ELECTRONIC KILNS

OWNER'S MANUAL

CONGRATULATIONS !

Congratulations on being the owner of a Cress electronic kiln! Besides having the safety and reliability that has long been associated with the Cress name, the kiln you have selected is equipped with the best electronic control on the market. We are pleased to offer a control with a wider range of automatic firing speeds which will do almost any firing job without the need for custom programming. This control also includes a short temperature soak at the end of each firing cycle to ensure greater temperature uniformity with uneven loads. There is considerably more insulation between the heat and the electronics to ensure high reliability, and a safety master switch is included to protect against power surges when the kiln is not in use.

We are proud of our products and gratified that you have joined the many thousands of ceramic enthusiasts who have compared and chosen Cress firing equipment. We sincerely wish you many years of creative and rewarding use of your Cress kiln.

UNPACK SHIPMENT IMMEDIATELY

When this shipment was given to the carrier, neither the crating nor contents were damaged, In case of damage or loss (either obvious or concealed) save all packing material. Concealed damage or loss discovered by the consignee, which was not noted at time of delivery, must be reported to the delivering carrier immediately upon discovery. At that time, an inspection of the merchandise by the carrier's representative should be requested. Failure to report such a damage or loss within 15 days places the burden of proof upon the claimant to show this damage or loss was caused while in the carrier's possession.

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IMPORTANT SAFEGUARDS!

Please read and observe the following safety warnings before operating your kiln:

1. Install kiln 18" or more from any wall or combustibles.
2. Fire only on stand or legs furnished.
3. Never fire hotter than cone 10 or 2350 ^{O}F.
4. Do not fire hotter than the manufacturer's recommendation for your clay, glazes, or decals, or permanent damage may result to your kiln or ware.
5. Do not open lid until kiln has cooled.
6. Before opening lid, turn off all switches, then carefully open lid and test that lid brace is securely engaged before allowing lid to stand freely.
7. Do not leave kiln unattended while firing.
8. Never use an extension cord.
9. Operate kiln only in a well ventilated room.
10. Unplug kiln before servicing or cleaning.
11. Dangerous Voltage - Do not touch heating elements with anything.
12. Do not touch hot sides of kiln or hot lid. Burns may result.
14. Never store anything under kiln; never lean objects against kiln.
15. Do not store or use flammable liquids or sprays in the same room with your kiln.
16. Do not store or use your kiln outside; keep rain and moisture away from kiln.
17 Do not use kiln if cord is damaged.
18 Wall receptacle must not be corroded.
19. Use kiln only with adequate electrical supply and with the correct voltage, amperage and correct fuse size (not too large or small). Be sure the wire size is large enough (avoid aluminum wiring). Do not use a 208 volt kiln on 220 volts.
20. Kiln must be grounded properly.
21. Wear goggles when looking thorough peephole.
22. Wear protective gloves when handling hot peephole plugs.
23. When firing objects to be used with food and drink, use only supplies tested and labeled "safe" for such purposes.

It is imperative that you read all instructions before operating the kiln.

KILN PLACEMENT AND INSTALLATION

All kilns should be located in an area free from flammable materials such as drapes, boxes, paper, spray cans, paint, gasoline, etc. All kilns must be located a minimum of 18 inches from every vertical surface. Do not place any kiln under any overhead obstruction such as cabinets, shelf, drapes, hanging plastic, etc., and never lean anything against your kiln. Do not store anything between the kiln and a wall or under your kiln; keep these areas clear at all times. Keep material off the top of your kiln; do not use the lid as a shelf.

Recommended floor surfaces include cement, ceramic tile with cement grout, brick, or stone. If it is necessary to put your kiln on a synthetic or wooden floor, use a sheet of fireproof material underneath your kiln and extending 24" beyond the kiln in all directions. A layer of hard firebrick is also acceptable for this purpose. Floor coloration may be sensitive to heat.

Good housekeeping must be maintained at all times in the kiln area for safety.

Your kiln must be fired on the metal stand provided; it has been designed specifically for the height and weight of your kiln. Do not use any other stand. Be sure to center the kiln on the stand so that it is stable, and position it so that the cord does not touch the sides of the kiln, which will be hot during firing. It is also important that the stand and kiln be level (use a bubble level for this purpose), otherwise there is a possibility of pieces of ware falling during firing.

Use your kiln only in a well ventilated room. Vapors containing poisonous gases are possible when firing certain materials. Do not breath fumes from kiln when firing.

