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RampMaster II

FEATURES

- Firing Methods and Features which make firing easier:
 - **CONE FIRE METHOD** – Fire to a specific cone number using one of four speeds: “Slow Bisque”, “Fast Bisque”, “Slow Glaze” or “Fast Glaze”.
 - **RAMP MODE PROGRAMMING** – Program up to 6 separate firing profiles for repeated use. Each profile may have up to 8 segments with separate heating or cooling rates, temperature set points, and hold times.
 - **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 200°F for a specified time prior to starting the firing. This can be used for drying ware.
 - **ALARM** – User set audible temperature alarm.
- Advanced features:
 - **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 ramp.
 - **ERROR CODES** – Error codes may be turned on so the kiln will automatically shut down if there is an error.
- Messages and information:
 - **REVIEW PROGRAM** – Review your firing profile 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.

PRECAUTIONS

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

Do not operate the controller in temperatures above 125°F.

Never leave your kiln unattended at the end of a firing.

The controller contains electronic components that are sensitive to static electricity. Before handling the controller, dissipate any static charge you may have by touching metal or a screw on the controller panel, the electrical box, the kiln lid, or some other grounded object.

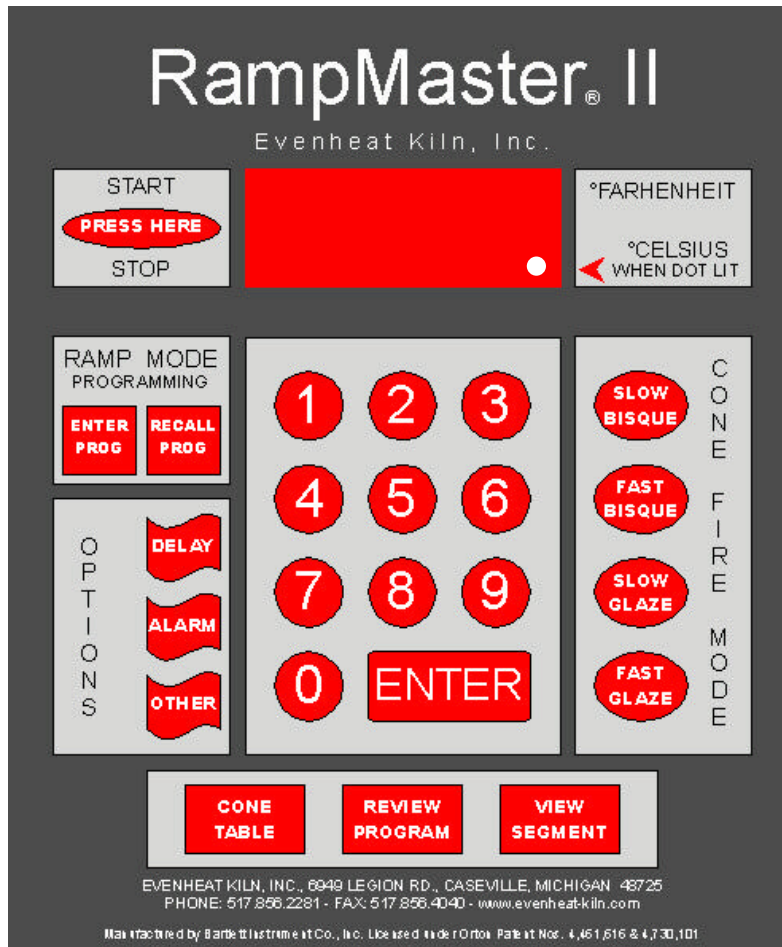
Always review the current program before firing to ensure the correct profile is programmed.

RampMaster II Controller Faceplate Layout

Start - Stop
key for starting and stopping firings.

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

Options
Section for many features including: Delay Start, Temperature Alarms, 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 profiles.

Viewing Section to look up cone temperatures, review the selected program, 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

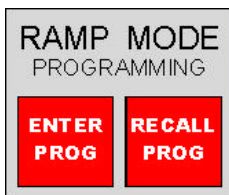
START - STOP Key



Starts the firing or, if there is a firing in progress, stops the firing.

