Table of Contents

RampMaster II

FEATURES

- Firing Methods:
  - **CONE FIRE METHOD** – Fire to a User Specified Cone Number using one of four speeds: “13 hrs”, “10 hrs”, “7 hrs”, or “4 hrs”.
  - **RAMP MODE PROGRAMMING** – Program up to 6 separate User Programs for repeated use. Each program may have up to 8 segments with separate heating or cooling rates, temperature set points, and hold times. Or make use of the already Pre-set Ramp Mode User Programs.

- Advanced Features:
  - **BACK-UP KEY** – Allows you to back up one step during your Ramp Mode Programming or while scrolling through Other Options Menu.
  - **DELAY START** – Delay the start of your firing up to 99 hours and 99 minutes.
  - **PREHEAT** – Used with CONE FIRE method to hold a temperature of 200ºF for a specified time prior to starting the firing. This can be used for drying ware.
  - **CONE COOL DOWN** – Allows you to enter a cool down segment for a Cone Fire Method.
  - **ALARM** – User set audible temperature alarm.
  - **CONE OFFSET** – Used to raise or lower the final temperature of any cone to fine tune the controller to your kiln.
  - **SKIP STEP** – Skip from the present segment to the next segment.
  - **PAUSE** – While in a ramp mode this allows you to hold the current displayed temperature for up to 30 minutes. While in a hold mode it will add 5 minutes to your remaining hold time.
  - **POWER TAME** – Controls the amount of heat an Elemented Lid produces by setting a percentage of time the lid elements are on compared to the side elements.
  - **ERROR CODES** – Error codes may be turned on so the kiln will automatically shut down if there is an error.
  - **RESET** – Allows you to reset all Error Codes and Default TC settings.
  - **RESTORE** – Allows you to restore Default Ramp Mode Programs individually.

- Messages and Information:
  - **REVIEW PROGRAM** – Review your firing program at any time before or during the firing.
  - **VIEW SEGMENT** – View the current segment or skip to the next segment.
  - **CONE TABLE** – Easily look up temperature and cone number equivalents.
  - **FAHRENHEIT** or **CELSIUS** temperature scales.
  - **ERROR DATA** – Data Recorded just before an Error Code is given to help troubleshoot kiln.
  - **FIRING COUNTER** – Keeps track of number of firings on your kiln.

PRECAUTIONS

The controller is used to control temperature…. it is not a safety device.

Do not operate the controller in temperatures above 250ºF.

Never leave your kiln unattended while firing. Check on kiln at the end of a firing, to ensure program has completed as planned.

The controller contains electronic components that are sensitive to static electricity. Before handling the controller, dissipate any static charge you may have by touching some other grounded object. It’s also recommended that you flip your breaker off to the kiln when not in use to help prevent damage from power surges or electrical spikes. Plugging and unplugging kiln is not recommended since it causes the receptacle springs to loosen and not be as secure.

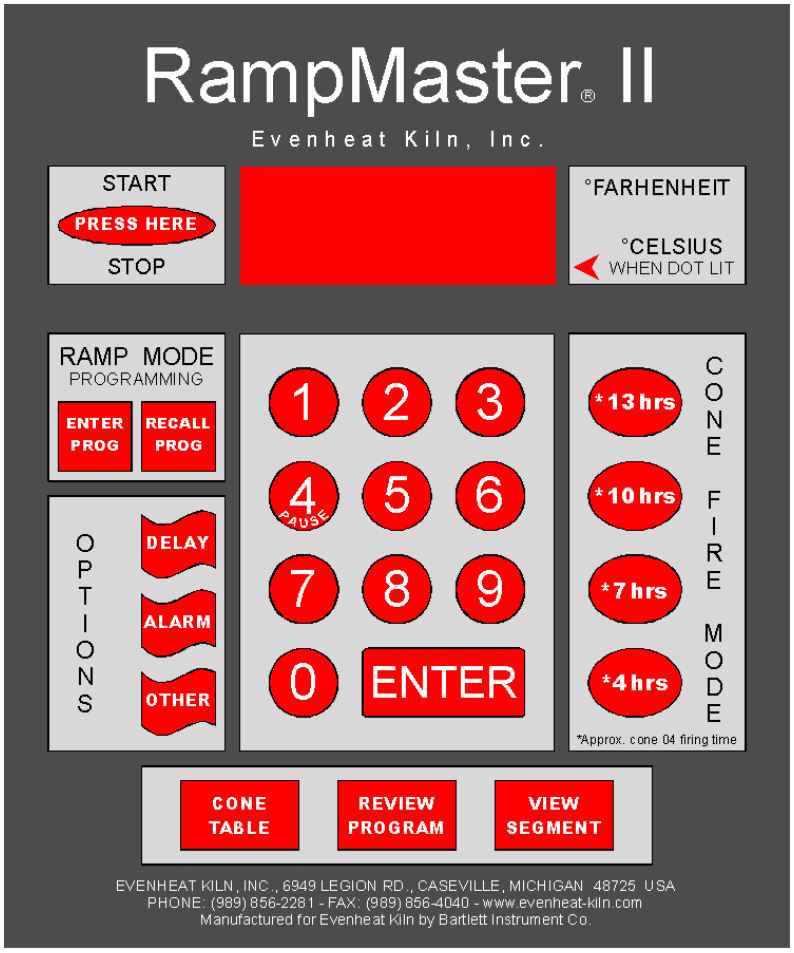
Always review the current program before firing to ensure the correct User Program is selected.

RampMaster II Controller Faceplate Layout

Start - Stop key for starting and stopping firings.

Ramp Mode Programming Section for setting and saving your own firing programs

Options Section for many features including: Delay Start, Temperature Alarms, Power Tame Preheat, Cone Offset, Reset, T/C Offset and Fahrenheit or Celsius Scale.



LED Display Four digits display showing times and temperatures.

Celsius Light Light will be on when firing in Celsius

Number Keys Section for entering temperatures and times.

Cone Fire Section for choosing one of four preset cone fire programs.

Viewing Section to look up cone temperatures, review the selected program, review number of firings on kiln, backing up during Ramp Mode Programming, and view the current segment, or skip to the next firing segment.

On the following pages the individual sections of the controllers front panel will be explained in more detail.

DESCRIPTION of KEY FUNCTIONS and DISPLAY

The front panel of the controller includes the START-STOP key along with six distinct sections:

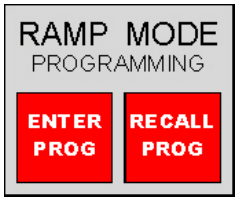
RAMP MODE PROGRAMMING Section
LED Display
OPTIONS Section
NUMBER KEYS Section
VIEW Section
CONE FIRE MODE Section

START - STOP Key

Pressing the **Start-Stop** Key first then the **Enter** Key starts the firing.
To stop a firing in progress, press the **Start-Stop** Key alone.

NOTE: This key has no function during programming.

RAMP MODE PROGRAMMING Section [1] - Customize and Recalls Ramp Mode Programs.



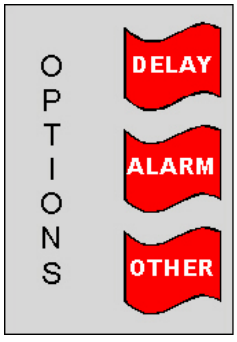
ENTER PROG – This key allows you to initiate customization of the 6 Ramp Mode User Programs.

RECALL PROG – This key allows one step recall of one of the Ramp Mode User Programs to start the firing.

LED DISPLAY [2] – Displays temperatures, times, and messages.

The LED (Light Emitting Diode) has room for four digits or letters in the display. Because each digit has fourteen (14) segments to create each number or letter, some letters do not appear as you are use to seeing them in print. When the decimal point is displayed between the middle two digits, a time is being displayed. If there is a decimal to the right of all the digits, the temperature is in degrees Celsius (Centigrade).