ELECTRICAL SPECIFICATIONS

Proper electrical wiring is necessary to safely and efficiently operate a kiln. Even though the voltage is a full 120 volts or 234 volts at the meter, the voltage on which the kiln operates will be somewhat lower at the kiln location. Make sure your electrical outlet has the correct electrical capacity and voltage to handle your kiln. It is necessary to measure the voltage at the location of the kiln with the kiln turned on. Voltage drops occur on all wiring. Proper electrical wiring will provide an adequate operation voltage and current at the kiln without significant voltage drop. (Voltage may be temporarily low during brownouts especially on a hot day in the summer when all your neighbors have their air conditioning turned on and during peak electrical usage periods in your area). If the wire coming from your power source to the kiln is too small or too long the kiln will not operate properly, even if the wire meets national electrical safety codes. If the voltage is low, the kiln may not reach the maximum desired temperature or will fire too slowly. This may reduce element life. 230 volt and 240 volt kilns may be used with 220 volt to 245 volt power.

Do not attempt to change the receptacle on an existing line without using the services of a licensed electrician. The electrician will know whether the wire size is correct. It is advisable to use a larger wire size than absolutely necessary to prevent voltage drop, especially if the run to the meter is long. The increase in cost is usually very small compared to the long term savings in firing times and line loss (voltage loss). Never cut the plug off and replace it. If the plug becomes damaged, change the entire cord with a CRESS factory supplied cord which will meet temperature as well as electrical requirements. The outlet must be in good condition or heating of the cord and plug cap will occur. Do not use an extension cord at any time.

Temperature rating specifications as well as the electrical rating requirements for your kiln are listed on a decal on the kiln. Your electrician must make sure all local codes are met with your house wiring. Your licensed electrician is responsible for meeting the requirements for the local and national codes.

			Maximum		Fuse	Copper Wire
Model	Amps	Volts	Cone	Temp.	Size	Size
E1814		24	220	10	2350	30 8
		23	208	10	2350	30 8
E18		25	220	10	2350	30 6
		26	208	10	2350	30 6
E23		36	240	10	2350	50 6
		32	208	10	2350	40 6
ET23		36	240	10	2350	50 6
		32	208	10	2350	40 6
E27		48	240	10	2350	60WD 4
		55	208	10	2350	60WD 4
ET27		48	240	10	2350	60WD 4
		55	208	10	2350	60WD 4
ET28		48	240	8	2300	60WD 4
		57	208	8	2300	70WD 3

WD = wired direct - no cord. A licensed electriction must follow all local and federal codes.

THE CRESS ELECTRONIC CONTROL

The Cress Electronic Control is easy to use and includes advanced features which give great flexibility in firing schedules. It displays the internal kiln temperature throughout the firing and cooling process, so you can easily monitor the progress of your firing.

The control is a microprocessor based programmable ramping control which will run either preprogrammed firing profiles, or your own user designed custom profiles. It has five preprogrammed firing speed profiles, an optional user selected alarm setting, program preview, pyrometric cone-temperature equivalent file, and an LED display that can be selected for either °F (Fahrenheit) or °C (Celsius) temperature read out and operation.

This control also has self diagnostics that help safeguard the equipment as well as the ware being fired. It will alert you to problems and help in failure diagnosis with the use of error codes that are displayed in the LED window.

There are two basic modes of operation; The CONE FIRE mode, which uses preprogrammed firing profiles, and the RAMP HOLD mode, which allows you to create and use custom firing profiles.

CONTROL KEYS OVERVIEW

The following is a list of the control operating keys on the control touch pad along with a brief explanation of their functions.

10 KEY TOUCH PAD WITH ENTER KEY - used to input user selected program variables.
START KEY - used to start a firing profile.
STOP KEY - used to stop a firing profile.
PREVIEW KEY - used to display program or firing information. (varies with mode of operation)
°F or °C SELECT KEY - used to access the 10 different set up options.
CONE TABLE KEY - used to look up the temperature equivalent of a pyrometric cone.
RAMP HOLD KEY - used to select or to create a custom firing profile.
CONE FIRE KEY - used to select a preprogrammed firing profile.
FAST KEY - used to select the fast CONE FIRE profile.
MED-FAST KEY - used to select the medium fast CONE FIRE profile.
MED KEY - used to select the medium CONE FIRE profile.
MED SLOW KEY - used to select the medium slow CONE FIRE profile.
SLOW KEY - used to select the slow CONE FIRE profile.
ALARM KEY - used to insert a user selected alarm point. (temperature)

SETUP, INFORMATION & OPTION KEYS

There are ten (10) options which are accessed by using the "°F or °C SELECT" key.

