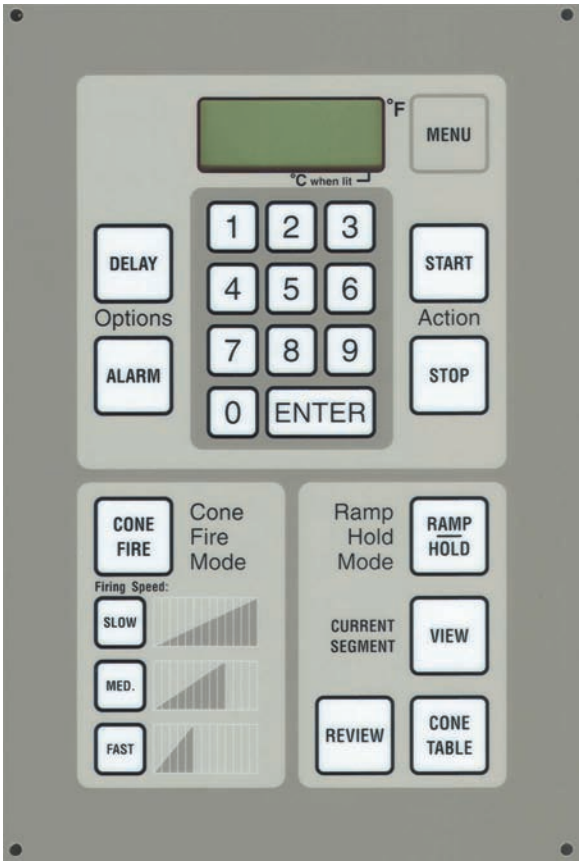
GENERAL PROGRAMMING INFORMATION

THE LED DISPLAY

The display, while improved, is still limited to 4 characters and 14 segments per character. This is not always enough to exactly represent the message presented. If you find you do not understand a message, consult the Display Messages section of this manual.



The controller may be programmed in either Celsius or Fahrenheit. It is very important to know which temperature scale it is using. If there is a LED illuminated in the lower right hand corner of the display, the temperature scale is set to Celsius. Refer to the MENU section of this manual to change scales if necessary.

When prompted to enter time values, there will be an LED illuminated in the lower center portion of the display. We refer to this as a decimal point. Everything to the left of the decimal will be hours and everything to the right will be minutes.

IDLE MODE

When the kiln is flashing IdLE alternately with the current temperature of the kiln chamber we refer to the controller as being in Idle Mode. This simply means that the kiln is ready to be programmed. To return to Idle mode you may press STOP at any time. If controller is programmed for Zone Control, the display will also show current thermocouple being read.

START/STOP/ENTER

The START key begins the program which is currently loaded in memory. It may only be accessed when the kiln is in Idle Mode. The STOP key will turn off the kiln at any point of a program. It may also be used to return to Idle Mode in the middle of entering a program. ENTER must be pressed after entering any time, temperature or programming speed. ENTER is also used to turn an Alarm off that has sounded during a firing.

DELAY

The Delay feature allows you to program, the kiln to automatically start at a future time. This feature is primarily used to take advantage of better off-peak electric rates or to time the shutoff of the kiln for a time that is convenient for you to be there. It can be set for a Ramp Hold Mode or Cone Fire Mode program and can be accessed only after the program has been entered and the controller is in Idle Mode. You can enter a delay time up to 99 hours and 99 minutes.

From Idle Mode, press **DELAY**
Input **Delay time in hours and minutes**, then press **ENTER**

When START is pressed to begin the program, the time entered for the delay will reappear on the screen and begin counting down. When it reaches 00.00 the kiln will start the program currently loaded. **The Delay time will stay in memory until it is cleared**. To clear it, follow the instructions for entering a Delay and enter 00.00 for the Delay time.

ALARM

The Alarm feature is used to sound an Alarm at a specific temperature in the program. This feature is primarily used to prompt the user to lower a propped lid or for glass artists to look into the kiln at peak temperature. It can be set for a Ramp Hold or Cone Fire program. You can enter any Alarm temperature between 0 and the maximum temperature rating of the kiln.