OPTIONS Section [3] - Delay, Alarm and Other



DELAY – Used to delay the start time of a firing.

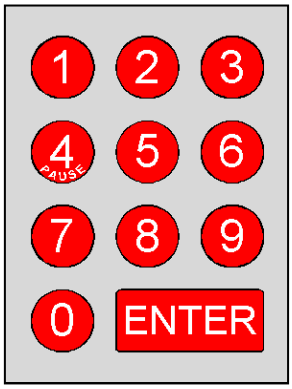
ALARM – Used to set the high and low temperature alarms.
Also used to back-up while viewing the **Other** Menu.

OTHER – There are eleven “OTHER” options

RSET – Resets various parameters to a default setting.
PRHT - Allows for a preheat at the beginning of a “Cone Fire”.
Id - Identification number for use with PC program.
16-S – Allows ramp mode programs 5 & 6 to be tied together.
CNOS - Allows adding an offset temperature to a cone fire.
CHG° - Allows changing between Fahrenheit and Celsius scales.
ERCd - Allows for error codes to be turned on or off.
TCOS – Allows adding an offset temperature to a thermocouple
PCT 4 – Power Tame Setting
bd T – Displays the ambient or working temperature of the RM II
REST – Restores Ramp Mode Programs to default firing schedules

DESCRIPTION of KEY FUNCTIONS and DISPLAY - continued

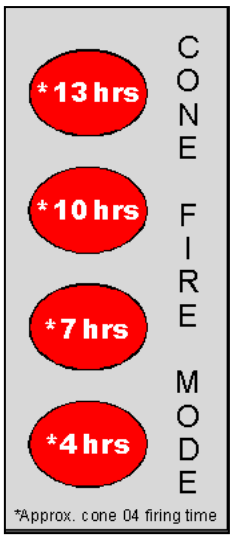
NUMBER KEYS Section – Contains the ENTER key and the Number keys.



Numeric keys – Used for entering temperature rates, hold times, set point temperatures and other numbers. Hot Keys for clearing error messages, pausing firing, adding hold time, or displaying firing data. [4]

Enter key – Used to enter or acknowledge numbers and programs. Also used to initiate the start of a firing after pressing the start key.

CONE FIRE MODE Section [5, 6] – Selects Cone Fire Mode Programs.



Typically used for firing larger Bisque firings.
** 13 hours to fire to cone 04.**

Typically used for firing smaller Bisque or specialty Glaze firings.
** 10 hours to fire to cone 04.**

Typically used for Glaze firings.
** 7 hours to fire to cone 04. **

Typically used for Overglaze or Decal firings.
** 4 hours to fire to cone 04. **

[1] For more detailed instructions see PROGRAMMING, RAMP MODE, page 10.
[2] Display messages are explained further in APPENDIX D, page 20 & 21.
[3] For more detailed instructions see PROGRAMMING, OPTIONS, page 12 - 17.
[4] For more detailed instructions see PROGRAMMING, HOT KEYS, page 12.
[5] For more detailed instructions see PROGRAMMING, CONE FIRE, page 8 & 9
[6] Detailed descriptions of Cone Fire Mode Programs are found in APPENDIX A, page 17.

DESCRIPTION of KEY FUNCTIONS and DISPLAY - continued

VIEW Section – Contains keys used to look up Cone Temperatures, Review Programs, View Current Segment and Skip segments during firings.

The view section allows you to view various information about cone temperatures, firing and settings.

The VIEW section contains three keys: Cone Table, Review Program, and View Segment.

Cone Table
This is used to look up the equivalent temperature of various cone numbers. The temperature displayed is for self-supporting cones with a heating rate of 108ºF/hr.

Review Program
The information displayed when Review Program is pressed varies depending on whether you are using Cone Fire or Ramp Mode. When Review Program is pressed, each of the steps in the current firing program is displayed one after another.

In Cone Fire Mode – The display will show the selected firing program in the following order:

- Cone Fire Mode Program Description
- Preheat time
- Cone Number
- Cone temperature
- Cone Offset
- Hold time
- Cooling Rate Per Hour, Set-Point Temperature, and Hold Time
- Delay time
- Alarm setting
- Error Codes (on or off)
- Total Number of Firings

When a firing is complete, Review Program is used to see the final temperature reached during the firing.

In Ramp Mode – The display will show in the following order:

- The user program number
- The number of segments used
- 1st ramp rate
- 1st segment temperature
- 1st hold time (If there is more than 1 segment, then the ramp rate, segment temperature, and hold time of each of the remaining segments will be displayed in order.)
- Delay time
- Alarm setting
- Error Code (on or off)
- Total Number of Firings

View Segment
View Segment is available only during a Ramp Mode firing. It is used to view the current firing segment or to skip from the current segment to the next firing ramp[7]. When View Segment is pressed during a firing, the current stage of the firing, temperature the kiln is scheduled to be at that moment in the firing, and the board temperature are displayed. If it is pressed in between firings, STOP and then the current temperature will be displayed.

[7] Detailed information on Skip Step is given on page 12

OVERVIEW of RAMPMASTER II CONTROLLER FUNCTION

When there is electrical power connected to the controller, the display will be lit; usually, the current temperature will be flashing. The current temperature is measured at the tip of the thermocouple (T/C). If the tip of the thermocouple is inserted inside the kiln, the current temperature is the temperature inside the kiln. If the t/c is outside the kiln, the controller is displaying the room temperature.

When the START-STOP button is pressed followed by the Enter Key with either a CONE FIRE or RAMP MODE program selected, the controller starts to increase the temperature toward the first set temperature at the programmed rate of rise. The kiln will be cycling on and off to accomplish the exact rate of temperature rise. When the measured temperature reaches the first soak temperature, the hold phase begins. If there is a hold time programmed for this segment, the controller will hold at the set temperature for the prescribed time thus ending the first segment of the firing. The second segment ramp stage then begins with the temperature increasing toward the second set temperature at the second ramp rate. The temp is then held if there is a hold time programmed for the second segment. This sequence of segments with first increasing the temperature at a specific rate and holding the temperature at a set temperature are continued until the end of the firing program. There are 6 ramp programs already entered as a beginning point from which you may use or completely change and enter your own personal program. You may program up to eight segments in the Ramp Mode. In the CONE FIRE mode, the number of segments and the firing profile are preset to insure that the correct heat work is done to mature the witness cone. You have an option to choose a cool down rate at the end of your Cone Fire Mode if so desired.

The ramp portion of a segment need not always be increasing. You can program a decrease in temperature at a specific rate also, but your program can not begin with a descending ramp. When flash venting you need to include this in your program or the controller will assume the kiln is cooling off to fast and begin to heat up. For a Flash Vent segment use 9999 as your rate per hour, be sure to close the lid before you reach your next set-point temperature. This prevents an error code from coming up when the display temperature drops below the set-point then raising above the set-point temperature after closing the lid.

In more detail…
The controller actually accomplishes the temperature rise by establishing what's called a traveling set point. The traveling set point is set by the controller at the initial kiln temperature, and it is increased (or decreased) at a rate equal to the ramp rate. Anytime the kiln temperature is below this traveling set point the heating elements of the kiln are turned on. If the temperature is above the traveling set point the heating elements are turned off. When both the traveling set point and the measured temperature reach the first soak temperature, the hold phase begins.

GETTING STARTED

Read all precautions before using your controller.

If your kiln has individual controls for each heating element, turn all the dials to HIGH.

Apply power to the controller by plugging the kiln in to an electrical outlet. Throw power switch to the ON (I) position. Applying power to the controller causes a message of WAIT to be displayed. The microprocessor in the controller is checking various settings so it will take several seconds before the display changes to the current temperature and IDLE. When the current temperature and IDLE is flashing, you may program the controller for a firing or you may choose one of the other available options.

IMPORTANT NOTE: Before initiating a firing profile or performing any other function, the current temperature must be flashing with the word IDLE. Pressing the "1" key will clear the display of errors. Some error messages will prevent the continuation of programming/firing the kiln.

