

OPERATION OF YOUR L&L LIBERTY-BELL KILN

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IMPORTANT CAUTIONS

TEMPERATURE LIMITATIONS

The LIBERTY-BELLE kilns are rated for use to 2350°F (1287°C) (Cone 10). The control will not allow you to fire any higher than this.

READ THE CAUTIONS SECTION

Read the separate CAUTION INSTRUCTIONS (cautions.pdf) in this section of the manual. There are also specific cautions and recommendations in the INSTALLATION INSTRUCTIONS (*liberty-belle-install.pdf*).

CERAMIC FIRING PROCESS

See the separate CERAMIC-FIRING instruction sheet (ceramic-firing.pdf) in this section for information about the ceramic firing process.

HOW YOUR LIBERTY-BELLE KILN WORKS

The automatic program control measures the temperature inside the kiln using the thermocouple probe. The control automatically adjusts power to evenly heat up the kiln according to one of the four programs you are firing. You do not typically have to adjust anything once you start firing. However, if you are manually venting the kiln by cracking the lid and opening peepholes you will have to close the lid at the appropriate point in the program.

USING YOUR LIBERTY-BELLE KILN

TURNING ON THE KILN

- 1) Make sure your circuit breaker or fused disconnect switch is turned on.
- 2) Make sure the kiln is plugged in.
- 3) Turn on kiln with the toggle On/Off switch on the front of the control box.

WHEN YOU FIRST TURN ON THE KILN

- 1) When the kiln is turned on you will see either ErrP

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or **StOP** in the display. If you see **ErrP** press any key to see **StOP**. When you see **StOP** or **IdLE** alternating with the **temperature** you are ready to begin programming. (NOTE: If the power was on recently the display may read what it said before power was turned off).

- 2) Press **ENTER** to begin.
- 3) The previously fired program will be displayed, either **USr1**, **USr2**, **USr3**, or **USr4**.

NOTE: These programs are preprogrammed:

USr1 is a slow bisque fire to cone 05.

USr2 is a slow glaze fire to cone 06.

USr3 is a fast glaze fire to cone 6.

USr4 is unprogrammed.

All of the above can easily be changed.



4) If you want to review that program hit the **DOWN** (Review) button.

5) If you want to fire that program hit **ENTER** and keep hitting **ENTER** to scroll through the program. At the end of the program you will see **rEdl**. Hit **ENTER** again to start the program.

6) If you make a mistake just hit **ENTER** again to stop the program. (You can stop the program from firing at any time by doing this). This will return you to the **IdLE** alternating with **temperature**. Hit **ENTER** again to display the program you are in. You can then change the program (see “Editing a Program” below) or can hit **ENTER** again and review and edit the program you are in.

WHAT YOU SEE WHILE FIRING

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

TO CHANGE TO A DIFFERENT PROGRAM

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

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

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

EDITING A PROGRAM

1) The Delay Time will delay the start of your firing. Enter a Delay Time: **dELA** is displayed alternating with a time like **03.00** (Hours.Minutes). Use the **UP** and **DOWN** keys to change the delay time. Press **ENTER** when the desired delay time is displayed. Note: **00.00** equals no delay.

The delay time is like a countdown timer - it will countdown the hours and minutes after you start the program before the program actually sends heat to the kiln.



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

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single temperature and then holds there).

3) Now program the ramp rate for the first segment. You will see **rA 1** alternating with the ramp rate. Ramp rates are expressed in degrees per hour. Use the **UP** and **DOWN** keys to select the desired rate and press **ENTER**. A rate of **9999** will cause the kiln to heat (or cool if in a down ramp) at the maximum rate.

The first segment of a program must always be an "up" ramp.

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

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

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



6) Repeat the above three steps for each additional segment for the ramp rate, temperature, and hold time.

7) **rEd1** will be displayed after the last segment is entered. Press **ENTER** to begin firing. Remember - if you don't want to fire that program just start it and then stop it. You will return to the **IdLE** display alternating with temperature and you can then change programs.

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



REVIEWING THE PROGRAM WHILE FIRING

- 1) Once you have started a program firing you can review it by hitting the DOWN (Review) Button.
- 2) The program will scroll. You will see, in the following order, various aspects of the program.
 - a) The program name (**USr1, USr2, USr3, USr4**)
 - b) Number of Segments (**SEG** followed by some number, i.e. **0004**)
 - c) **rA 1** alternating with the ramp rate.
 - d) **°F 1** alternating with the temperature (i.e. **0900**).
 - e) **HLd1** alternating hold time (i.e. **00.30**)
 - f) The above three steps are repeated for each segment.

