DOWN keys) to select desired Dwell unit type
 - **MM.SS** (*MMSS*) sets the amount of Minutes and Seconds it will dwell
 - **HH.MM** (*HHMM*) sets the amount of Hours and Minutes it will dwell
 - b. Press  **SCROLL** key to select

The following steps will repeat for each segment in your profile:

10. **SG.no** (*SGno*) (Segment Number) should appear
 - a. Use ▲ ▼ (UP & DOWN keys) to select desired segment number
 - b. Press  **SCROLL** key to select

11. **SG.tY** (*SGtY*) (Segment Type) should appear
 - a. Use ▲ ▼ (UP & DOWN keys) to select desired segment type
 - **rAMP** (*rAMP*) segments increase or decrease temperature
 - **dLL** (*dLL*) segments hold your profile at a fixed temperature for a set amount of time
 - **JuMP** (*JuMP*) segments move to another segment or profile (will likely not be used and is not discussed in this manual)
 - **END** (*END*) segment will end your program.
 - b. Press  **SCROLL** key to select

The following steps apply to the "rAMP" selection in step 11.

12. If **rAMP** (*rAMP*) is selected:
 - a. **tG.SP** (*tGSP*) (Target Setpoint) should appear
 - Use ▲ ▼ (UP & DOWN keys) to select desired target temperature
 - Press  **SCROLL** key to select
 - b. **rt.rr** (*rtrr*) (Ramp Time / Ramp Rate) should appear (this is the duration of the segment or the degrees per hour)
 - Use ▲ ▼ (UP & DOWN keys) to select desired ramp time or ramp rate
 - Press  **SCROLL** key to select
 - c. **P2.EV** (*P2EV*) should appear (this is for events and should always be set to 0000)
 - Press  **SCROLL** key to select
 - d. **Hbty** (*Hbty*) (Holdback Type) should appear (this is used when trying to hold the program when it falls behind in temperature)
 - Use ▲ ▼ (UP & DOWN keys) to set to **off**
 - Press  **SCROLL** key to select

RETURN TO STEP 10

The following steps apply to the "dLL" selection in step 11.

12. If **dLL** (*dLL*) is selected:
 - a. **dLL.t** (*dLLt*) should appear
 - Use ▲ ▼ (UP & DOWN keys) to select desired time.
 - **MM.SS** (*MMSS*) sets the amount of Minutes and Seconds your program will remain at the same temperature
 - **HH.MM** (*HHMM*) sets the amount of Hours and Minutes your program will remain at the same temperature

RETURN TO STEP 10

To finalize your program, return to Step 11 and select END as your segment type.



Template for Creating a new Profile for your Laguna Gas Kiln's P41 Digital Controller

Profile #:



Type of Firing: Bisque Glaze

Start Setpoint:
(50 °F recommended)

Cone:
(or Target Temperature)

Segment	Type	Target Setpoint	Ramp Rate (°F / hr)	Time	Total Time
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				
	<input type="checkbox"/> RAMP <input type="checkbox"/> DWELL <input type="checkbox"/> END				

RUNNING A PROFILE IN MANUAL MODE

1. Turn on the Power switch to the controls.
2. Press the  PAGE key until the top display says MODE (*mode*). Use the UP or DOWN arrows to select "man". (See **Figure 22**).
3. Press and hold the  PAGE key for 5 seconds to enter the manual mode. The upper display will flash.
4. The lower green display will show the percentage (%) output to the gas valve from the controller. (Example: *H 15.0* means 15%). Use the UP or DOWN arrows to change the percentage of gas going to the main burners. (See **Figure 23**).
5. You can also set the controller to 100% output and use the main burner valve (**FIGURE 4**) to control the gas to the kiln. Use the WC Gauge (**Figure 5**) to measure the gas supply to the burners.
6. To exit the manual mode, press **▲ ▼** (UP & DOWN keys) together at the same time. The controller will now return to the STAT (*Stat*) mode. (See **Figure 20**).