To become familiar with your controller, you may press any of the buttons to see how each functions. You may choose and set different firing profiles and review them. The kiln will not begin a firing until the START - STOP and ENTER key are pressed. In most cases when programming, you will choose an option, then press ENTER to accept the option.

The CONE FIRE mode uses Orton's patented method to achieve correct heat work so it is ideal for firing ceramics. The advantage of using the CONE FIRE method is that a very complicated firing profile may be chosen with just a few key strokes. The CONE FIRE method helps protect against over and under firing by carefully tracking and controlling the temperature at the end of the firing as the cone temperature is approached and adjusting it as needed. Remember what cone number selection you make for one firing profile will come up in the others as well after programming is complete.

The Ramp Mode can be used for ceramics, glass, jewelry, glazes, decals, knives etc. There are preset glass firing profiles already stored for you to use as a basis of where to begin, but it also allows you to override these by creating your own custom firing profiles which can be saved and used over and over.

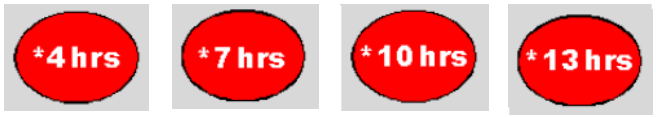
PROGRAMMING

CONE FIRE MODE

The CONE FIRE mode allows you to fire to a cone number using one of four different programs.

To use CONE FIRE:

Make sure the temperature is flashing with IDLE. Pressing the “1” key will clear the display of error messages. Some error messages will prevent the continuation of programming or firing the kiln.

Press one of the 4 firing program buttons. 

Press ENTER

Using the “number keys”, key in the cone number desired. If you type a wrong number, press zero 3 times or until all zeros appear in the display, press enter, then type the correct number (only three digits are displayed at this time)

Press ENTER

Using the “number keys”, key in a hold time, if desired.

Press ENTER

Using the “number keys”, key in a rate of cool down, if desired. (If none then enter “0” and it will skip this option and go to IDLE)

Press ENTER

Using the “number keys”, key in the temperature you want to control the cool down to.

Press ENTER

Using the “number keys”, key in the amount of hold time you want to hold the end temperature.

Press ENTER

IDLE and the current temperature will display.

Press 

. The display will read “-- -- -- --“.

Press ENTER to begin firing.

NOTE: With any of the CONE FIRE modes, a pre-heat and cool down stage is available. During the pre-heat stage the temperature is increased at a rate of 60ºF per hour until 200ºF is reached; the 200º temperature is then held for the programmed amount of time. Pre-heat is automatically set to zero during cone fire programming and at the end of each firing, so if a pre-heat stage is desired, it must be reprogrammed for each cone firing. During the programming of the cool down stage you can specify how fast or slow you want the temperature to drop as well as specify to what end temperature you want it to be controlled to. The cool down stage is pre-set to zero and reverts back to that after the completion of each firing.

CONE FIRE Mode Entry Example

13 Hour Firing, Pre-heat 1 hour, Cone 6, 10 minute Hold, Controlled Cool Down – The following steps are for a firing to cone 6, with a 10 minute hold at the peak temperature, a preheat stage with 1 hour hold, and a controlled cool down to 1500° F to enhance glaze..

Step	Press	Display will Read	Comment
1		13 HR	If you press the wrong key, before pressing Enter, simply press the correct key.
2		Alternately flashing: CONE & Number	The 13 Hr firing has been selected. Now CONE and the last entered cone number will alternately flash on the display.
3		6	Now enter the cone number you wish to fire to.
4		Alternately flashing: HLd & Number	The cone number has been accepted. Now HLd and the last entered hold time will alternately flash on the display.
5		0.10	Now enter the 10 minute hold time. Numbers to the left of the decimal point are hours, numbers to the right are minutes.
6		Alternately flashing: RA 8 & 0	The 10 minute hold time has been accepted. Now RA 8 and 0 will alternately flash on the display.
7		150	Now enter the cool down rate per hour.
8		Alternately flashing: ° F 8 & 0	The rate of cooling has been accepted. Now ° F 8 and 0 will alternately flash on the display.
9		1500	Now enter the 1500° end temperature.
10		Alternately flashing: HLd 8 & 0.00	The end temperature has been accepted. Now HLd 8 and 0.00 will alternately flash on the display.
11		0.00	Now enter “zeros” for no hold time.
12		Alternately flashing: IDLE & current temperature	The Cone Firing Program has been accepted. You now have to go and select the Preheat Feature.
13		PRHT	Pressing the Other key 2 times causes PRHT to be displayed. If you accidentally press Other too many times, press the Alarm key to back up.
14		Alternately flashing: HLd & Number	Preheat has been selected. Now HLd and the last entered hold time will alternately flash on the display.
15		1.00	Now enter the 1 hour hold time. Numbers to the left of the decimal point are hours, numbers to the right are minutes.
16		Alternately flashing: IDLE & current temperature	The hold time has been accepted and programming the preheat stage has been completed.
17		– – – – – – – –	Once you press the Start-Stop Key “-- -- -- --“ comes up in the display and requires you to press the Enter key to initiate the firing schedule. This 2 Key starting process is to help prevent accidental starting of a firing by pressing the Start Key Alone.
18		--ON--	After --On-- is displayed for several seconds, the heating elements of the kiln will cycle on and the current temperature in the kiln will be displayed. If a time is displayed instead of the current temperature, then a delay start is in effect. If you do not want to delay the start, press START-STOP key, then Delay, then 0000, ENTER. When the current temperature again flashes in the display with IDLE, press START-STOP then ENTER.

Note: If at anytime you entered wrong data during the programming process (before Pressing the Enter key) press “zero” 4 times to clear the display and reenter your data (after Pressing the Enter Key) you must continue on through the rest of the programming and restart the process again till you reach that part of the program that you need to correct. Remember when entering a Hold time anything on the right side of the decimal point will be counted as minutes. For Example: 1.50 is equal to 1 hr and 50 min and 1.90 is equal to 2 hrs and 30 min.

PROGRAMMING - continued

RAMP MODE

It is best to write out the firing program, which you plan to use before you begin programming. For example:

Segment	Rate, °/Hr	Set Point Temperature	Hold / Soak Time
1	9999	200	4 hours
2	500	1500	10 minutes

Note: At the end of this manual there is a blank form for writing your firing programs. Photo-copy this form as needed.

RAMP Mode Entry Example

Step	Press	Display	Comment
1	ENTER PROG	Alternately flashing: USER & Number	The display alternates between USER and the last selected firing program number.
2	1	1	Now enter the program number 1.
3	ENTER	Alternately flashing: SEGS & Number	The display flashes between SEGS and the number of segments that were previously selected for this program.
4	2	2	Now enter the number of segments needed for our example program.
5	ENTER	Alternately flashing: RA 1 & Number	The display flashes between rA 1 and the heating rate per hour of the previously selected for this program.
6	9 9 9 9	9999	Now enter the rate/hour for segment 1.
7	ENTER	Alternately flashing: ºF 1 & Number	The display flashes between ºF 1 & the temperature, which was previously selected for this profile.
8	2 0 0	200	Now enter the set-point temperature for segment 1.
9	ENTER	Alternately flashing: HLd1 & Number	The display flashes between HLd 1 & the hours and minutes, which were previously selected for this program.
10	4 0 0	4.00	Now enter the hold time for segment 1.
11	ENTER	Alternately flashing: rA 2 & Number	The display flashes between rA2 & the heating rate previously selected for this program.
12	5 0 0	500	Now enter the rate/hour for segment 2.
13	ENTER	Alternately flashing: ºF 2 & Number	The display flashes between ºF 2 & the temperature that was previously selected for this program.
14	1 5 0 0	1500	Now enter the set-point temperature for segment 2.
15	ENTER	Alternately flashing: HLd2 & Number	The display flashes between HLd2 & the previously selected hold time.
16	3 0	.30	Now enter the hold time for segment 2.
17	ENTER	Alternately flashing: ALRM & Number	The display alternates between ALRM & the previously used alarm setting.
18	9 9 9 9	9999	Now enter the desired temperature at which the alarm will sound. The alarm will be disabled with a setting of 9999.
19	ENTER	CPL then IDLE & current temperature	CPL is displayed briefly, indicating the program has been completed. Then IDLE & the current temperature is displayed.
17	START PRESS HERE STOP	– – – – – – – –	Once you press the Start-Stop Key "-- -- -- --" comes up in the display and requires you to press the Enter key to initiate the firing schedule. This 2 Key starting process is to help prevent accidental starting of a firing by pressing the Start Key Alone.
18	ENTER	--ON--	After --On-- is displayed for several seconds, the heating elements of the kiln will cycle on and the current temperature in the kiln will be displayed.