From Idle Mode, press **ALARM**
Input **Alarm Temperature**, then press **ENTER**

When START is pressed the program currently loaded will begin. When the temperature of the kiln reaches the Alarm temperature entered, the Alarm will sound in a series of beeps. **Press ENTER to turn off the Alarm. Do not press STOP, this will stop the program**. **The Alarm temperature will stay in memory until it is cleared**. To clear it, follow the instructions for entering an Alarm and enter 9999 for the Alarm Temperature. "9999" is the default for having the Alarm off.

MENU

The Menu features are discussed in depth in the Menu Features section of the manual.

REVIEW

The Review key allows the user to look at the current program loaded to make sure it is correct. We highly suggest to use this feature to check programs prior to each firing. Press **REVIEW** and the display will step through each segment of the program for a Ramp/Hold program. It will also let you know if there are Alarm temperatures or Delay times entered and whether or not the Error Codes feature is ON or OFF. Below is a sample Review of a Cone Fire program.

Sample Cone Fire Review

1.	Cone	04	Cone Number
2.	F	1920	Actual temperature when kiln shut off
3.	SPD	FAST	Cone fire speed
4.	HOLD	0.00	Length of hold at top temperature
5.	PRHT	0.00	Preheat time (Will only be displayed if preheat is set to ON)
6.	DELA	0.00	Delay Time
7.	ALRM	9999	Alarm Temperature
8.	ERCD	ON	Error Codes on or Off

VIEW

The View key allows you to determine what segment of a Ramp/Hold program the controller is currently running. While a Ramp/Hold program is firing press **VIEW**. The display will show the current segment, the traveling set point, and the circuit board temperature. The segment number is prefixed by either "RA" (Rate) or "HLd" to indicate whether the kiln is heating (or cooling) or holding temperature. The traveling set-point indicates the target temperature of that segment.

CONE TABLE

The Cone Table key allows the user to look up the temperature equivalent of Cone values. To use simply press **Cone Table** from Idle Mode, enter a cone value and press ENTER . This key may also be used to insert a Cone Value for the peak temperature of a Ramp and Hold program. This Cone Value will be automatically adjusted (Cone Correlation) based on the performance of the kiln. To use this feature press Cone Table when prompted to enter the peak temperature of your program, enter a Cone value and press Enter.

DURING THE FIRING

You will see the internal temperature of the kiln displayed as the temperature increases. The options available during the firing are:

- Review program at any time.
- View Current Segment of **RAMP/HOLD** Program.
- Press **STOP** to interrupt a firing for any reason.

Note it is common to see smoke come out of your kiln on the first firing. This is normal; the elements are burning off their protective coating.

AFTER THE FIRING

- When completed, the display will show "CPLt" alternately with the firing time in hours and minutes and the current temperature of the kiln. Press **ENTER** to return to Idle Mode.
- When a Cone Fire Mode program (or a Ramp and Hold program which uses the Cone Correlation feature) is run, the controller may alter the peak temperature of the program based on the kilns ability to achieve the final temperature rate. This is done to insure the heatwork remains constant. If you are interested in knowing if that temperature changed, press **REVIEW** after the program is complete. This temperature value will only appear in a review once after the firing so be sure to pay attention.
- Allow the kiln to cool naturally. Never unplug additional peepholes or post the lid until the ware is cool enough for barehanded unloading, about 130°F (54°C).
- When unloading, be sure to examine the Self-Supporting Cones on the shelf to determine if the kiln is firing correctly.
- It is not necessary to unplug the kiln when not in use (unless severe storms are expected). Continuous plugging and unplugging may cause components in the plug and receptacle to loosen up over time. Loose components in electrical connections create heat and can pose a fire hazard.

FINE TUNING YOUR KILN

If after inspecting your witness cones you find that the kiln fired a little hot, a little cold, or a little uneven, there are certain things you can do to fine tune the kiln before your next firing. Always be sure you use Self Supporting 108°F (42°C) Witness Cones. Cones should be placed about 2 inches (4.8 cm) from the kiln wall and or thermocouple. Never place cones directly on the bottom slab.

<u>Too Cool</u>
Add more Hold Time to a Cone Fire program. If the target cone did not bend at all, try adding 15 minutes to the Hold Time. If the Cone has started to bend, add time in 5 minute increments. If hold times begin exceeding 30 minutes contact Skutt or your distributor for more information.