NOTE: This key has no function during programming.

RAMP MODE PROGRAMMING Section ¹ - Programs firing profiles and recalls for use.



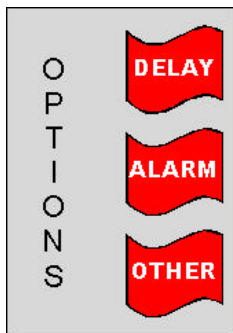
ENTER PROG – This key allows you to initiate programming. Up to 6 profiles may be programmed and saved.

RECALL PROG – This key allows one step recall of one of the programmed profiles.

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 seven (7) segments to create each number or letter, some letters do not appear as you are used to seeing them in print, for example, t is display as **t**. Also the messages are displayed using both capital and small letters, for example, cone display as **ConE**, stop as **StOP**. 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.

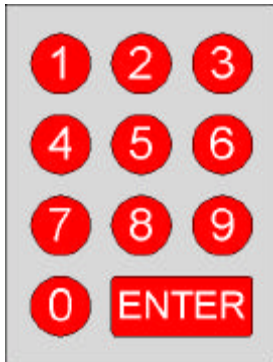
ALARM – Used to set the high and low temperature alarms.

OTHER – There are nine “OTHER” options

rSEt – Resets various parameters to a default setting.
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.
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
bd t – Displays the ambient or working temperature of the RM II

DESCRIPTION of KEY FUNCTIONS and DISPLAY - continued

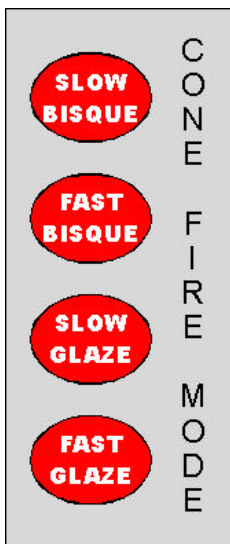
NUMBER KEYS Section – Contains the ENTER key and the Number keys.



Numeric keys – Used for entering temperature rates, hold times, set point temperatures and other numbers.

Enter key – Used to enter or acknowledge numbers and programs.

CONE FIRE MODE Section ^{4,5} – Choose the CONE FIRE mode (profile) you want to use.



Slow Bisque – Used for setting a slow bisque firing profile.
** 13 hours to fire to cone 04.**

Fast Bisque – Used for setting a fast bisque firing profile.
** 10 hours to fire to cone 04.**

Slow Glaze – Used for setting a slow glaze firing profile.
** 7 hours to fire to cone 04. **

Fast Glaze – Used for setting a fast glaze firing profile.
** 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 C, page 18.

³ For more detailed instructions see PROGRAMMING, OPTIONS, page 12.

⁴ For more detailed instructions see PROGRAMMING, CONE FIRE, page 8.

⁵ Detailed descriptions of Cone Fire profiles are found in APPENDIX A, page 16.

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

Used to look up the equivalent temperature of various cone numbers. The temperature displayed is for self-supporting cones with a heating rate of 108°F/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 profile is displayed one after another.

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

- Preheat time
- Cone Number
- Cone temperature
- Hold time
- Delay time
- Alarm setting

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

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 ramp⁶. When View Segment is pressed during a firing, the current stage of the firing is displayed. If it is pressed in between firings, StOP will flash 3 times and then the current temperature will be displayed.

⁶ 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 with either a CONE FIRE or RAMP MODE profile 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 profile. 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.

The ramp portion of a segment need not always be increasing. You can program a decrease in temperature at a specific rate also.

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 either the current temperature or "ErrP" (Error Power) to be displayed. Press the "1" key to change the "ErrP" display to the current temperature. The microprocessor in the controller is checking various settings so it will take several seconds before the display changes to the current temperature. When the current temperature 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. Pressing "1" key will clear the display of errors (Err) or FAIL.

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 key is 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.

The Ramp Mode can be used for ceramics, glass, jewelry, glazes, decals, etc. It allows you to create your own 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 profiles.