PROGRAMMING - continued

RAMP MODE RECALL is used to recall a previously programmed firing program.

Example: to recall user program #5, perform the following key strokes:

Step	Press	Display	Comment
1	RECALL PROG	Alternately flashing: USER & Number	The display alternates between USER and the last selected firing program number.
2	5	5	Now enter the program number 5.
3	ENTER	Alternately flashing: IDLE & current temperature	Program has been accepted and is ready to start.
17	START PRESS HERE STOP	– – – – – – – –	Once you press the Start-Stop Key "-- -- -- --" comes up in the display and requires you to press the Enter key to initiate the firing schedule. This 2 Key starting process is to help prevent accidental starting of a firing by pressing the Start Key Alone.
18	ENTER	--ON--	After --On-- is displayed for several seconds, the heating elements of the kiln will cycle on and the current temperature in the kiln will be displayed.

VIEW SECTION

Cone Table Example – Cone Table allows the user to identify the equivalent temperature used when choosing to fire using the Cone Fire Mode. Equivalent temperatures represent those used on the 108°F cone chart.

Step	Press	Display	Comment
1	CONE TABLE	Alternately flashing: CONE & Number	The word CONE and the last entered cone number will alternately flash on the display.
2	0 7	07	Now enter desired cone number to look up: for example 07
3	ENTER	Cone Temperature (1789 for cone 07)	The cone temperature is displayed for 2 seconds then IDLE & the current temperature will be displayed.

Review Program Example – If you select a 13 HR CONE FIRE program to cone 04 with a 20 minute hold and no controlled cool down rate, the following will be displayed, each for about ½ second when Review Program is pressed.

Display	Comment
13 HR	13 Hour firing program selected
PRHT	Next value will be the preheat hold time
00.00	No preheat hold time is selected
CONE	Next value will be the selected cone number
04	Selected cone number
ºF	Next value will be the cone temperature
1926	Temperature for cone 04
CNOS	Next value will be the cone offset
0	Selected cone offset
HOLd	Next value will be the hold or soak time at the cone temperature.
00.20	20 minutes hold selected
COOL	Controlled cool down information to be displayed next
RATE 8	Next value will be the rate per hour the kiln is to cool down by
0	If Zero is selected there is no controlled cool down
°F 8	Next value will be the temperature the kiln will cool down to
0	If Zero is selected there is no controlled cool down
Hld 8	Next value will be the hold or soak time at the final cool down temperature
0	No hold time selected for final temperature of the cool down segment

PROGRAMMING - continued

Review Program Example (con't):

dELA	Next value will be the delay time before the start of firing
00.00	No delay, firing will start when START/STOP and ENTER is pressed
ALRM	Next value will indicate at what temperature for the alarm to sound
9999	This setting disables the alarm.
ErCd	Next value will be Error Codes Setting.
ON	Error Codes are ON by default
FIRE	Next value will be the total number of firings the controller has performed
1	1 firing count
IDLE	Program Review complete and back at Idle

When entering a Ramp Mode Program the **Review Program** Key performs as a **Backup** Key, allowing you to go back and correct information that may have been entered wrong, without having to cycle through the entire program and then going back into the program to make the correction.

View Segment Example:

If you press View Segment, and the following is displayed	It Means
Stop	No Firing is in progress
RA 4	Currently firing Ramp stage of segment 4
SETP	Traveling set-point temperature
bd T	Temperature of the control board
HLd 6	Hold period of segment 6

SKIP SEGMENT (SKIP)

Skip Segment is included in View Segment. The Skip feature is only available in a RAMP MODE firing program. It is used when enough heat work has been achieved at the current segment and you want to immediately go to the next ramp rate. To skip to the next segment, press **View Segment**, then within 2 seconds, press **ENTER (SKIP will be displayed)**, then **ENTER** a second time, the next segments information will be displayed briefly and then your current temperature.

HOT KEYS NUMBER SECTION

Pause & Add Hold Time - Pressing the # 4 key while in a ramp mode will pause the firing at the displayed temperature for 30 minutes or until you press the # 4 key again to discontinue the pause feature. Pressing the # 4 key while in a hold mode will add 5 minutes to your remaining hold time displayed.

OPTIONS SECTION

Delay - This key is used to delay the start of both cone fire programs and ramp mode programs. When the delay feature is in use you will see the amount of time counting down in the display after you have selected to start your firing.

Delay Example: Program a one hour delay to the start of a firing.

Step	Press	Display	Comment
1		Alternately flashing: dELA and Number	The word dELA and the last entered delay time will alternately flash on the display.
2		1.00	Now enter desired delay time of 1 hr. Numbers to the left of the decimal point are hours, to the right of the decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
3		Alternately flashing: IDLE & current temperature	Delay setting has been accepted and is ready to start.

PROGRAMMING – continued

OPTIONS SECTION (con't)

Alarm -This key is used to set the temperature alarm. The alarm may be set before or during a firing. When the alarm temperature is reached, a buzzer will sound. The alarm is disabled by default with a setting of 9999. When you want to stop the alarm from buzzing, press the Alarm Key and the current setting will be displayed allowing you to key in 9999 (to turn it off for the remainder of the firing) or another temperature, after pressing the enter key to accept the new setting the display will go back to the current temperature and proceed with the remainder of the firing program. The alarm button may be used as a **Back-up Key** while scrolling through the Other Options.

Alarm Example: Before the start of a firing, set the alarm temperature to go off at 200ºF.

Step	Press	Display	Comment
1		Alternately flashing: ALRM and Number	The word ALRM and the last entered alarm temperature will alternately flash on the display. If nothing is entered within 10 seconds, the display will revert back to IDLE and the current temperature.
2		200	Now enter desired alarm temperature. If you type a wrong number, press zero 4 times, then type the correct number.
3		Alternately flashing: IDLE & current temperature	Alarm setting has been accepted and is ready to start.

Other - This key allows for the setting of various "other" options. There are eleven "Other" options. Pressing the "Other" key will cycle through these available options. Pressing the ALARM Key will act like a BACKUP Key while scrolling through the Other Options. Options appear in the order listed below.

RSET - Reset of thermocouple offset to 0 and turning error codes back on.
PRHT - Allows for a preheat stage at the beginning of a "Cone Fire".
Id - Identification number for use with PC program.
16-S – Allows user programs 5 & 6 to be tied together for more complicated firing profiles.
CNOS - Allows adding an offset temperature to a cone fire.
CHG° - Allows changing of the temperature scale between Fahrenheit and Celsius.
ERCd - Allows for error codes to be turned on or off (enabled or disabled).
TCOS – Allows adding an offset temperature to a thermocouple.
PCT4 – Allows percentage control of heat from the lid element, also known as Power Tame.
bd T – Displays the ambient or working temperature of the RM II control board.
REST – Allows user to restore the Ramp Mode Programs to the default firing schedules.

TO EXIT this menu without selecting any option, press the Stop Key.