<u>Too Hot</u>
If the Cone is knuckled down on the shelf, reduce the Hold Time by 15 minutes. If the tip of the Cone has just started to touch the shelf, reduce Hold Time in 5 minute increments. If hold times are already set to zero, contact Skutt or your distributor for more information. Thermocouples drift towards an over fire as they age so if the problem persists or requires excessive changes to correct, it may be time to change the thermocouple.

<u>Uneven Heat Distribution</u>
Kilns will tend to fire cooler on the top and the bottom. Skutt compensates for this effect by putting hotter elements in these spots. If you notice a certain area consistently firing cooler, load those areas a little less dense. If areas are firing a little hot, load them a little more dense. Always be sure to post the first shelf at least 1" (2.5 cm) above the slab and if you have a small load, concentrate the mass towards the center of the kiln.

Downdraft vents such as the EnviroVent 2 help with uneven heating by mixing the air within the kiln chamber.

CHOOSING A PROGRAMMING MODE

The first step in programming your kiln is to decide which "Programming Mode" to use. Before making this decision it helps to have a good understanding of Firing Programs. A Firing Program consists of a series of program segments. Each segment consists of a Rate, a Temperature and a Hold Time. These segments determine the rate at which the kiln will heat up or cool down and how much Heatwork the pieces in the kiln will receive. For more information on Heatwork see Appendix 3.

CONE FIRE MODE

With Cone Fire Mode the programs are written for you. You simply give the controller some key information regarding the pieces you are firing and it accesses a program which best suites your project. This is the most commonly used mode of programming. The programs were created by Ceramic Engineers and are designed to minimize problems that can occur during critical stages in the firing process.

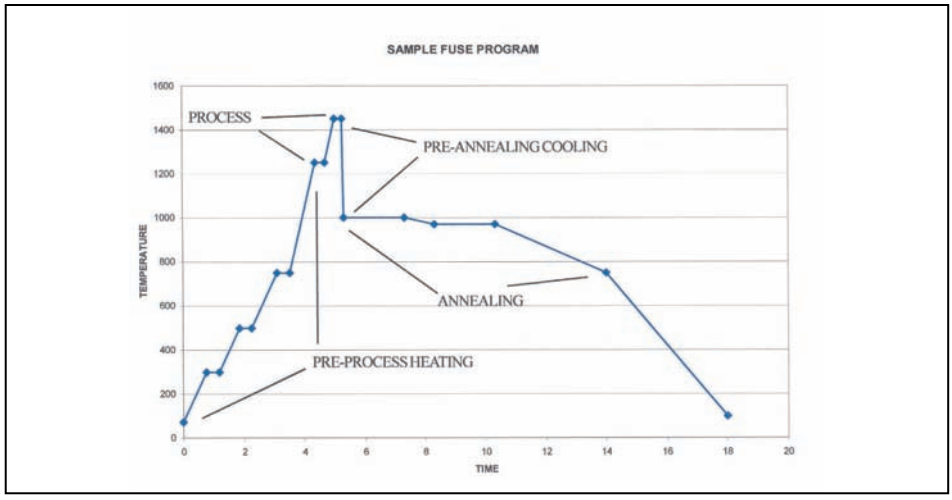
Cone Fire Mode is incredibly easy to use however, the software itself is extremely advanced. Cone Fire Mode uses complex algorithms to simulate the heatwork of a Pyrometric Cone. What is impressive is that it automatically makes adjustments to the firing profile based on your kilns performance. Cone values are based on heatwork and heatwork is a function of time and temperature. Therefore, if your kiln is firing slow due to a heavy load or aging elements, Cone Fire Mode automatically adjusts the peak temperature down so you get the perfect amount of heatwork. There are very few reasons not to use this mode of programming.

RAMP/HOLD MODE

RAMP/HOLD Mode allows you to write your own programs when the results you want cannot be achieved through Cone Fire Mode. It is a perfect tool for:

- Fusing and slumping glass
- Annealing metal and glass
- Firing Precious Metals
- Clay
- Specialized glaze formulations and techniques

Ramp/Hold is generally considered an advanced form of programming. It requires in-depth knowledge of heatwork and a good feel for how your kiln performs under a range of conditions. Below is an example of a simple glass fusing Ramp/Hold program.