To use CONE FIRE:

Make sure the temperature is flashing. Pressing the “1” key will clear the display of errors (Err) or FAIL.

Press one of the 4 firing profile buttons.




Press 

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 

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








Press  CPL will be displayed briefly, then the current temperature will be flashing in the display.

Press  to begin firing.





NOTE: With any of the CONE FIRE modes, a preheat stage is available. During the preheat stage the temperature is increased at a rate of 60°F per hour until 200°F is reached; the 200° temperature is then held for the programmed amount of time. Preheat is automatically set to zero during cone fire programming and at the end of each firing, so if a preheat stage is desired, it must be reprogrammed for each cone firing.

CONE FIRE Example 1

Slow Bisque Firing, Pre-heat 1 hour, Cone 04, 10 minute Hold – Use the following steps for a bisque firing to cone 04, a 10 minute temperature hold at the peak temperature, and a preheat stage with 1 hour hold time.











Step	Press	Display	Comment
1		S-bC	If you press the wrong key, before pressing Enter, simply press the correct key.
2		Alternately flashing: ConE & Number	Slow Bisque is now selected. The word ConE and the last entered cone number will alternately flash on the display. Now enter the cone number – 04.
3		Alternately flashing: ConE & 04	The word ConE and the entered cone number will alternately flash on the display. If you type a wrong number, press zero 4 times, then type the correct number.
4		Alternately flashing: HLd & 00.00	The cone number has been accepted. Now enter the 10 minute hold time.
5		00.10	Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
6		CPL flashes, then the current temperature	The 10 minute hold time is accepted. CPL indicates the firing profile has been completed.
7		PrHt	Pressing Other causes PrHt to be displayed. If you accidentally press “Other” more than once, press it several more times until PrHt appears again.

PROGRAMMING - continued

8		Alternately flashing: HLd & 00.00	Preheat has been selected and the hold time is to be entered now.
9		01.00	Numbers to the left of the decimal point are hours, to the right of the decimal point are minutes. NOTE: For a 1 hour hold time you could also enter 60 for 60 minutes; the display would show 00.60. If you type a wrong number, press zero 4 times, then type the correct number.
10		CPL flashes, then the current temperature	Accepts a hold time of 1 hour, then CPL indicates the preheat stage has been completed.
11		-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, press START-STOP.

Cone Fire Example 2

Fast Glaze Firing, Cone 06, 10 minute Hold, Delay start of 2 hours. Use the following steps for a glaze firing to cone 06, a 10 minute temperature hold at the peak temperature, and a 2 hour delay before the start of the firing.

Step	Press	Display	Comments
1		F-GL	If you press the wrong key, before pressing ENTER, simply press the correct key.
2		Alternately flashing: ConE & Number	Fast Glaze is selected. The word ConE and the last entered cone number will alternately flash on the display.
3		Alternately flashing: ConE & 06	The word ConE and the entered cone number will alternately flash on the display. If you type a wrong number, press zero 4 times, then type the correct number.
4		Alternately flashing: HLd & 00.00	The cone number has been accepted and the hold time is entered now.
5		00.10	The Hold time is displayed. 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.
6		CPL flashes, then the current temperature.	Accepts a hold time of 10 minutes and then CPL indicates the firing profile has been completed.
7		Alternately flashing; DELA & 00.00 (or the last programmed delay time)	Either 00.00 or the last programmed delay time will flash alternately with dELA.
8		02.00	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.
9		CPL flashes, then the current temperature.	The 2 hour delay time is accepted. CPL indicates the job is completed. After CPL flashes several time, the current temperature is displayed.
10		-On-, then 02.00	Starts the countdown of the delay time toward zero, at which time the kiln will start to heat. The display will show the amount of time left until the firing is to start.

PROGRAMMING - continued

RAMP MODE

















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

Segment	Rate, %/Hr	Set Point Temperature	Hold / Soak Time
1	100	200	0
2	500	1575	0

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

RAMP MODE Example




The following steps are used to program User 1 program for the firing profile above. Programming of the Ramp Mode begins when the ENTER PROG key is pressed.