NOTE: PRHT (Preheat) will not appear in this menu unless a CONE FIRE mode has been selected.
NOTE: 16-S will not appear in this menu unless user program 5 has been recalled for firing.

RSET (Reset) – Reset is used to reset the thermocouple offset to 0 and reset error code checking to on. When RSET is displayed simply press the ENTER key and the rest will take effect.

PRHT (Preheat) – Preheat is used with the CONE FIRE mode only. When Preheat is in use, the temperature ramps up at 60ºF/hour to 200ºF and then holds at 200º for the amount of time programmed. So if you start at a room temperature of 70ºF, then it will take just over 2 hours to reach 200ºF at which time the hold segment will start. Preheat is automatically set to zero during cone fire programming and at the end of each firing, so if a preheat stage is wanted, it must be reprogrammed for each cone firing.

PROGRAMMING – continued

OPTIONS SECTION (con't)

Preheat Example: Set a preheat time of 2 hours.

Step	Press	Display	Comment
1	OTHER	PRHT	If PRHT does not show on the display, even after cycling through the options, it means that a CONE FIRE mode has not been selected. Exit the menu and select a CONE FIRE program, then return to the Other menu.
2	ENTER	Alternately flashing: HLd & 0.00	Once PRHT has been selected Hld & 0.00 will alternate in the display.
3	2 0 0	02.00	Now enter the desired amount of hold time at 200ºF. Numbers to left of decimal point are hours, to the right are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
4	ENTER	Alternately flashing: IDLE & current temperature	Preheat setting has been accepted and is ready to start.

Id - The RampMaster II has the ability to interface with a PC. Current software allows for up to 10 kilns to be operated at one time. The Id number defines which kiln is which. Id numbers range from 0 to 9. Use the number keys to define the kiln in these terms and press the ENTER key. If PC control is not being used this setting has no effect. Factory default is 01.

Note: The use of PC control requires that the kiln include the built-in hardware for such operation.

16-S (16 segments) - This setting allows the user to combine user program numbers 5 and 6 together. In doing so, the firing program is extended from 8 to 16 segments. This is helpful when a firing profile needs more than 8 segments to complete.

To use this feature, enter the needed firing data in user program 5 until segments all are used, then enter user program 6 with remaining firing data. Recall user program 5. Using the "Other" key, locate 16-S in the Options menu. Press the ENTER key one time and the display will show OFF. Press the 1 key one time and display will read ON. Press the ENTER key to store the data. IDLE & current temperature will then be displayed indicating the change is complete and ready to start. Press the Start – Stop key followed by the ENTER key and the controller is now starting the firing at user program 5 and will continue into user program 6 until the firing is complete.

CNOS (Cone Offset) – Used to raise or lower the final cone temperature. The final cone temperature can be raised or lowered a maximum of 45ºF.

When entering the offset temperature the following code is used: the left two digits designate whether to raise (00) or lower (90) the cone temperature, that is, "00" means plus (+) and "90" means minus (-). The right two digits are the number of degrees the cone temperature will be raised or lowered.

CNOS Examples:

Number	Meaning
0020	Raise the final cone temperature by 20ºF
0040	Raise the final cone temperature by 40ºF
0015	Raise the final cone temperature by 15ºF
9030	Lower the final cone temperature by 30ºF
9005	Lower the final cone temperature by 5ºF
9045	Lower the final cone temperature 45ºF

This option does not affect the Ramp Mode but it will show up on the menu.

PROGRAMMING – continued

OPTIONS SECTION (con't)

Cone Offset Example: Adjust cone 07 to shut off the kiln at 20ºF below the preset cone temperature.

Step	Press	Display	Comment
1	OTHER	CNOS	Press the Other key until CNOS displays. If you go past the option use the Alarm Key to back-up to the previous selection.
2	ENTER	Alternately flashing: CONE & Number	Cone Offset has been selected; the word CONE and the last entered cone number will alternately flash on the display.
3	0 7	07	Now enter the cone number which you want to adjust (in this example cone 07). If you type a wrong number, press zero 3 times, press ENTER, the type the correct number
4	ENTER	Alternately flashing: ºFOS & Number	ºF OS and the previous offset setting alternately flash.
5	9 0 2 0	9020	Now enter the new offset temperature using the rules above, in this example, "9020". If you type a wrong number, press zero 4 times, then type the correct number.
6	ENTER	Alternately flashing: IDLE & current temperature	The new offset temperature adjustment has been accepted.

CHGº - Used to select degrees Fahrenheit (ºF) or degrees Celsius (ºC).

Step	Press	Display	Comment
1	OTHER	CHGº	Press the Other key until CHGº displays. If you go past the option use the Alarm Key to back-up to the previous selection.
2	ENTER	ºF	Indicates that the Fahrenheit (ºF) scale is being used. You can toggle back and forth between ºF and ºC by pressing the 1 key.
3	1	ºC	Displays ºC. The decimal point in the lower right corner means that the Celsius (centigrade) scale has been selected.
4	ENTER	Alternately flashing: IDLE & current temperature	The new temperature scale has been accepted.

ERCd – Used to turn on or turn off the error codes. When you receive your controller, the error codes are turned ON. In most cases, you want the error codes on to protect your firing. They can be turned off if you are doing special firings that would require you more freedom from error codes.

ERCd Example: Turn the error codes off.

Step	Press	Display	Comment
1	OTHER	ERCd	Press the Other key until ERCd displays. If you go past the option use the Alarm Key to back-up to the previous selection.
2	ENTER	ON	Indicates that the error codes are turned on. You can toggle back and forth between ON and OFF by pressing the 1 key.
3	1	OFF	Displays OFF indicating the error codes will be turned off.
4	ENTER	Alternately flashing: IDLE & current temperature	The error codes are now off.

PROGRAMMING – continued

OPTIONS SECTION (con't)

TCOS - This feature is used to raise or lower the temperature indicated by the thermocouple. The maximum offset is 50 degrees. A positive offset is entered with 00 preceding the amount of offset and a negative offset is preceded with 90. This is basically the same as is done when entering cone offsets as described earlier in the manual.

For example; if shelf cones indicate that the kiln is underfiring it means that the thermocouple indicated that proper temperature was reached when in fact it was cooler. To correct this, a programmed number of degrees needs to be subtracted from the actual reading. This programmed offset will lower the temperature reading and cause the kiln to fire to a higher temperature, increasing the heatwork for the kiln.

Press the Other Key until TCOS is displayed, press ENTER and TC1 will be displayed. Press ENTER and the current offset for the thermocouple will be displayed. Use the number keys to add offset and press ENTER.

PCT 4 (Power Tame) – This feature allows you to control the amount of top heat a lid elemented glass kiln generates separately from the side elements, by choosing the percentage of time the lid elements are on compared to the side elements. From the factory the Power Tame is set to 100% (meaning the lid elements are on 100% of the time the side elements are on). This setting does not automatically revert back to 100% once you've changed it, so after your firing is complete, if you no longer wish for your new setting to be used you will need to reset the Power Tame to 100% by following the same instructions. Power Tame can be changed at IDLE as well as "On-the-Fly" while a program is running, in the event you only want to reduce the lid heat during a particular stage of your firing.

PCT 4 (Power Tame) Example: Reducing the Lid Heat by 50% while at IDLE.

Step	Press	Display	Comment
1		PCT4	Press the Other key until PCT4 displays. If you go past the option use the Alarm Key to back-up to the previous selection.
2		100	Press the Enter Key to see the current Power Tame setting.
3		50	Now enter the desired percentage of Lid Heat.
4		Alternately flashing: IDLE & current temperature	The new Power Tame setting has been accepted and the controller is ready to begin firing.

PCT 4 (Power Tame) Example: Reducing the Lid Heat by 50% On-the-Fly.