* NOTE: Always refer to complete instruction manual for detail operating information. (Located inside control panel or online)

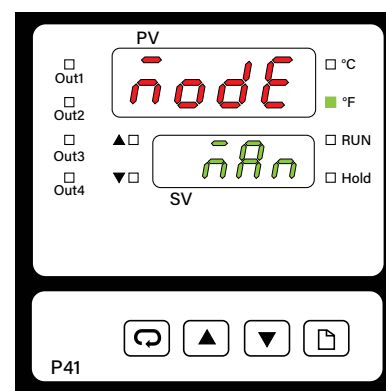


Figure 22

The P41 Set Point Programmer reading "mode" and "man" (manual).

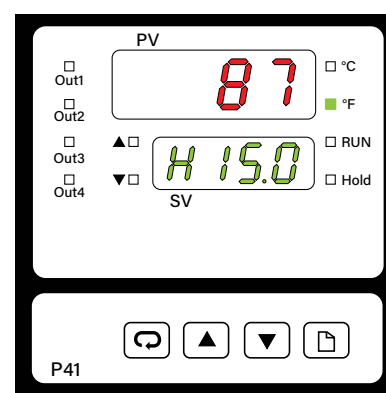


Figure 23

The P41 Set Point Programmer reading the internal temperature of the kiln (87 °F), and "H15.0" (a 15% gas output value).

KILN LIGHTING INSTRUCTIONS

BEFORE PROCEEDING

CAUTION : READ FULL INSTRUCTION MANUAL FIRST
 ONLY AUTHORIZED PERSONNEL MAY OPERATE KILN
 READ ALL FIRING INSTRUCTIONS BEFORE ATTEMPTING TO FIRE KILN

Review the following material, and become familiar with the kiln's control panel (Plate) and the kiln's "plumbing" and valve system (plate 4). The use and interaction of the controllers, switches and valves is critical to the successful and safe firing of your kiln.

FOLLOW THE STEPS PROVIDED BELOW, TO ENSURE THE SAFE LIGHTING OF YOUR KILN.

SAFE LIGHTING INSTRUCTIONS

1. Close each of the following valves (**see Figure 4**):
 - Main Gas Valve
 - Main Manual Burner Valve
 - Ribbon Igniter Valve
2. Make sure that the kiln door is open
3. Open the slide damper
4. Wait 5 minutes before the lighting process
5. Turn on main power switch (if your kiln is equipped with a Programmable Controller)
6. Open the main gas valve
7. Open the Ribbon Igniter Valve (about $\frac{3}{4}$ open)
8. Press the Pilot Start button (**See Figure 17**), the spark ignition will begin.
9. Once the ribbon burner is established, adjust the Main Burner Valve to desired pressure reading. For kilns with programmable controllers, refer to manual for burner adjustment.
10. Once the main burners are ignited, close the kiln door slowly and adjust the slide damper.
11. If the kiln does not light, repeat steps 1-9 above.

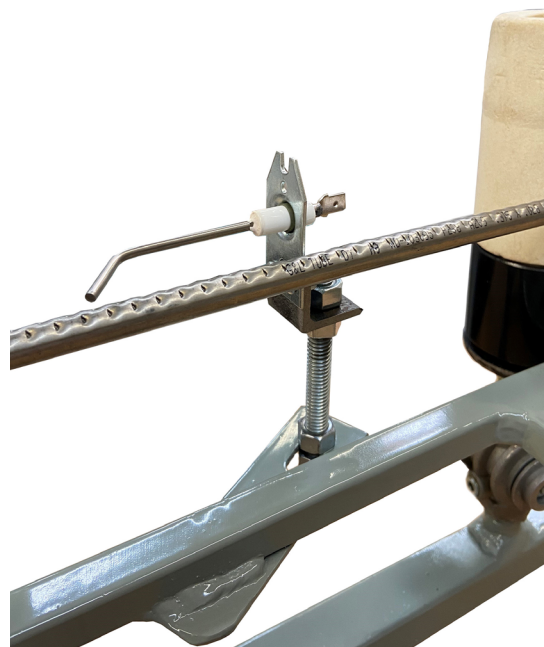


Figure 24

The Ribbon Igniter, or Ribbon Burner, is a perforated gas line that emanate small flames and act as a pilot to ignite the kiln's main burners. Shown here, is the flame sensor at it's appropriate position with respect to the ribbon burner.