CONTROLLED COOLING

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

THE END OF THE PROGRAM

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

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OPTIONS WHILE FIRING

SKIP A STEP

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

1) While firing (running a program) press the **UP** (View Segment) key. The current ramp or hold is displayed followed by the current or traveling set-point, then "SStP" is displayed.

2) If you do not press a key within several seconds the display will return to showing the current temperature in the kiln.

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

ADD TIME TO HOLD PERIOD

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

1) When in a hold period (during a hold or soak, the temperature in the kiln will be alternating in the display with the remaining hold time), press the **UP** (View Segment) key.

2) When "SStP" is displayed press the **UP** key again and "tME" will be displayed.

3) Press **ENTER** and 5 minutes will be added to the hold time.

4) You will see the new hold time displayed.

5) You may use this procedure as many times as necessary to get the hold time that you want.

ADD TEMPERATURE TO A HOLD PERIOD

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

1) When in a hold period (during a hold or soak, the temperature in the kiln will be alternating in the display with the remaining hold time), press the **UP** key.

2) When "SStP" is displayed press the **UP** key twice more and "tMP" will be displayed.

3) Press **ENTER** and 5 minutes will be added to the hold time.

4) If you hit the **UP** key again you will see the new hold temperature displayed briefly.

5) You may use this procedure as many times as necessary to get the hold temperature that you want.

CHANGE PROGRAM WHILE FIRING

You can reprogram the control by stopping it and changing the program and then restarting it. The control will compare the current temperature with where the kiln should be in its new program.

To stop the kiln hit **ENTER**. Then hit **ENTER** again and you will see your program name (i.e. **USr2**). Then hit **ENTER** again to reprogram your program. When you see **rEdI** press **ENTER** again to restart the program where you left off.

NOTE IF YOU HAVE A DOWN RAMP IN YOUR PROGRAM: If there is a down ramp it will look for the first up ramp that has the temperature it is looking for. You may need to use SKIP STEP to get back to where you want to be if you have a down ramp in the program.

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DISPLAY MESSAGES

CPLt Firing Cycle Complete (firing time is alternately displayed).

dELA Delay. Displays when entering the delay time (hour:minutes) until the start of the firing.

DLy Delay. Alternates with the remaining delay time until the start of the kiln.

°F # Segment temperature in °F - Set temperature for a user program.

°C # Segment temperature in °C - Set temperature for a user program. A decimal point will display in lower right corner.

EdIt Edit the default options (beeping at complete, temperature scale, maximum programmable temperature)

Err1 Error 1, kiln was heating less than 15°/hr and it has been stopped.

Errd Error d, kiln temperature is 50° hotter than the set-point temperature. Kiln has been stopped.

ErrF Error F, similar to Err1 but during a down ramp the temperature is decreasing less than 15°/hr. Kiln has been stopped.

ErrP There has been a power interruption that has stopped the firing. Press any key to clear.

FULL Beeps continuously at end of firing until a key is pressed.

HLd# Soak time in hours:minutes at a hold temperature.

OFF No beeping when firing is complete.

On Beeps for 15 seconds at end of firing.

rA # Ramp Number (rate per hour of temperature increase or decrease).

rEdl Ready to fire current program. Press START to begin firing.

SEG Short for Segments. You can enter up to 8 segments in a program.

SStP Skip Step (used to advance to the next ramp)

StOP The kiln is at idle and ready to be programmed. Stop alternates with the current kiln temperature.

USr # User program number displayed

tMP Temperature (used in the Skip Step Option. The display actually looks like two “U”s upside down)

tME Time (used in the Skip Step Option. The display actually looks like two “U”s upside down)

ERROR CODES

Err1 Error 1 indicates the temperature in the kiln is rising during an up ramp slower than 15°F/hr. If this rate continues for 8 minutes the firing will be stopped. Err1 may be an indication that the elements are worn or that a relay has stopped working.

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

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

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

tC FAIL tC alternating with **FAIL** indicates the thermocouple has failed. Replace the defective thermocouple. To clear the error, press any key.

tC- - The red and yellow thermocouple wires are reversed.

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FIRST FIRING TO CONE 6

The first firing of the kiln should be a test fire. Fire it empty except for shelves and posts.

NOTE: You may experience some smoking from the kiln on its first firing. This, if it occurs, is due to residual oil left on the element wire when the elements were made.