Step	Press	Display	Comment
1		Alternately flashing: PCT4 & current percentage	Press the Other key and PCT 4 will appear along with current Power Tame Setting.
2		50	Now enter the desired percentage of Lid Heat.
4		current temperature	The new Power Tame setting has been accepted and the current kiln temperature will be displayed.

bd T - This feature allows the user to see the actual ambient or working temperature of the RM II control board. The RM II control board should not be operated in temperatures exceeding 250°F. If the ambient temperature is greater than this the controller will display an error code of "E-bd" and immediately shut the firing down. Action then must be taken to reduce this temperature. It should be noted that the kiln area should provide adequate ventilation, not only to keep the ambient board temperature down but to provide fresh air to the kiln and to allow removal of airborne particles produced during the firing.

PROGRAMMING – continued

OPTIONS SECTION (con't)

REST - This feature will restore a ramp mode firing program back to its default pre-set firing schedule listed in Appendix B.

REST (Restore) Example: Restoring Ramp Mode Program # 5.

Step	Press	Display	Comment
1		REST	Press the Other key until REST displays. If you go past the option use the Alarm Key to back-up to the previous selection.
2		REST & Number	The display alternates between REST and last ramp mode program number selected.
3		5	Now enter the desired Ramp Mode Program number you wish to restore to the default firing schedule listed in Appendix B.
4		Alternately flashing: IDLE & current temperature	The selected Ramp Mode Program has been restored and the controller is ready to begin firing.

APPENDIX A – CONE FIRE TEMPERATURE PROFILES

13 Hour Cone Firing Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME	TIME IN HOURS
3	80	250	0	2
4	200	1000	0	4
5	100	1100	0	1
6	180	Final Temp – 250°F	0	Varies
7	80	Final Temp	0	3

10 Hour Cone Firing Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME	TIME IN HOURS
3	120	250	0	2
4	300	1000	0	3
5	150	1100	0	1
6	180	Final Temp – 250°F	0	Varies
7	108	Final Temp	0	2

7 Hour Cone Firing Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME	TIME IN HOURS
5	150	250	0	1
6	400	Final Temp – 250°F	0	Varies
7	120	Final Temp	0	2

4 Hour Cone Firing Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME	TIME IN HOURS
6	570	Final Temp – 250°F	0	Varies
7	200	Final Temp	0	1

In all cone firing programs, total firing time will vary depending upon cone chosen. End temperature values are automatically adjusted via the computer software to compensate for the total time of firing to allow for proper cone maturity.

APPENDIX B – PRE-SET RAMP MODE FIRING PROGRAMS

USER 1 = Medium Speed Glass Slumping Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	500	250	12 min
2	500	500	12 min
3	500	750	12 min
4	600	1100	5 min
5	600	1220	5 min
6	9999	1000	1 hour
7	90	970	1 hour
8	120	750	1 min

USER 2 = Medium Speed Glass Tack Fuse Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	500	250	12 min
2	500	500	12 min
3	500	750	12 min
4	600	1250	20 min
5	600	1350	10 min
6	9999	1000	1 hour
7	90	970	1 hour
8	120	750	1 min

USER 3 = Medium Speed Glass Full Fuse Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	500	250	12 min
2	500	500	12 min
3	500	750	12 min
4	600	1250	20 min
5	600	1480	15 min
6	9999	1000	1 hour
7	90	970	1 hour
8	120	750	1 min

USER 4 = Glass Bead Annealing Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	9999	960	8 hours
2	9999	960	40 min

USER 5 = Lost Wax Burnout Program

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	9999	300	1 hour
2	100	350	30 min
3	350	1350	1 hr 30 min
4	300	900	99 hrs 99 min

USER 6 = Slow Cooling Cycle for Cone 6 Glazes

SEGMENT	RATE °F / HR	TEMPERATURE	HOLD TIME
1	9999	2232	0
2	9999	1900	0
3	150	1500	0

The above listed Pre-set Ramp Mode Firing Programs are basic guidelines to give you a beginning point in which to build from. The Programs can be changed entirely to suit your own custom programs. There is also a Restore Feature that will allow you to wipe the slate clean and revert back to these Pre-set Ramp Mode Firing Programs if desired.

APPENDIX C – TERMS AND ABBREVIATIONS

Celsius – A temperature scale in which 0º is the freezing point and 100º the boiling point of water. Also known as centigrade.

Cone – A pyrometric cone, which bends to indicate the amount of heatwork accomplished. A "witness cone" is a useful type of pyrometric cone that is positioned on a shelf during the firing. Adjustments to the firing can be made as a result of understanding the bend of the witness cone. Other pyrometric cones do exist, none of which find use with the RM II control.

Cone Fire Mode – System used by the RM II that offers the user 4, preset firing programs.

Fahrenheit – A temperature scale in which 32° is the freezing point and 212° the boiling point of water.

Hold/Soak – Each of these words describes the action of maintaining, or keeping steady a specific temperature for a given period of time. These words can be used interchangeably.

LED – LED is an acronym for Light Emitting Diode. It's a neat, solid state device that glows!

Local Set Point – This is basically the temperature at which the kiln should be at any given moment in the firing profile.

Offset – The addition of value, either positive or negative, to a particular parameter. The use of offsets in the RM II is limited to temperature measurement adjustments. If temperatures "appear" too high or too low offsets can be added to *offset* these differences.

On-the-Fly – Term used for features that can be selected and edited while a program is running without having to interrupt the firing process by stopping and restarting.

PC – Personal computer.

Program – A series of segments, which define how the kiln temperature is to proceed through the firing.

Ramp – An ascending or descending change in temperature over a specific time period. The RM II asks for ramp information in the degrees per hour format.

Ramp Mode – System used by the RM II that has preset glass programs already stored and allows the user to completely edit to customize and define their own sequence of multiple ramping, holds / soaks and temperature set points. The sequence is made up of distinct segments. The RM II allows programming of up to 8 segments per Ramp Mode program, with the option to combine 2 programs for a total of 16 segments.

RM II – RampMaster II control board.

Segment – A segment consists of a temperature ramp to a set point temperature along with a hold or soak time, at that set point temperature.

Set point – A specific temperature in which you wish to fire to.

T/C or t/c – Abbreviation for thermocouple.

Thermocouple – temperature measurement sensor made of two dissimilar metals that are joined at one end, the end where they are joined is the temperature measuring end. The RED wire is always the negative lead in a Type K thermocouple.

User Program – A sequence of segments, preset or defined by the user, containing a particular firing schedule. The RM II offers the user 6 user programs.

Zone Control – A technique of control that uses multiple thermocouples and multiple output relays to regulate kiln temperatures.

APPENDIX D – DISPLAY MESSAGES

ALRM - Alarm. When ALRM flashes in the display, an alarm temperature between 0° and 9999° may be entered. When alarm is set to 9999°, it is turned off.

bd T - Board temperature. Press the View Segment key during a firing will display the ambient board temperature.

°C 1 through °C 8 - Degrees Celsius temperature. In the Ramp Mode with the Celsius temperature scale selected, the controller is waiting for an end temperature to be entered for the segment. The numbers stand for the segment that is being programmed.

CHG° - Change degrees. When CHGº is displayed, press ENTER to select the temperature scale you would like to use, either Fahrenheit (ºF) or Celsius (°C). The "1" key will toggle between ºF and ºC. When the scale you want to use is displayed, press ENTER.

CNOS - Cone offset. Press ENTER to adjust an individual cone shut off temperature.

CONE - Cone number. When ConE is displayed, a cone number between 022 and 10 must be entered. This will be found in the Cone Table or the CONE FIRE Mode.

CPL - Complete. Indicates programming is complete.

CPLT - Complete. Indicates a firing has been completed.

Decimal Point displayed in lower right-hand corner of display. The temperature is displayed in degrees Celsius (ºC).

Decimal Point displayed in the center of display between 10's and 100's place. A time in hours and minutes is being displayed.

dELA - Delay. Indicates the time in hours and minutes before the start of firing.

ERCd - Error Codes. When ErCd is displayed, press enter to turn the Error Code function on or off. This function is located by pressing "Other" in the OPTIONS Section.