Step	Press	Display	Comment
1		Alternately flashing: USER & Number	The display alternates between USER and the last selected firing profile number.
2		1	Selects user (USER) profile number 1.
3		Alternately flashing: rA 1 & Number	The display flashes between SEG and the number of segments that were previously selected for this profile.
4		2	This is the number of segments needed for our example profile.
5		Alternately flashing: rA 1 & Number	The display flashes between rA 1 and the heating rate per hour of the previously selected for this profile.
6		0100	Displays the selected rate/hour.
7		Alternately flashing: °F 1 & Number	The display flashes between °F 1 & the temperature, which was previously selected for this profile.
8		0200	Displays the selected temperature.
9		Alternately flashing: HLd1 & Number	The display flashes between HLd1 & the hours and minutes, which were previously selected for this profile.
10		00.00	No hold time.
11		Alternately flashing: rA 2 & Number	The display flashes between rA2 & the heating rate previously selected for this profile.
12		0500	Displays the selected rate/hour.
13		Alternately flashing: °F 2 & Number	The display flashes between °F 2 & the temperature that was previously selected for this profile.
14		1575	Displays the selected temperature.
15		Alternately flashing: HLd2 & Number	The display flashes between HLd2 & the previously selected hold time.
16		00.00	No hold time.
17		Alternately flashing: ALAR & Number	The display alternates between ALAR & the previously used alarm setting.
18		9999	Enters the temperature at which the alarm will sound. The alarm will be turned off with a setting of 9999.
19		CPL flashes then the current temperature.	CPL flashes several times indicating the program has been completed. The current temperature then flashes in the display.

PROGRAMMING - continued





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

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

Step	Press	Display	Comment
1		Alternately flashing: USER & 1	The controller is ready to accept the desired user program number.
2		5	Indicates the user program selected.
3		CPL flashes then the current temperature	CPL flashes several times indicating the program has been selected. The current temperature then flashes in the display.

VIEW SECTION

Cone Table – 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		Alternately flashing: ConE & Number	The word ConE and the last entered cone number will alternately flash on the display.
2	The desired cone number, example:  	Alternately flashing: ConE & desired cone number. This example: ConE & 07	The word ConE and the entered cone number will alternately flash on the display.
3		Cone Temperature (1787 for cone 07) then CPL	The cone temperature is displayed for 2 seconds then CPL is displayed followed by the flashing current temperature.

Review Program

Example – If you select a Slow Bisque CONE FIRE profile to cone 04 with a 20 minute hold, the following will be displayed, each for about ½ second when Review Program is pressed.

Display	Comment
S-bC	Slow Bisque firing profile
PrHt	Indicates the 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
°F	Next number will be the cone temperature
1926	Temperature for cone 04
HLd	Next number will be the hold or soak time at the end of the firing.
00.20	20 minutes hold selected
dELA	Next number will be the delay time before the start of firing
00.00	No delay, firing will start when START/STOP is pressed
ALAr	Next number will be the high alarm limit setting
9999	This is as high as the alarm can be set and assures the alarm will not be functioning.
CPL	End of firing profile

PROGRAMMING - continued

View Segment

Examples:

If you press View Segment, and the following is displayed	It Means
Stop	No Firing is in progress, the controller is currently in between firings.
rA4	Ramp stage of segment 4
rA3	Ramp stage of segment 3
HLd2	Hold period of segment 2
HLd6	Hold period of segment 6

Skip Step (SStP)




Skip Step (Skip Step) is included in View Segment. The Skip step feature is only available in a RAMP MODE firing profile. It is used when enough heat work has been done at the current segment and you want to immediately go to the next ramp rate. To skip to the next ramp stage, press View Segment, then within 2 seconds, press ENTER, and ENTER a second time. If you press View Segment and do not press ENTER within 2 seconds, the current segment (e.g., rA 1) will continue to be displayed. Simply wait until the temperature is again displayed and press View Segment, then, ENTER within 2 seconds, and ENTER again. If you press VIEW Segment, then ENTER, then decide not to skip to the next ramp stage, simply do not press any key; after about 10 seconds the display will return to the current temperature.

OPTIONS SECTION

Delay - This key is used to delay the start of a firing.