LIGHTING THE KILN WHEN FIRING MANUALLY

Follow steps 1 through 11 as described above.

1. Make sure that the Manual Main Burner Valve is closed (**see Figure 4**).
2. Once the pilot ring is fully lit, open the main burner valve until the ribbon igniter lights all the main burners
3. Adjust the burners to the desired level.
4. Proceed with your manual firing (See "Running a Profile in Manual Mode" for kilns with a Programmable Controller).
5. If the pilot burner and pilot ring do not light in the above sequence:
 - Make sure you have electrical power to the control panel.
 - Ensure the gas company's valve is open at the meter as well as the main gas valve at the kiln.
 - If "OPT1" Light is lit press the reset key to reset the high limit controller from an exceeded temperature condition.

If you hear air hissing through the pilot during an attempted lighting, excess air will need to be bled from the main gas line. This is most likely to occur during the kiln's initial firing if the gas line was not completely bled at the time of installation. The air may bleed through the pilot as you progress through the lighting steps provided above, but if there is an excessive amount of air in the line, it may be necessary to open the main gas valve and slightly open the ribbon igniter valve to allow the air in the line to escape. When the air hissing stops and you smell gas, the line should be free of air and both gas valves should immediately be closed. No attempt to light the kiln should be made for at least 5 minutes following this procedure and closing all valves. Unless you are familiar with this process, it is recommended that you seek the help of a licensed plumber.

SHUTTING OFF THE KILN

1. Close Main Burner Valve.
2. Close Main Gas Valve
3. Turn Main Power Switch to OFF.
4. Close slide damper.

FIRING YOUR KILN FOR THE FIRST TIME

We recommend that the first firing of your new kiln be a bisque firing – a slow firing with a long candling period and a very gradual increase in gas pressure. This initial firing, between Cone 07 (1803 °F) and Cone 04 (1940 °F), will depend on the clay you are using. Also, be sure your pottery is thoroughly dry before the firing. (If you are uncertain about the dryness of your ware, we recommend candling overnight in the manual mode).

SAFETY WARNING

ALWAYS:

- ◇ Stand at least 24 inches from an open peephole
- ◇ Use industry approved gloves when removing a peephole plug
- ◇ Wear industry approved, dark, safety glasses when observing firing and witness cones.

KILN FURNITURE AND LOADING YOUR KILN

There is typically more than one size of kiln shelf suitable for any one kiln. Considerations such as the size of the pieces being fired, firing temperature, kiln atmosphere (oxidation or reduction), frequency of firings and budget will all contribute to the selection process. Cordierite and silicon carbide are the two most popular types of shelves; the image below shows a loaded kiln with advancer shelves.



(a)



(b)

Figure 25 (a, b)

Examples of the way ware should be loaded into your kiln, with plenty of room between the ware, the shelves, and all kiln furniture to allow for proper air circulation. The space above burners should be kept clear.

GUIDELINES

Hard Soaps ($\frac{1}{2}$ fire bricks, designated RF420 in the Laguna catalog) are ideal for supporting the bottom row of shelves off the floor of the kiln. Soaps will provide a level, solid base to support the mass of refractory and pottery stacked above them.