E- - Error codes are displayed as an "E" followed by a "-" then a number or letter. Error codes are listed in APPENDIX D. Be sure to note this information when calling for assistance.

ErrP - Error in power. If you lose power while firing, the controller will automatically restart if the kiln temperature is greater that 140°F AND the kiln temperature has not decreased more than 250°F while the power was off. The error codes are listed in APPENDIX D.

°F 1 through °F 8 - In the Ramp Mode with the Fahrenheit temperature scale selected, the controller is waiting for an end temperature to be entered for the segment. The numbers stand for the segment that is being programmed.

HLd - Hold. Indicates the holding time in hours and minutes at the end of a CONE FIRE program.

HLd 1 through HLd 8 - In the Ramp Mode the controller is waiting for a soak or hold time in hours and minutes to be entered for the segment. The numbers stand for the segment that is being programmed.

Id - ID number. The identification number of the particular kiln when used with the PC based program. Ten kilns may be controlled from the PC program. Kilns may be number from 0 to 9

IDLE - Message indicating kiln is in the IDLE mode, ready to accept data entry for a new program or recall an existing program or to start a program.

OFF - Off. Press ENTER when displayed to turn the Error Codes Off. Pressing the "1" key toggles between On and OFF.

APPENDIX D – DISPLAY MESSAGES - continued

ON - On (no dashes). Press ENTER when displayed to turn the Error Codes On. Pressing the "1" key toggles between On and OFF.

--ON-- - On displayed with dashes. Displayed for about 10 to 15 seconds when a firing has been started. Pressing any key while --ON-- is displayed, will stop the firing.

PCT4 - Power Tame Feature. Press ENTER to adjust the percentage of power that the Lid Element generates. This can be set from 0 to 100. Default factory setting is 100%. (Glass Kilns Only)

PF - Error in power. While firing if power is lost and the kiln temperature drops to less than 140°F OR the kiln temperature has decreased more than 250°F while the power was out, the controller will display PF and the firing will be stopped. Error codes are listed in APPENDIX D.

PRHT - Preheat stage. When PfHt is displayed, press ENTER to select the preheat stage holding time. Found in the "Other" menu in the OPTIONS section.

RA 1 through RA 1 - In the Ramp Mode the controller is waiting for a ramp temperature rise per hour to be entered for the segment. The numbers stand for the segment that is being programmed. The temperature is in "ºF/hr or ºC/hr whichever has been selected. If ºC has been selected, there will be a decimal point in the lower right-hand corner of the display.

RSET - Reset. Pressing the ENTER while reset is displayed will reset thermocouple offset to 0 and turn error codes to on. If zone control is used then LAG is set to 5.

REST - Restore. Pressing the ENTER while restore is displayed will allow you to restore a Pre-set Ramp Mode Program to its default firing schedule.

SEGS - Segment. When SEGS is displayed, the number of desired segments for a Ramp Mode program should be entered.

SKIP - Skip Segment. Press ENTER when SKIP is displayed to skip to the next ramp segment in a Ramp Mode program. Skip Segment is not available with a CONE FIRE program.

STOP - Indicates the firing has been stopped or a programming function has been cancelled.

SUSP - Pause. Press PAUSE (#4 Key) and SUSP is displayed indicating you have paused/suspended the firing and the current temperature will be held for 30 min or until you press PAUSE again.

USER - When USER is displayed, one of the 6 user programs may be selected.

Temperature - Flashing - The kiln is off and the current temperature in the kiln is displayed.

Temperature – Continuously displayed – The kiln is on (in either a Ramp Mode or a CONE FIRE program), and the current temperature in the kiln is displayed.

Time – Decreasing – A delay start is in effect for a Ramp Mode or a CONE FIRE program. The time remaining before the kiln starts to heat is displayed.

Time – Temperature alternately flashing – The kiln is in either a hold phase of a Ramp Mode segment or a hold phase at the end of a CONE FIRE program. The numbers displayed are the remaining time and the current kiln temperature.

TCOS - Thermocouple Offset. Displayed during programming of the "Other" options. See page 15 for detailed information.

WAIT - Wait is displayed when the controller is booting up. You must wait until display reads IDLE before beginning with program selection or data entry.

16-S - 16-S stands for "16 segments". User programs 5 and 6 may be combined for a total of 16 segments. See page 14 for detailed information.

APPENDIX E – ERROR CODES

Error Code	Description	Quick View
E- 0	Software Error. Recheck the selected program and reprogram if Necessary	
E- 1	The temperature is increasing less than 12 degrees per hour during a Ramp segment where the temperature is programmed to increase. This slow rate must persist for 22.5 minutes before the error is displayed.	Ramp segment Temp. increase < 12ºF/hr Persists > 22.5 min.
E- 2	During a hold segment, the temperature rises to greater than 50º above the hold temperature which was set. The temperature must stay 50º above this set temperature for 18 seconds before the error is displayed.	Hold segment >50ºF above set temperature Persists > 18 seconds
E- 3	During a hold segment, the temperature is more than 50º below the hold temperature that was set. The temperature must stay 50º below this set temperature for 18 seconds before the error is displayed.	Hold segment >50ºF above last hold temperature Persists > 18 seconds
E- 4	The temperature is more than 50º above the previous hold temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50º above this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment >50ºF above last hold temperature Persist > 18 seconds
E- 5	The temperature is more than 50º below the local setpoint temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50º below this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment >50ºF below local setpoint temperature
E- 6	A Negative temperature is displayed. This generally indicates the thermocouple is connected incorrectly. To correct this situation, ensure the red and yellow wires are connected correctly to the controller and at all junctions. You can identify the red lead on an unmarked thermocouple with a magnet because a magnet will be attracted to the red lead.	(-) displayed
E- 8	When using the Cone Fire Mode, the temperature is decreasing during the last ramp segment, indicating the kiln sitter has turned the kiln off.	Cone Fire mode only Temperature decreasing during last ramp segment.
E- 9	Software thermocouple selection does not match the hardware thermocouple jumper selection	
E- -	There was a power loss to the controller while writing a program to the non-volatile memory chip. Recheck the selected program and reprogram, if necessary.	
E- A	Invalid program variable.	
E-bd	Ambient board temperature too high.	
E- d	Kiln temperature is 50° above local set point temperature.	
E- R	Microprocessor memory does not match program storage memory (EEprom)	
ErrP	Indicated loss of power while firing. The controller will automatically restart if the kiln temperature is greater that 140°F AND the kiln temperature has not decreased more than 250°F while the power was off. Press “1” to clear the display.	
FAIL	The thermocouple is not connected to the controller or there may be a break in one of the thermocouple lead wires. If the thermocouple wire is broken, it must be replaced. When connecting the thermocouple, connect the RED wire to the connector with RED dot and connect the YELLOW wire to the connector with the YELLOW dot. On all Type K thermocouples, the RED wire is always negative, the yellow wire in this case is the positive.	
PF	While firing if power is lost and the kiln temperature drops to less than 140°F OR the kiln temperature has decreased more than 250°F while the power was out, the controller will display PF and the firing will be stopped. Press “1” to clear the display.	

APPENDIX F – Common Questions and Situations

Q. During programming of a firing, I typed a wrong number. How do I correct this?
A. Before pressing ENTER, enter zero until all zeros are displayed, then enter the correct number. If you have already pressed ENTER, you must press the REVIEW PROGRAM to back up to the previous step.

Q. How do I clear the "ErrP" from the display?
A. Firing will continue automatically, but you may clear this message by pressing the "1" key.

Q. I turned on the controller and "FAIL" is displayed. What does this mean?
A. Either the thermocouple is not working, a loose connection to the controller, or it may be connected incorrectly. See error codes Appendix E.

Q. How can I find out the final temperature that was reached during a cone firing?
A. At the end of a cone firing, the current kiln temperature and CPLT will be alternately flashing in the display. Press "STOP". Then press "Review Program", the final temperature will display. This final temperature will be retained until the next firing or until the controller is reprogrammed.