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




Remember: the temperature must be flashing before beginning to program

Step	Press	Display	Comment
1		Alternately flashing: dELA and 00.00	The controller is ready to accept the delay time of 1 hour.
2		01.00	Displays the selected time. 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		CPL flashes then the current temperature.	CPL flashes several times indicating the 1 hour delay has been accepted. The current temperature then flashes in the display.

Alarm - This key is used to set the high or low temperature alarm. The alarm may be set before or during a firing. When the alarm temperature is reached, a buzzer will sound.

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

Remember: the temperature must be flashing before beginning to program.

Step	Press	Display	Comment
1		Alternately flashing: ALAr and Number	The word ALAr and the last entered alarm temperature will alternately flash on the display. The controller is ready to accept the alarm temperature. If no alarm is entered within 10 seconds, the display will flash CPL and then the flashing current temperature.
2		0200	Displays the selected temperature of 200°. If you type a wrong number, press zero 4 times, then type the correct number.
3		CPL flashes then the current temperature	CPL flashes several times indicating the alarm temperature has been accepted. The current temperature then flashes in the display.

PROGRAMMING – continued

Other - This key allows for the setting of various “other” options.

There are nine “Other” options. Pressing the “Other” key will cycle through these available 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.

bd t – Displays the ambient or working temperature of the RM II control board.

TO EXIT this menu without selecting any option, cycle through by pressing “Other” until CHG° appears, then press ENTER twice.





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 is recalled for firing.

rSEt (Reset) – Reset is used to reset the thermocouple offset to 0 and reset error code checking 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 60°F/hour to 200°F and then holds at 200° for the amount of time programmed. So if you start at a room temperature of 70°F, then it will take just over 2 hours to reach 200°F 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.

Preheat Example: Set a preheat time of 2 hours. Remember: the temperature must be flashing to start the programming.

Step	Press	Display	Comment
1		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 profile, then return to the Other menu.
2		Alternately flashing: Hld & 00.00	Preheat has been selected; enter the time you want to hold the temperature at 200°F (in this ex. 2 hours)
3		02.00	Displays the selected time of 2 hours. Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
4		CPL flashes then the current temperature	CPL flashes several times indicating the 2 hour preheat time has been accepted. The current temperature then flashes in the display.

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.

PROGRAMMING – continued

16-S (16 segments) - This setting allows the user to combine user program numbers 5 and 6 together. In doing so, the firing profile 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, program the needed firing profile in user program 5 until segments all are used, then program user program 6 with remaining profile 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. CPL will then be displayed indicating the change is complete. Press the Start – Stop key and the controller is now starting the firing at user program 5 and will continue into user program 6 until the profile 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 45°F.







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.

Examples:

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





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

Cone Offset Example: Adjust cone 07 to shut off the kiln at 20°F below the prescribed cone temperature.

Step	Press	Display	Comment
1		CnoS	If CnoS does not show on the display, press the “Other key until “CnoS” displays.
2		Alternately flashing: ConE & Number	Cone Offset has been selected; the word ConE and the last entered cone number will alternately flash on the display. Now enter the cone number which you want to adjust (in this example cone 07).
3		Alternately flashing: ConE & 07	The word ConE and the entered cone number (07) will alternately flash on the display. If you type a wrong number, press zero 3 times, press ENTER, then type the correct number
4		Alternately flashing: °F OS & 9000	°F OS and the previous offset setting alternately flash. Enter the new offset temperature using the rules above, in this example, “9020”.
5		9020	The selected offset temperature is displayed. If you type a wrong number, press zero 4 times, then type the correct number.
6		CPL flashes then the current temperature	CPL flashes several times indicating the offset temperature adjustment has been accepted. The current temperature then flashes in the display.





PROGRAMMING – continued

CHG° - Used to select degrees Fahrenheit (°F) or degrees Celsius (°C).