PROGRAMMING CONE FIRE MODE

PROGRAMMING STEPS

STEP 1

- From Idle Mode. Press **CONE FIRE.**

  Display will read PRHT alternately with 00.00.

STEP 2

- Input a **PREHEAT TIME IN HOURS AND MINUTES**. Press **ENTER**. (See page 23 for more information on Preheat.)

  Display will read CONE alternately with the last Cone Value entered.

STEP 3

- Input a **CONE VALUE.** Press **ENTER**.

  Display will read Spd alternately with the last Speed entered.

STEP 4

- Press a **SPEED (SLOW, MED or FAST)**. Press **ENTER**.

  Display will read HOLD alternately with a Hold time value.

STEP 5

- Input a **HOLD TIME** if one is desired. Press **ENTER**.

  Display will flash CPL, then will return to Idle Mode. At this point the program is loaded and ready to start. Before pressing START, it is a good idea to press REVIEW to make sure the program was input correctly. Also, verify that the lid latch is engaged if your kiln is equipped with a lid lifter and check to see the area is clear of all combustible materials.

STEP 6

- Prepare **Venting**.

  If your kiln is equipped with and EnviroVent2 you will want to turn it on before pressing start. Be sure the lid is closed (and latched if you have a Lid Lifter) and all the Peep Plugs are in. If your kiln is not equipped with a vent system you will want to prop the lid open until the chamber temperature reaches 1000 °F (538°C). If your kiln is equipped with a Lid Lifter, use the installed Lid Prop. If your kiln does not have a built in Lid Prop, use a wedge of firebrick to prop it approximately 1 to 2 inches. Always use a fire proof glove to remove your prop.

STEP 7

- Press **START**.

  Display will read -ON- briefly and then display the current temperature of the kiln. If a delay start has been entered the display will begin counting down the time entered.

When the firing is complete the display will read *CPLT* alternately with the current temperature of the kiln and the time it took to complete the program. To clear this data and return to Idle Mode and press **ENTER**.

DESCRIPTION

STEP 1 - CONE FIRE

SEGS	RATE	TEMP	HOLD
1	200 °F/HR	250 °F	0
2	400 °F/HR	1000 °F	0
3	180 °F/HR	1150 °F	0
4	300 °F/HR	1694 °F	0
5	120 °F/HR	1946 °F	00.05

The Cone Fire Mode runs a factory installed multi-segment program which is selected based on the Cone Value, Speed, and Hold time you choose. To the right is an example of a program which is run if you choose a Cone Value of 04, a Speed of Medium and Hold time of 5 minutes.

One of the greatest features of Cone Fire Mode is Cone Correlation. It automatically measures the rate of firing during the last hour of the heating program and adjusts the final temperature based on the observed firing rate. This will insure consistent results as the kiln elements become weaker with normal wear from repeated firing. As a result the shutoff temperature may vary between firings.

STEP 2 - PREHEAT

Preheat is used to preheat the ware inside of the kiln before the temperature goes above the point when water turns to vapor. If residual water in the clay escapes as vapor too fast it can crack the ware or in extreme cases cause it to explode. Large, thick walled, pieces are more susceptible to damage caused by residual moisture.

When a Preheat time is entered and the program is started the kiln will climb in temperature at a rate of 60°F (15°C) per hour until it reaches 180°F (82 °C). It will then hold at that temperature for as long as the time entered. After the hold is complete, it will begin the Cone Fire program. If you do not wish to preheat your ware, enter 00.00 for the hold time. For instructions on turning this feature off, consult the Menu section of this manual.