Q. My witness cones are telling me that the kiln is underfiring or overfiring.
A. Use the cone offset feature to add or subtract temperature from the predetermined cone temperature. Go easy with adjustments, no more than 5° per adjustment is about right. If larger adjustments are necessary, you may wish to change out the thermocouple.

Q. My witness cones are telling me that some sections of the kiln are cooler or hotter than they should be.
A. A couple of options here. First choice would be to slow the firing. Do this by choosing a slower cone fire program. The 13 hour program is the slowest. Along with slowing the firing close the kiln up earlier by closing the peepholes and lid, if you operate with them open at certain times of the firing. If the controller uses zone control it is possible to offset the individual thermocouples in the zones to even temperatures. Also try to stagger shelves to allow better air flow through out kiln.

Q. Can witness cones be used for firing glass – fusing, slumping, painting?
A. Use of witness cones in glass work is very limited. The best answer is no. Glass is very visual and often requires intervention of the user at the most sudden of moments. In glass, the witness is the user! Witness cones are more of a fixed response and don't really allow for the dynamic that is seen in glass firing.

Q. I get an error message when I flash vent.
A. You need to enter a segment for Flash Venting… your rate per hour would be 9999°, your set point would be the temperature you're flash venting down to, your hold time would be how long you want the kiln to remain at that temperature before progressing to your annealing portion of your schedule. Remember to shut the lid before the set point temperature is reached to avoid receiving an error that the kiln is heating up when it's suppose to be holding. It is normal for the internal temperature of the kiln to raise after you have shut the lid.

Q. How do I clear/reset my Ramp Mode Programs?
A. You can not clear the program data. You must override your old data with your new data the same way you entered your program originally. You may restore an individual ramp mode program to its original default setting by using the OTHER key to choose the REST option.

Q. Why is my kiln not reaching temperature or taking too long to fire?
A. There are many factors that could result in this situation but here are the most common: Power Tame/PCT4 setting could have been changed (Glass Kilns Only), Some elements may not be heating (due to element or relay failure), Possible weak elements, or Possible low voltage supply.

Q. Why is my controller buzzing/beeping?
A. Check your alarm setting. If the alarm setting is set to anything lower than the temperature displayed, the alarm will go off immediately when you start your program. To disable alarm you need to enter 9999.

If you set your alarm for a hold temperature, it will continually beep during that hold segment till you change the alarm setting. See page 13 for more information on the alarm feature.

APPENDIX G – Firing Program Blank

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Firing Program Number: _________

Segment	Rate, °/Hr	Set Point Temperature	Hold / Soak Time
1			
2			
3			
4			
5			
6			
7			
8			

Firing Program Number: _________

Segment	Rate, °/Hr	Set Point Temperature	Hold / Soak Time
1			
2			
3			
4			
5			
6			
7			
8			

Firing Program Number: _________

Segment	Rate, °/Hr	Set Point Temperature	Hold / Soak Time
1			
2			
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7			
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Segment	Rate, °/Hr	Set Point Temperature	Hold / Soak Time
1			
2			
3			
4			
5			
6			
7			
8			

RAMPMASTER II ZONE CONTROL ADDENDUM

Your RampMaster II may be equipped with zone control. Zone control uses more than one thermocouple or temperature sensor to control firing operations. Zone control is typically used for larger, deeper kilns to offset any shortcomings of single zone temperature control. To determine if your RampMaster II utilizes zone control, simply count the number of thermocouples used. More than one thermocouple indicates that the controller is set up for zone control.

Programming of the RampMaster II, with zone control, is essentially the same as with a single zone controller. There are some differences, however, in features and programming that are explained below.

General Discussion

The RampMaster II (RM II) zone control system has all the features of a single zone control and many new features to ensure even firing from top to bottom of the kiln. Zone control may use 2 or 3 zones depending upon model. Zone control uses multiple thermocouples or temperature sensor inputs and multiple independent outputs which allow for the control of distinct and separate kiln sections or zones.

The controller senses the temperature in each zone of the kiln, compares the temperature to the desired temperature and adjusts the power going to each zone separately. Giving each just the right amount of power to keep the temperature at the correct setting. This is in contrast to a single zone controller that measures the temperature, usually at the center, and gives all zones the same amount of power.

The zone control uses a proportional – integral – differential (PID) control algorithm that calculates the amount of power needed by each section to keep the temperature at the desired setting without large temperature swings. It is expected, during the firing, that zones will “lag” behind the desired temperature to some extent. If a zone is lagging behind by more than the acceptable, preset amount the controller will suspend the ramping until the lagging zone catches up. Once the zone has caught up, the controller resumes ramping. This guarantees that all zones will be within a particular degree setting.

The RM II automatically determines the amount of LAG based on it’s ramp rate.

Normal variations in thermocouples can cause a zone to fire too hot or too cool. As with the single zone RM II the zone control also offers an offset feature to adjust the reading of each thermocouple to compensate for any error. For example; if shelf cones indicate that the bottom section is underfiring it means that the thermocouple positioned in the bottom zone indicated that proper temperature was reached when in fact it was cooler than indicated. To correct this, a programmed number of degrees needs to be subtracted from the actual reading. This programmed offset will lower the temperature reading and cause the offset zone to fire to a higher temperature, increasing the heatwork for that zone.

The zone control also offers security through the use of multiple thermocouples. In a single zone controller, thermocouple failure will stop the firing process. In a zone control, the firing will continue if one or more thermocouples fail. If all thermocouples fail, however, the firing is stopped. If a failure in a thermocouple is seen then the failed zone will be controlled by the nearest zone. The zone controller will not start a firing with a failed thermocouple.

The zone control has all the standard error checking of the single zone and also monitors the zones to check for over temperature. If any zone becomes hotter than 50° above the current setting an error code is displayed (E- d). This error can be brought about by thermocouples inserted in the wrong section or stuck relays remaining on without a command from the controller.

Firings such as glass firing may require that the door or lid be opened during a firing. The sudden loss of heat can trigger various errors like E- 3 (temperature more than 50° below hold point). The zone control has the ability to have its error codes turned off to allow for these situations. Caution should be taken when choosing to turn off error codes because it leaves the kiln vulnerable to malfunctions that would normally be caught by the error codes. When errors are off only E- 6 (thermocouple backwards), E-bd, E--, E- R, E- A, E-0, E-9 are checked for in the Ramp Mode. In the Cone fire mode, in the last segment of firing only E- 8 are checked. The lag feature is also turned off when errors are turned off.

Zone Control Programming Additions

The zone controller is programmed using the same concepts and key strokes as defined in the main portion of this operating manual. Minor additions are made to the “Other” Options and error code areas only.

Additional “Other” Options

Additional options available to the zone control include further functions of the Reset feature and further functions of the Thermocouple Offset feature.

RSET – While the Reset feature works exactly as described in the main portion of this manual, the use of zone control adds some further actions to the Reset function. When Reset is employed the LAG setting is reset to the factory setting of 5 and all thermocouple offsets are reset to 0. Error codes are also turned back on or enabled as expected.

TCOS - The thermocouple offset works exactly as described previously in this manual. The difference with the zone control is that instead of one thermocouple there are multiple thermocouples. Each may be offset.

This feature is used to raise or lower the temperature indicated by any of the thermocouples. The maximum offset is 50 degrees. A positive offset is entered with 00 preceding the amount of offset and a negative offset is preceded with 90. This is the same as is done for entering cone offsets.

When TCOS is displayed, press ENTER and TC1 will be displayed. Press ENTER and the current offset for the top thermocouple will be displayed. Use the number keys to adjust the offset and press ENTER when the correct offset is displayed; TC2 will then be displayed. Repeat the above steps for TC2 and TC3.

Please note that when performing the “Reset” function all thermocouple offsets are returned to the factory setting of 0.

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