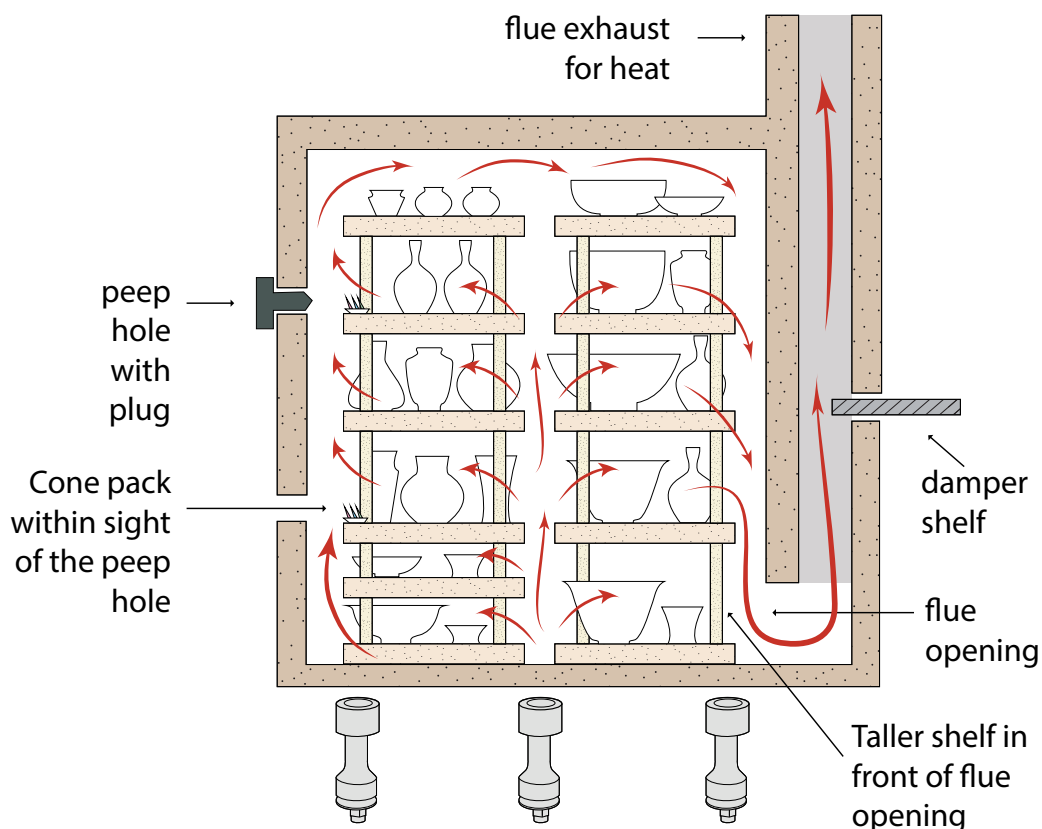
In downdraft kilns a one-inch space between shelves (on each level) is essential to allow proper airflow and heat distribution from the top to the bottom of the kiln.

Maintain a minimum of one-inch clearance between the shelves and the front and back of the kiln. The shelves should not cover any portion of the burner holes in the floor of the kiln, nor should your pieces being fired ever come in direct contact with the flames.

Turn ("flip") shelves often to minimize warping.

The quality of firings will be enhanced by varying the space between the shelf levels in your kiln (e.g. one level 10", the next 4", another 8", etc.).

In a downdraft kiln, **NEVER BLOCK THE EXIT FLUE IN THE BOTTOM CENTER OF YOUR KILN WITH EITHER KILN FURNITURE OR POTTERY.** Draw a semicircle of 6-8" from the exit flue and leave it void of pottery, kiln posts, etc., otherwise you will impede the flow of air resulting in an under fired kiln. In an updraft kiln, allow at least 3" distance from your ware and the exit port of the flue.