STEP 3 - CONE VALUE

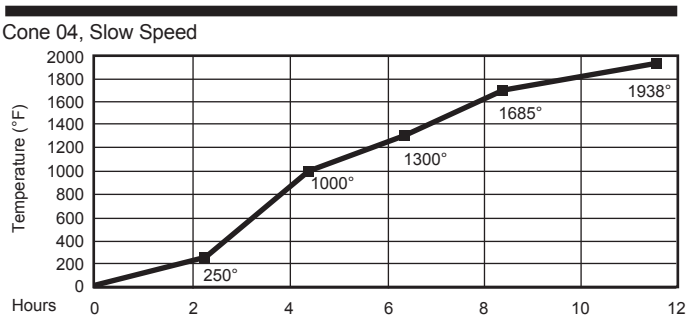
Every clay and glaze should have a Cone Value associated with it. A Cone Value is a measurement of the Heatwork needed for the clay or glaze to mature. The Heatwork is measured through the use of Pyrometric Cones (see pg 42.) The values of these cones used by the KilnMaster controller ranges from Cone 022 through Cone 10. It will not let you enter a cone value outside of this range. **Remember that there is a big difference between values with "0"s in front of them and ones without "0"s. Example: A Cone Value of "6" is much hotter than a cone value of "06".**

STEP 4 - SPEED

The Firing Speed you select will determine how long the kiln will take to heat up. This is important because if you heat some pieces too quickly, they can crack or explode. There are three available speeds to choose from. Below is a description of each speed along with a graph showing the firing profile.

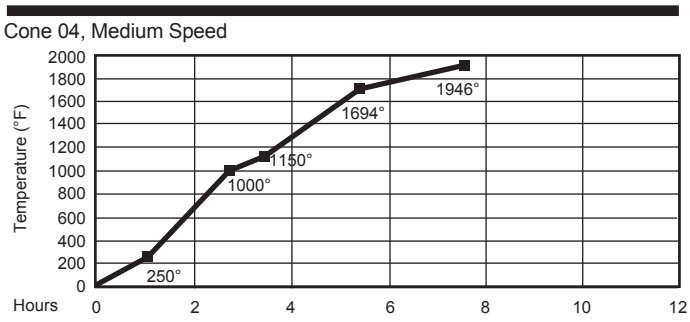
CONE FIRE – SLOW

Slow Speed will take approximately 12 hours to complete. Slow Speed is recommended for large or thick walled pieces. We recommend that most teachers use Slow Speed because it is often hard to tell how thick the walls are in a student's project. If you are unsure if the piece is completely dry, use this speed.



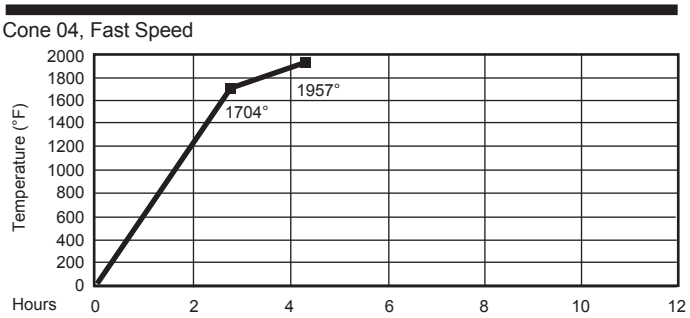
CONE FIRE – MEDIUM

Medium Speed will take approximately 7.5 hours to fire. Medium Speed is fine for most firings. When in doubt, use the Slow Speed



CONE FIRE – FAST

Fast Speed will take approximately 4 hours. This speed is only recommended for items such as lusters and decals which can handle the fast increase in temperature.



STEP 5 – HOLD TIME

HOLD is another important feature of CONE FIRE MODE. Once the kiln has achieved its peak firing temperature, HOLD can maintain that temperature for a set amount a time. This allows the user to make fine tune adjustments to the firing process by introducing more heatwork which can help witness cones reach maturity. Additionally, a HOLD permits the kiln to equalize temperature, allowing for even firings and firings that fall between cone temperatures, for example cone 05.5.

CAUTION: Excessive hold time can result in over firings. A common mistake is to enter ten hours when a ten-minute hold is desired. 00.10 equals ten minutes, 10.00 equals ten hours.