The test firing should be done with nothing in the kiln except the furniture kit.

Be sure to monitor the kiln from time to time. Especially watch it in the first few hundred degrees to be sure that the kiln was set up properly and then at the end of the firing to be sure the location you have chosen is safe and that everything is working properly.

Note: It is a good idea to apply kiln wash to your shelves before you do your test firing. This will help sure the kiln wash in preparation for use. See the section call "Applying Kiln Wash" later in these instructions.

You can run these programs one after the other or split the test firing into two days.

TEST CONES

Put in a test cone. This can be either a cone 5 or a cone 6 cone. A cone 5 cone will typically heat up enough so that its point will touch the hearth. A cone 6 will typically bend over between 20 Deg to 40 Deg.

(Note: the first program to cone 05 will not affect the cone).

(Also note: if you want to run the two programs on seperate days you could put a cone 05 in as a test cone on Day One. This is not necessary but possible if you are curious to see what happens).

On Day 1:

Turn the on/off toggle switch on to turn on the kiln.

Press any key. The display will say "IDLE", "60" over and over again. (That "60" will be whatever the temperature is currently)

Press **Enter**, see "USr1". (That "USr1" can be any USr number 1 through 4)

Press the **up** or **down** arrows if you see another USr number besides 1. Make it say "USr1"

Press **Enter** as often as necessary to scroll through all the steps of the program: The control makes you press **Enter** to advance through each step of the program (this serves as a good review).

Continue to press **Enter** until the display says "REDI"

Press **Start/Stop** to begin the program.

Before you go home in about 8 hours or so, press **Start/Stop** to stop the program before you leave.

Turn the toggle switch off.

On Day 2:

Turn the on/off toggle switch on to turn on the kiln.

Press any key. The display will say "IDLE", "60" over and over again. (That "60" will be whatever the temperature is currently)

Press **Enter**, see "USr1". (That "USr1" can be any USr number 1 through 4)

Press the **up** or **down** arrows if you see another USr number besides 1. Make it say "USr3"

Press **Enter** as often as necessary to scroll through all the steps of the program: The control makes you press **Enter** to advance through each step of the program (this serves as a good review).

Continue to press **Enter** until the display says "REDI"

Press **Start/Stop** to begin the program.

This program should heat the kiln up into the 2250 degF range in about 4-5 hours. It will be finished when the display says "CPLt"

Once you see the "CPLt" it is OK to Press **Start/Stop** and then the toggle switch to turn everything off.

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STANDARD PROGRAMS

USR1 - SLOW BISQUE TO CONE 05

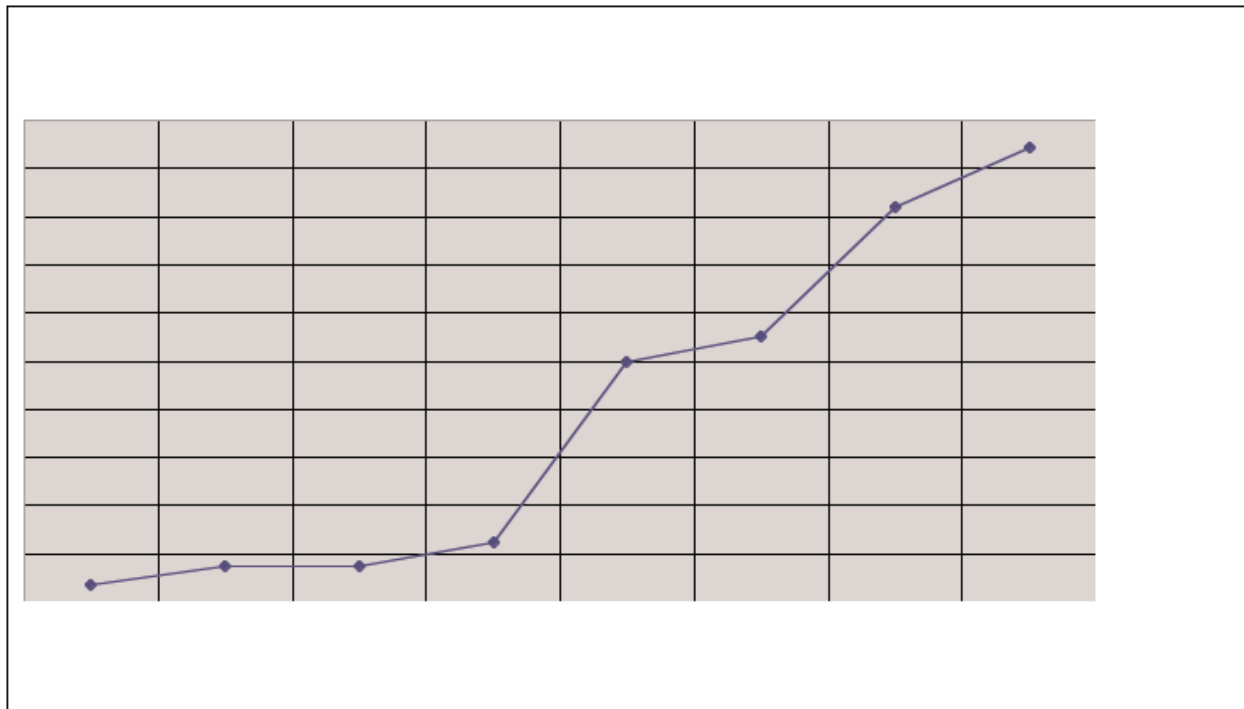
DISP	VALUE	TIME	COMMENT
dLAY	00.00		
SEG	0006		
rA 1	60	1.15 hours	
°F1	150		
Hld1	03.00	3 hours	Preheat
rA 2	80	1.25 hours	
°F2	250		
Hld2	00.00		
rA 3	200	3.75 hours	
°F3	1000		
Hld3	00.00		
rA 4	100	1 hour	
°F4	1100		
Hld4	00.00	This is the quartz inversion phase	
rA 5	180	3 hours	