Step	Press	Display	Comment
1		CHG°	If “CHG°” does not show on the display, press the “Other” key until “CHG°” displays.
2		°F	Indicates that the Fahrenheit (°F) scale is being used. You can toggle back and forth between °F and °C by pressing the “1” key.
3		°C	Displays “°C”. The decimal point in the lower right corner means that the Celsius (centigrade) scale has been selected.
4		CPL flashes then the current temperature	CPL flashes several times indicating the temperature scale has been changed. The current temperature in °C then flashes in the display. There will be a decimal point in the lower right-hand corner of the display.

ErCd – Used to turn on or turn off the error codes. When you receive your controller, the error codes are turned on or enabled. In most cases, you want the error codes on to protect your firing. They can be turned off if you are doing special firings, such as glass firing where the kiln may be opened.

Example: Turn the error codes off.

Step	Press	Display	Comment
1		ErCd	If “ErCd” does not show on the display, press the “Other” key until “ErCd” displays.
2		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		OFF	Displays “OFF” indicating the error codes will be turned off.
4		CPL flashes then the current temperature	CPL flashes several times indicating the error codes are off. The current temperature then flashes in the display.

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.

When 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.

bd t - This feature allows the user to see the actual ambient or working temperature of the RM II control. The RM II control should not be operated in temperatures exceeding 125°F. Generally the lower the better. If ambient temperatures greater than this are indicated then action 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.

APPENDIX A – CONE FIRE TEMPERATURE PROFILES

Slow Bisque firing profile

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

Fast Bisque firing profile

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

Slow Glaze firing profile

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

Fast Bisque firing profile

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 firing profiles, total firing time will vary depending upon cone chosen.

When using the Slow Bisque or Fast Bisque firing profiles for low fire ware the profiles are automatically adjusted to lower values to compensate for the lower firing temperatures.

APPENDIX B – TERMS AND ABBREVIATIONS

Celsius – A temperature scale in which 0° is the freezing point and 100° 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 profiles.

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

Hold / Soak / Dwell – 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.

PC – Personal computer.

Profile – 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 allows the user to define a sequence of multiple ramping, holds / soaks and temperature set points information. The sequence is made up of distinct segments. The RM II allows programming of up to 8 segments per Ramp Mode program.

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, also called dwell, at that set point temperature.

Set point – A specific temperature.

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, defined by the user, containing a particular firing profile. 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 C – DISPLAY MESSAGES

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

bd t - Board temperature. Press the ENTER key to display 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 CHG° is displayed, press ENTER to select the temperature scale you would like to use, either Fahrenheit (°F) or Celsius (°C). The “1” key will toggle between °F and °C. When the scale you want to use is displayed, press ENTER.

ConS - 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.

[PL - Complete. Indicates programming or some programming function is complete.

[PLt - Complete. Indicates a firing has been completed.

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

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.

Err- - Error. Indicates a software error has occurred. Contact the supplier of your controller. The error codes are listed in APPENDIX D.

Errd - Error displayed in a zone controlled kiln. Indicates that a zone has exceeded the local set point temperature by 100 degrees.

ErrE - Error. Indicates a software error has occurred. Contact the supplier of your controller. The error codes are listed in APPENDIX D.

Err0 through **Err8** - Error. As error has occurred, the error codes are listed in APPENDIX D.

ErrP - Power Error. This is displayed during a firing if power in the kiln has been interrupted for more than 2 minutes. 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.

FA IL - 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.

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

APPENDIX C – DISPLAY MESSAGES - continued

HLd 1 through **HLdB** - 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

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

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 the START-STOP button is pressed to begin a firing. The heating elements of the kiln will not begin heating until -ON- disappears and the current kiln temperature is displayed.
NOTE: Pressing any key while -ON- is displayed, will stop the firing.

PF - Power Failure. PF indicates the power to the kiln has been interrupted for a long enough time to effect the current firing. The kiln has shut down and the firing must be restarted.

PfHt - 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 8** - 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 °F/hr or °C/hr whichever has been selected. If °C 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.

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

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

StOP - Indicates the firing has been stopped. Also displays when the controller is first turned on.

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.