SIDE VIEW OF A DOWNDRAFT
GAS KILN

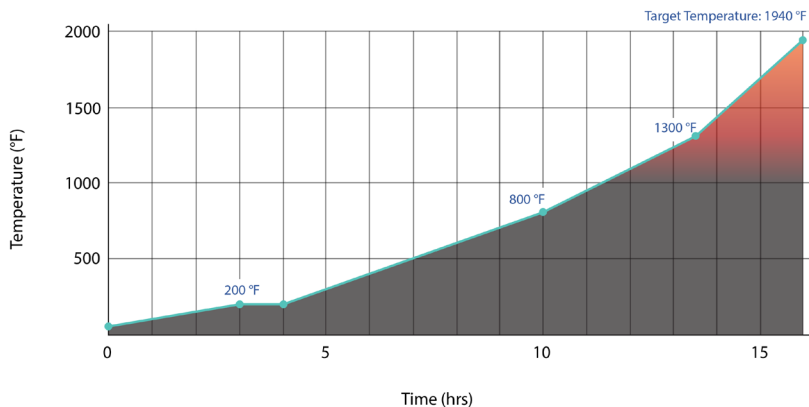
Figure 26

A diagram showing airflow inside of a down-draft kiln. The damper is moved in and out to allow for more or less oxygen inside the kiln during a firing. The front and rear shelves are properly spaced to allow air to travel between the shelves and the ware. The rear, bottom-most shelf is tall enough to allow air to freely be drawn out by the flue opening. The damper should never be fully closed during a firing.

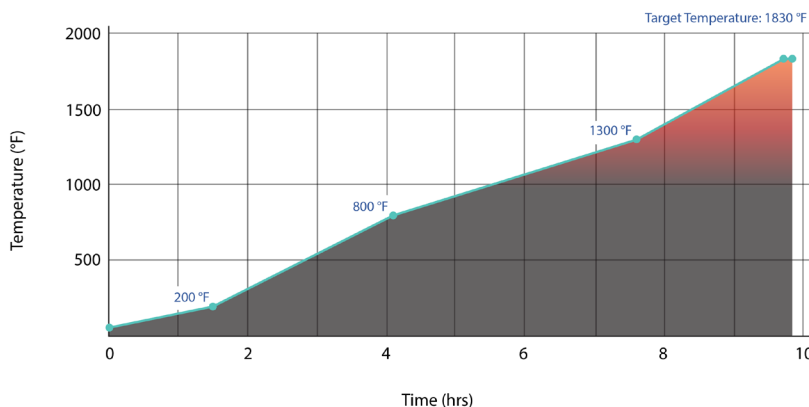
FIRING SCHEDULES ALREADY PROGRAMMED TO CONTROLLER

The following four profiles have been programmed into your Digital Controller at the factory:

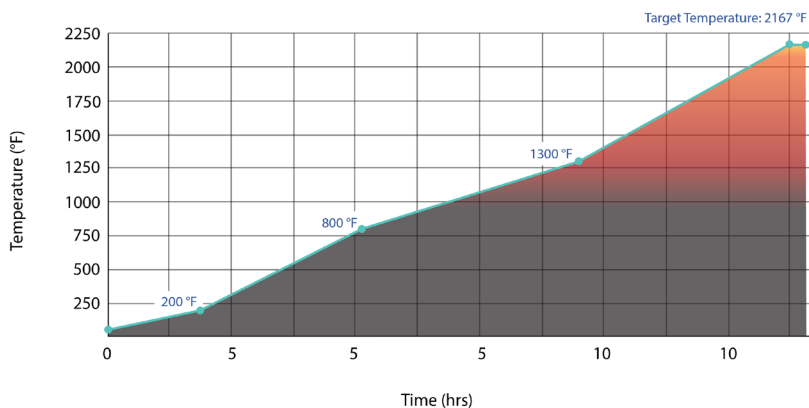
Profile 1 - Cone 04 Slow Bisque			Hours
Segment 0	Setpoint	200 °F	3
	Rate of Change	50 °F/hr	
Segment 1	Setpoint	DWELL	1
	Rate of Change	---	
Segment 2	Setpoint	800 °F	6
	Rate of Change	100 °F/hr	
Segment 3	Setpoint	1300 °F	3.5
	Rate of Change	150 °F/hr	
Segment 4	Setpoint	1940 °F	2.5
	Rate of Change	150 °F/hr	
Segment 5	Setpoint	END	---
	Rate of Change	---	
Total Hours: 16			