°F5	1638	Second to Final Temperature
Hld5	00.00	

rA 6	108	2.31 hours
°F6	1888	Final Temperature
Hld6	00.00	

Total Estimated Time: 15.49 hours (15 hours, 29 min)

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



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USR2 - SLOW GLAZE TO CONE 06

DISP	VALUE	TIME	COMMENT
dLAY	00.00		
SEG	0003		
rA 1	150	1.2 hours	
°F1	250		
Hld1	00.00		
rA 2	400	3.3 hours	
°F2	1578		Second to Final Temp
Hld2	00.00		
rA 3	108	2.31 hours	
°F3	1828		Final Temperature
Hld3	00.00		

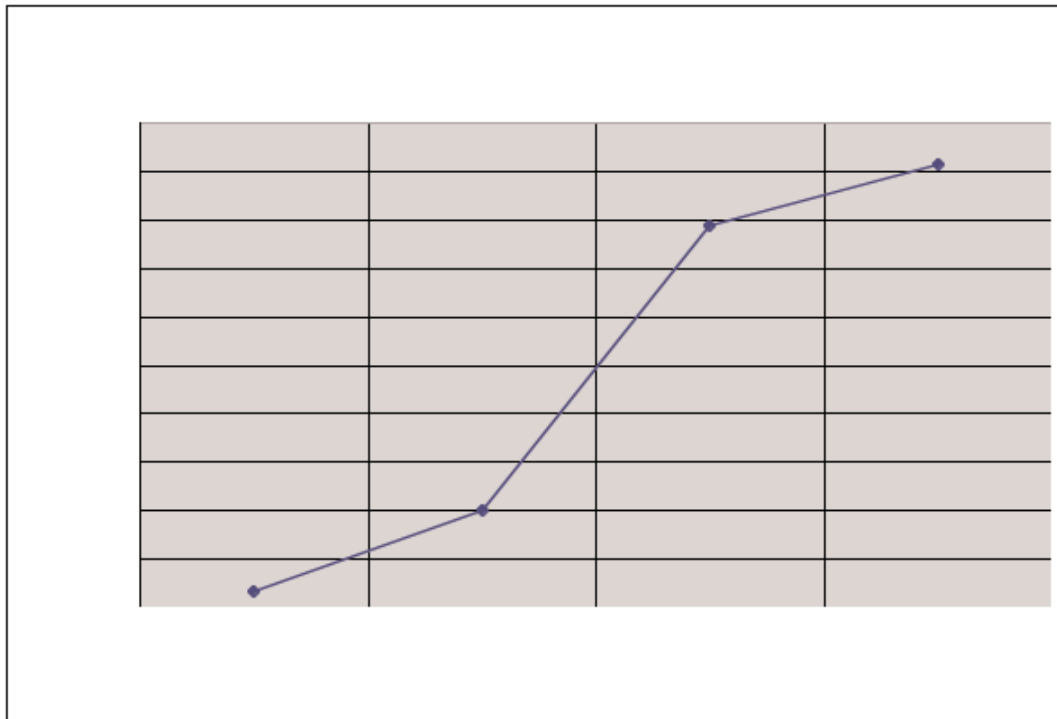
Total Estimated Time: 6.81 hours (6 hours, 55 min)
 Note: These are best possible times based on the program. Times will vary considerably with load weight, voltage, element age, etc.