6-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 D – ERROR CODES

Error Code	Description	Quick View
Err0	Software Error. Recheck the selected program and reprogram if Necessary	
Err1	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 < 12°F/hr Persists > 22.5 min.
Err2	During a hold segment, the temperature rises to greater than 50° above the hold temperature which was set. The temperature must stay 50° above this set temperature for 18 seconds before the error is displayed.	Hold segment >50°F above set temperature Persists > 18 seconds
Err3	During a hold segment, the temperature is more than 50° below the hold temperature that was set. The temperature must stay 50° below this set temperature for 18 seconds before the error is displayed.	Hold segment >50°F above last hold temperature Persists > 18 seconds
Err4	The temperature is more than 50° above the previous hold temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50° above this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment >50°F above last hold temperature Persist > 18 seconds
Err5	The temperature is more than 50° below the local setpoint temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50° below this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment >50°F below local setpoint temperature
Err6	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
Err7	The temperature is more than 50° above the local setpoint temperature during a ramp segment where the temperature is programmed to increase. The temperature must stay 50° above this set temperature for 18 seconds before the error is displayed.	Increasing Ramp segment >50°F above local setpoint temperature Persists > 18 seconds
Err8	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.
ErrP	Continuous ErrP in display. Indicates a long term power outage. The kiln has been shut down. Press "1" to clear the display.	
ErrP	ErrP and the current temperature are alternately flashing. To clear the display, press the "1" key. If a firing was in progress, it will continue.	
Err-	The Err with a dash indicates 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.	
Errd	Errd signals that a zone, in a zone controlled kiln, has exceeded the local set point by 100 or more. Check thermocouples for proper position and relays for proper operation	
ErrE	A hardware error has been detected by the controller software. The controller must be returned for service.	Hardware error

APPENDIX E – 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 enter to progress through to the end of the program then start the program again.

Q. How do I clear the “ErrP” from the display?

A. Press the “1” key. After several seconds the current temperature will be displayed. Several other numbers or StOP may be displayed before the current temperature.

Q. I turned on the controller and “FAIL” is displayed. What does this mean?

A. The thermocouple is not connected to the controller. 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. Also, there may be a break in one of the thermocouple lead wires. If so, the thermocouple must be replaced.

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.

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 profile. The slow Bisque profile 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.

Q. I don't use witness cones. How do I know if the kiln is reaching the proper cone number?

A. Use witness cones.

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.

APPENDIX F – Firing Program Blank

Keep this page as a master and photocopy as needed

Firing Program Number: _____

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

Firing Program Number: _____

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

Firing Program Number: _____

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

Firing Program Number: _____

Segment	Rate, %/Hr	Set Point Temperature	Hold / Soak Time
1			
2			
3			
4			
5			
3			
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 allows the user to define the amount of lag that is acceptable. The default, factory setting is 5 degrees. Note that a smaller “lag” setting will result in tighter control between zones but may cause a slower firing if one zone has weak elements.

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 100° above the current setting an error code is displayed (Errd). 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 Err3 (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 Err6 (thermocouple backwards) is checked for in the Ramp Mode. In the Cone fire mode, in the last segment of firing only Err1 and Err8 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 LAG adjustment, further functions of the Reset feature and further functions of the Thermocouple Offset feature.

LAG - The zone control offers the user the ability to adjust the number of degrees that any particular zone is allowed to lag or fall behind the desired temperature. If a zone exceeds this limit, ramping is suspended until the “lagging” zone catches up. Once the zone has caught up ramping resumes. A smaller LAG gives tighter control but usually slows the ramp rate because the local set point will only advance as fast as the slowest zone. The default, factory setting is 5 degrees.

The “Other” Options menu will display all previously mentioned options along with this new option, LAG. To adjust the LAG simply press the “Other” key until LAG appears. Press The ENTER key; the current lag setting is displayed. Use the number keys to choose the lag amount and press ENTER. Stop will appear briefly in the display then temperature.

Please note that when performing the “Reset” function that the LAG is returned to the factory setting of 5.

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.

Additional Error Code

The zone control offers the additional error code Errd; shown as **Errd**. This error will appear if any zone gets more than 100 degrees above the current setting. This fault can occur when thermocouples are placed in the incorrect zone or if an output relay becomes stuck to the on position.