STEP 6 – PREPARE VENTING - (SEE DESCRIPTION ON PAGE 15)

STEP 7 – START

Start initiates the CONE FIRE MODE firing program. If a Delay is entered the kiln will start a countdown from the amount of entered delay time. Before pressing START, verify that the lid latch is engaged, and that all combustible materials are moved out of the vicinity

ADVANCED CONE FIRE MENU FEATURES

In Cone Fire mode, the operator has the ability to modify the firing program. They can do this in one of two ways. The first method allows the user to program custom Cone Fire programs. The second involves controlling the rate in which the kiln cools down

WRITING CUSTOM CONE FIRE PROGRAMS

This new feature on the 700 Board allows you to utilize the cone correlation benefits of Cone Fire Mode coupled with the flexibility of RAMP/HOLD Mode. To use Cone Correlation to calculate your final temperature during a RAMP/HOLD program press **CONE TABLE** instead of entering a temperature for your final heating segment. Input the Cone Value you would like to correlate and Press **ENTER**.

SLOW COOLING (CONE FIRE CONTROLLED COOLING)

COOL is a feature that allows you to add a 1-segment cooling program to the end of a Cone Fire program. When COOL is toggled "ON" it will prompt you to enter a "Rate", "Temperature", and "Hold Time" after you finish entering the Hold Time for a Cone Fire program. This is helpful when trying to achieve certain glaze effects.

PROGRAMMING THE RAMP/HOLD MODE

PROGRAMING STEPS

STEP 1

- From Idle Mode, press **RAMP/HOLD**.
  Display will show PROG alternating with a number between 1 and 6.

STEP 2

- Input the **PROG Number** of the Program you wish to create or run. *(This is a number between 1 and 6 that you assign to a program which will be stored in permanent memory until it is replaced.)* Press **ENTER**

  Display will show SEGS

STEP 3

- Input the total number of segments for your program. Press **ENTER.**

  Display will show RA 1

STEP 4

- INPUT THE FIRST HEATING RATE IN DEGREES PER HOUR. PRESS **ENTER.**

  Display will show °F 1 (or °C 1 if using Celsius)

STEP 5

- INPUT THE FIRST TEMPERATURE TO REACH. PRESS **ENTER.**

  Display will show HLD 1.

STEP 6

- INPUT THE AMOUNT OF **Hold Time** in hours and minutes**.** Press **ENTER.**

  Display will show ALRM if this the last segment you are entering, otherwise it will show RA 2.

STEP 7

- **REPEAT** steps 4 through 6 until all segments have been completed. The display will then flash **ALRM** (Alarm) alternately with the current Alarm temperature. The default setting for no alarm is 9999. Enter the desired alarm setting. Press **ENTER**

  Display will briefly flash CPL

STEP 8 – PREPARE VENTING - (SEE DESCRIPTION ON PAGE 15)

STEP 9

- The display will return to Idle mode. At this point the program is loaded and ready to start. Before pressing **START,** it is a good idea to press **REVIEW** to make sure the program was input correctly. Be sure to check that the lid latch is secure on kilns that are equipped with lid lifters. **Press START** and the program will begin firing.

  Display will briefly show ON and then will show the internal temperature of the kiln chamber unless a DELAY START has been programmed in which case it will begin counting down minutes from the designated Delay time.

DESCRIPTION

STEP 1 – RAMP/HOLD

RAMP/HOLD MODE IS A MODE OF PROGRAMMING THAT ALLOWS YOU TO WRITE YOUR OWN FIRING PROGRAM. WHEN YOU ARE ENTERING YOUR PROGRAM YOU WILL NOTICE DATA ALREADY STORED. SIMPLY WRITE OVER THIS INFORMATION. IF YOU MIS-ENTER DATA YOU MAY EITHER PRESS ZEROS TO CLEAR THE DATA AND RE-ENTER IT OR PRESS STOP TO START FROM THE BEGINNING.

STEP 2 – PROGRAM NUMBER (PROG)

You have the option of storing up to six firing programs. You may recall these programs at any time for future use. We recommend that you write down which number you have assigned each program so that you do not overwrite existing programs you have stored.

STEP 3 - SEGMENTS (SEGS)

This step is prompting you to input the total number of segments you wish to use in your program. Each segment consists of a heating or cooling rate, a target temperature, and a hold time at that target temperature if one is desired. You may program up to eight segments. Two programs may be connected to achieve 16 segment programs. See instructions on page 20.