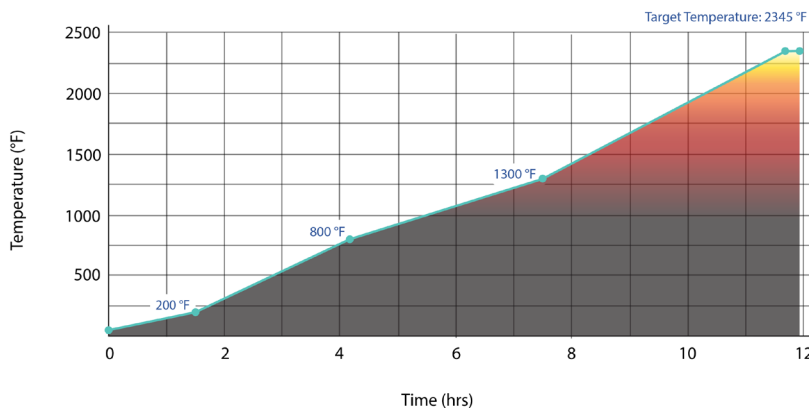
Profile 2 - Cone 06 Glaze Fire			Hours
Segment 0	Setpoint	200 °F	1.5
	Rate of Change	100 °F/hr	
Segment 1	Setpoint	800 °F	2.66
	Rate of Change	225 °F/hr	
Segment 2	Setpoint	1300 °F	3.33
	Rate of Change	150 °F/hr	
Segment 3	Setpoint	1830 °F	2.12
	Rate of Change	250 °F/hr	
Segment 4	Setpoint	DWELL	.166
	Length of Time	10 mins.	
Segment 5	Setpoint	END	---
	Rate of Change	---	
Total Hours: 9.8			



Profile 3 - Cone 5 Glaze Fire			Hours
Segment 0	Setpoint	200 °F	1.5
	Rate of Change	100 °F/hr	
Segment 1	Setpoint	800 °F	2.66
	Rate of Change	225 °F/hr	
Segment 2	Setpoint	1300 °F	3.33
	Rate of Change	150 °F/hr	
Segment 3	Setpoint	2167 °F	3.5
	Rate of Change	250 °F/hr	
Segment 4	Setpoint	DWELL	.25
	Length of Time	15 mins.	
Segment 5	Setpoint	END	---
	Rate of Change	---	
Total Hours: 11.25			



Profile 4 - Cone 10 Glaze Fire			Hours
Segment 0	Setpoint	200 °F	1.5
	Rate of Change	100 °F/hr	
Segment 1	Setpoint	800 °F	2.66
	Rate of Change	225 °F/hr	
Segment 2	Setpoint	1300 °F	3.33
	Rate of Change	150 °F/hr	
Segment 3	Setpoint	2345 °F	4.18
	Rate of Change	250 °F/hr	
Segment 4	Setpoint	DWELL	.25
	Length of Time	15 mins.	
Segment 5	Setpoint	END	---
	Rate of Change	---	
Total Hours: 11.9			



Note: the color under each graph indicates the approximate color visible through your peephole at that point of the firing.

REDUCTION FIRING

PRINCIPALS OF REDUCTION FIRING:

Reduction firing produces different colors and visual effects because metallic oxides willing to give up oxygen convert to their reduced or more metallic form. Good examples of reduction atmosphere are Copper reds. Copper fires green in a oxidation atmosphere, but in a reduction firing, beautiful reds can be achieved. Iron in clay bodies is enhanced by reducing the kiln and can produce a wide range of rich earthtones.

Many potters fire their kilns up in oxidation reduce the kiln for a period between Cone 010 and Cone 08.

If you want consistent reduction firings, instead of going by feel, you may want to invest in an Oxygen Probe. This instrument will give you a direct measurement of the amount of oxygen, and consequently, reduction in the kiln's atmosphere.



Figure 27

An "Oxyprobe" or Oxygen Probe measures voltage upon detecting a differential between the number of oxygen atoms in your kiln's atmosphere and those sealed in the oxyprobe.