USR3 - FAST GLAZE TO CONE 6

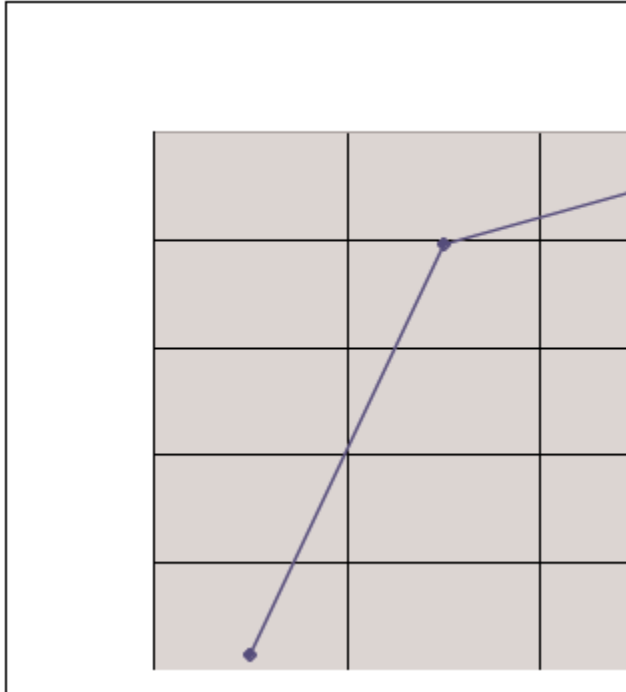
DISP	VALUE	TIME	COMMENT
dLAY	00.00		
SEG	0002		
rA 1	570	3.3 hours	
°F1	1982		Second to Final Temp
Hld1	00.00		
rA 2	108	2.31 hours	
°F2	2232		Final Temperature
Hld2	00.00		

Total Estimated Time: 5.61 hours (5 hours, 36 min)
 Note: These are best possible times based on the program. Times will vary considerably with load weight, voltage, element age, etc.

Typical KW usage for a 55 pound load: 23 KWH
 (at 8 cents per KWH that would be a total cost of \$1.84)



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

FIRING TO OTHER CONES

You can use these same basic programs for firing to different cones.

Note that the last ramp rate in every program is 108 degrees F per hour climbing. Using 108 for the ramp rate is the best way to consistently get the most accurate firing according to an Orton Cone. Using a faster ramp rate means you will have to raise the final set point in order to still get the cone to melt. Using a slower ramp rate means you must lower the final set point to keep the cone from melting too much.

For a Slow Bisque Program change the temperatures in ramp 5 (rA 5) and ramp 6 (rA 6) to the following values.

For a Slow Glaze Program change the temperatures in ramp 2 (rA 2) and ramp 3 (rA 3) to the following values.

For a Fast Glaze Program change the temperatures in ramp 1 (rA 1) and ramp 2 (rA 2) to the following values.

Note that the final ramp starts 250°F below the final temperature to be reached. You can modify this temperature to be 250°F below your final set point if you want to speed up your program.

FIRING TO CONE	SECOND TO FINAL TEMP	FINAL TEMP
07	1539	1789
06	1578	1828
05	1638	1888
05-1/2	1609	1859
04	1695	1945
03	1737	1987
02	1766	2016
01	1796	2046
1	1829	2079
2	1838	2088
3	1856	2106
4	1874	2124
5	1917	2167
5-1/2	1947	2197
6	1982	2232
7	2012	2262
8	2030	2280
9	2050	2300
10	2095	2345

OTHER PROGRAMS

A FAST BISQUE PROGRAM TO CONE 05

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

```

dLAY 00.00
SEG 0006
-----
rA 1 60 1.15 hours
°F1 150
Hld1 01.00 1 hour This is the Preheat
-----
rA 2 120 .83 hours
°F2 250
Hld2 00.00
    
```