STEP 4 – RATE (RA#)

This step is prompting you to input a Temperature Rate. The display will show RA along with the current segment number you are programming alternately with the previous data entered. You may enter any rate between 1 °F/hr (1 °C/hr) to 9999 °F/hr (9999 °C/hr). This can be a cooling rate or a heating rate. The controller distinguishes between the two by checking to see if the temperature entered in the next segment is hotter or cooler than the previous segment.

Just because you enter a rate does not mean the kiln is capable of achieving that rate. Things such as element age, load density, and temperature range will all affect the kilns ability to heat. Conversely, the kiln's insulation will influence its ability to cool. A rate must be entered for each segment.

STEP 5 – TEMPERATURE (°F#) OR (°C#)

This prompt is asking you to enter a temperature to go to. When it gets to that temperature it will either hold at that temperature or switch to a new rate and aim for a new temperature. If you are programming in Celsius it will read °C instead of °F. The controller will allow you to program temperatures between 32 °F (0 °C) and 2400 °F (1315 °C). A temperature should not be entered which exceeds the kilns temperature rating.

STEP 6 – HOLD TIME (HOLD)

A HOLD time is generally entered to allow the kiln time to balance out and all of the pieces in the kiln to reach the input temperature before the kiln moves to the next segment. You may enter hold times of 00.00 to 99.99.

A Hold at peak temperature can be used for this reason or to gain additional heatwork to fine tune cone bends or to fire in-between cones. Remember that everything to the left of the decimal point on the display is Hours and everything to the right is Minutes. Excessive Hold times may cause over-fires.

STEP 7 – REPEAT

Continue to enter a rate, a temperature and a hold time for all the segments. When the last segment has been entered the display will prompt you to enter an Alarm temperature. The default is 9999 for no alarm. Input an Alarm temperature and Press **ENTER**. The display will briefly flash CPL for "complete" and then return to Idle Mode. The program is now loaded.

STEPS 8 AND 9 – PREPARE VENTING AND START

Before starting the program it is always a good idea to press **REVIEW** and make sure the data was entered correctly. If you find an error simply press **RAMP/HOLD** and continue to Press **ENTER** until you find the error and are able to correct it. If there is a Delay entered, when you press start the kiln will begin counting down from the input time. Remember to turn on your vent (or prop your lid) before pressing START

ADVANCED FEATURES

16-SEGMENT

When the 16-Segment feature is toggled ON, the controller links programs #5 and #6. Now, when you run program # 5, it will automatically run program #6 to continue the firing after program #5 has completed. Due to requirements of the software, the first segment of Program #6 must be increasing in temperature. Here is how to use this feature:

STEP 1

- Input a 1 to 8 segment RAMP/HOLD Program in PROG #5.

STEP 2

- Input a 1 to 8 segment RAMP/HOLD Program in PROG #6.

STEP 3

- Press **RAMP/HOLD**, Press **5**. Press **ENTER.** Press **STOP**

STEP 4

- Press **MENU**. The Display will show SET. Press **ENTER**. The Display will show PRHT. Press **MENU** until the display shows 16-S then press **ENTER**. The display will show OFF. Toggle to ON using the **1** key, then press **ENTER**

STEP 5

- Press **REVIEW**. Press **START**

IMPORTANT. Program #5 must be cued prior to toggling the feature, **ON**. Once both programs have run, the controller automatically toggles **OFF** the 16-segment feature.

SKIP STEP

Skip any segment in a Ramp/Hold Program by pressing **VIEW** quickly followed by pressing **ENTER**. If done quick enough you will see SKIP in the display. Immediatly press **ENTER** again

CONE CORRELATION

The 700 Board allows you to utilize the cone correlation benefits of **CONE FIRE Mode** coupled with the flexibility of **RAMP/HOLD MODE.** To use Cone Correlation to calculate your final temperature during a **RAMP/HOLD** program, press **CONE TABLE** instead of entering a temperature for your final heating segment. Input the Cone Value you would like to correlate and press **ENTER**.

RUNNING A STORED RAMP HOLD PROGRAM

STEP 1

- Press **RAMP/HOLD**.

Step 2

- INPUT DESIRED STORED PROGRAM NUMBER

STEP 3

- Press **STOP**

STEP 4

- Press **REVIEW**

STEP 5

- Press **START**