FOR ALL LAGUNA GAS KILNS:

1. You can use the main burner valve to increase or decrease the gas supply to the burners.
2. You can also adjust the damper to get the reduction atmosphere you desire.

FOR KILNS EQUIPPED WITH A PROGRAMABLE CONTROLLER:

3. Place the kiln controller in a "manual" mode. Follow the instructions under "Running a Profile in Manual Mode" in this Manual to fire the kiln manually.
4. At this point, you can increase or decrease the gas supply (% output) to the main burners and or adjust the damper to achieve the desired reduction atmosphere necessary.

TIDBITS

ADJUSTABLE HINGES (FRONT LOADING KILNS) The hinges on the door of your Laguna kiln are adjustable, allowing you to attain the best possible seal between the door and the kiln. The door has been properly adjusted at the factory, but in the years to come as the bricks and the door's ceramic fiber seal wear, this adjustment feature will allow you to easily maintain a positive seal.

DOOR CLAMPS When shutting your kiln door, do not close the clamps tightly. As the kiln heats up, the bricks expand, and the clamps will get tighter and tighter. Close them enough to keep door closed, and not more.

BRICKS CRACK It is normal for the firebricks in your kiln to crack. It is the nature of the insulating firebrick (IFB) to expand and contract during the heating and cooling process often resulting in hairline cracks. These cracks will not affect firings or the integrity of the kiln. If your kiln has firebrick walls, there is an inch and a half of insulation board behind the bricks, which eliminates heat loss as a result of brick cracking.

GAS SMELLS If you smell gas when firing your kiln, shut down the kiln immediately and call your local gas company to check for leaks in the plumbing servicing your kiln. The same action should be taken if you smell gas around your kiln when it is not in operation.

WITNESS CONES Even with an automatic controller, we recommend the use of witness cones with every firing. Cones are a consistent, reliable source of information, and the best possible means of accurately checking kiln temperature.

A KEEN EYE If you are not using a programmable controller, never leave a firing kiln unattended for a significant period of time. Meltdowns happen; but not when a kiln is attended.

ASSISTANCE If you have questions, need kiln furniture, accessory items, repair parts or require assistance in any way, contact Laguna Clay Co. at (626) 330-0631, (800) 452-4862 or info@lagunaclay.com.



Figure 28

Laguna Gas Kilns have adjustable hinges. As your kiln ages, it might be useful to adjust these hinges to maintain a positive seal around your kiln door.



Figure 29

The door clamps that keep your kiln door closed should not be overtightened.

LAGUNA KILN LIMITED WARRANTY

Your new Laguna Clay Kiln is guaranteed to be free of defects in materials and workmanship. This warranty is limited to the original purchaser. Should warranty repairs be required, Laguna, or a service representative authorized by Laguna, will perform all necessary repairs. This warranty covers total cost of parts and labor for 12 months from date of shipment. Any transportation costs shall be borne by the purchaser. Proof of purchase is required to verify the date of purchase. In the absence of such verification, the date of manufacture shall be considered the date of purchase.

This warranty does not cover: (1) damage created by firing at a temperature above that for which you kiln is rated or at temperatures which exceed the melting temperature of the material being fired - regardless of the reason or cause for such a firing; (2) damage as a result of moving or transporting the kiln; (3) negligence or abuse to the kiln or any element of the kiln, whether intentional or unintentional; (4) unauthorized changes or alterations to the original kiln; (5) the firing of reactive materials; (6) damage resulting from excessive moisture being introduced into the kiln; (7) damage caused by an improper gas connection and/or installation; (8) any use of the kiln for purposes other than the firing of ceramic materials; (9) damaged contents of the kiln (furniture, ware, etc.).

All inquiries regarding this warranty should be directed to the dealer from whom the kiln was purchased or directly to:

Laguna Clay Company
14400 E. Lomitas Avenue
City of Industry, CA 91746
(626) 330-0631 • Fax: (626) 333-7694