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rA 3	300	2.5 hours
°F3	1000	
Hld3	00.00	
rA 4	150	.66 hours
°F4	1100	
Hld4	00.00	This is the quartz inversion phase
rA 5	180	3 hours
°F5	1638	Second to Final Temperature
Hld5	00.00	
rA 6	108	2.31 hours
°F6	1888	Final Temperature
Hld6	00.00	

A PROGRAM FOR SLUMPING GLASS

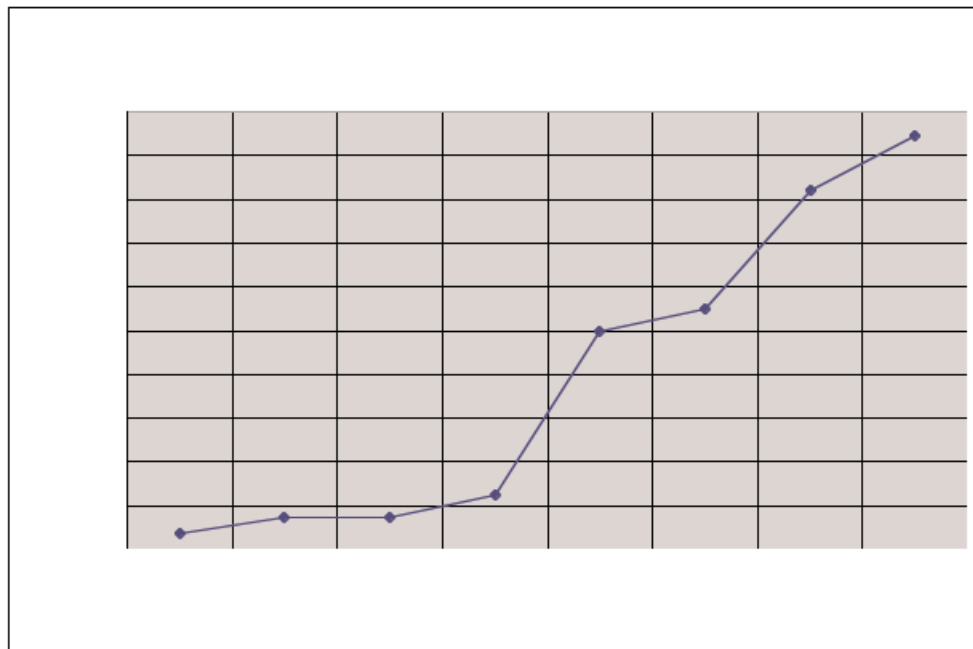
People have many different ways and programs for firing glass. Here is one recommendation for slumping that you can try. CAUTION: Be very careful not to overfire glass - it can cause a real mess when it melts (like a big hole in your kiln floor) which we can not be responsible for. Use your peepholes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

dLAY	00.00
SEG	0003
rA 1	400

°F1	1400
Hld1	00.15 Hold
rA 2	9999 Ramp down as fast as possible
°F2	950
Hld2	01.00 Hold
rA 3	100 Slow Ramp down
°F3	100 to room temperature
Hld3	00.00

A PROGRAM TO HEAT TO 1800 DEG F AND HOLD FOR EIGHT HOURS

dLAY	00.00
SEG	0001
rA 1	9999
°F1	1800
Hld1	08.00



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OTHER CONTROL OPTIONS

Default Settings

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

- 1) Complete beeping sequence. This is the alarm sounding at the end of a firing. **The default setting is "On".**
- 2) Temperature scale, °F or °C. **The default setting is °F.**
- 3) Maximum temperature, 1700°F, 2000°F, or 2350°F. **The default setting is 2350°F.**

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

Complete beeping

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

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

Temperature Scale

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

Maximum Temperature

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

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

Programming the Options

In order to program the above options the controller must first be turned OFF. Press and hold any key while you turn the power back ON. Continue to hold the key until **EdIt** is displayed, then release the button.

NOTE: There is NO beep when keys are pressed while programming the following options.

- 1) **FULL, On, or OFF** will be displayed depending on the currently selected option for Complete Beeping. Press the **UP** or **DOWN** keys to select the option you want and press **ENTER**.
- 2) **°F or °C** will be displayed depending on the currently selected option. Press the **UP** or **DOWN** keys to select the option you want and press **ENTER**.
- 3) **2350** will be displayed. Press the **UP** or **DOWN** keys to select the maximum programmable temperature you want and press **ENTER**.

The options are now programmed. The controller will continue where it was prior to editing. The controller will fire if it was firing or be in the programming mode where it left off.

NOTE: A beep will now be heard with each key press.