CHG°- Change between °F and °C
ErCd – Turn Error Codes on or off
tCoS – Set Thermocouple offset
dELA – Set Delay start
bd t – Displays Board temperature
rSEt – Resets board to default settings
PrHt – Set Preheat segment
Id – set controller ID number
16-S – Combines user 5 and user 6 programs to achieve a 16 segment program.
CnoS – Set cone offset.

Pressing "°F or °C SELECT" will continue to cycle through the options available, CHG° (Change degrees), ErCd (Error Codes), tCoS (thermocouple offset), dELA (delay start), bd t (board temperature), rSEt (reset), PrHt (Preheat), Id (identification), 16-S (16 segment), CnoS (Cone Offset).

NOTE: PrHt (Preheat) will not appear in this menu unless a CONE FIRE program has been selected. 16-S (16 segment program) will not appear unless user 5 is the selected program.

TO EXIT this menu without selecting any option, cycle through by pressing "°F or °C SELECT" until CHG° appears, then press ENTER twice or when bd t is displayed press ENTER.

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

Example: Change from °F to °C.

Step	Press	Display	Comment
1	°F or °C SELECT	CHG°	If "CHG°" does not show on the display, press the "°F or °C SELECT" key until "CHG°" displays.
2	ENTER	°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	1	°C .	Displays "°C .". The decimal point in the lower right corner means that the Celsius (centigrade) scale has been selected.
4	ENTER	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 the error codes on or off. When you receive your controller the error codes are turned on. In most cases, you want the error codes on to protect your firings. They can be turned off if you are doing special firings, such as jewelry or glass firing where the kiln is left open. When errors are off only err6 (t/c backwards) is checked for in a ramp/hold firing. In a cone fire program, in the last segment (last 250 degrees) of the firing err1 (ramping too slowly) and err8 (temperature falling) are also checked. Error Codes "off" also turns the "LAG" feature off when using a multi-zone control.

Example: Turn the error codes off.

Step	Press	Display	Comment
1	°F or °C SELECT	ErCd	If "ErCd" does not show on the display, press the "°F or °C SELECT" key until "ErCd" displays.
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	CPL flashes then the current temperature	CPL flashes several times indicating the error codes are off. The current temperature then flashes in the display alternating with IdLE.

tCoS – T/C OFFSETS are used to raise or lower the temperature indicated by 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. A negative offset will lower the indicated temperature reading and cause more heat-work. When tCoS is displayed, press enter and the current offset for the thermocouple will be displayed. Press enter when the correct offset is displayed.

dELA - This option is used to delay the start of a firing.

Example: Program a one hour delay to the start of a firing. The temperature must be flashing before beginning to program.

Step	Press	Display	Comment
1	°F or °C SELECT	dELA	Continue to press "°F or °C SELECT" until dELA is displayed.
2	ENTER	Alternately flashing: dELA and 00.00	The controller is ready to accept the delay time of 1 hour.
3	1 0 0	01.00	Displays the selected time. 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	ENTER	CPL flashes then the current temperature	CPL flashes several times indicating the 1 hour delay has been accepted. The current temperature then alternately flashes in the display with IdLE.

bd t – Press ENTER when bd t is displayed and the circuit board temperature will be displayed. It is used for diagnostics.

rSEt - This option resets the board to the default settings. Press "°F or °C SELECT" UNTIL rSEt is displayed then press "ENTER". CPL will be displayed indicating that the T/C offsets have been set to zero and the LAG to 13.

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	°F or °C SELECT	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 this menu.
2	ENTER	Alternately flashing: HLd & 00.00	Preheat has been selected; enter the time you want to hold the temperature at 200°F (in this example, 2 hours)
3	2 0 0	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 enter the correct number.
4	ENTER	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 alternating with IdLE.

Id (identification) Used by KISS™ (Kiln Interface Software System) to identify the kiln when connected to a personal computer. This is covered in a separate KISS manual.

16-S (16 segment program) This option allows vary-fire programs 5 and 6 to be combined into a 16 segment program. It is only displayed in the menu when vary-fire user 5 is programmed and selected. When using this option, the programs can have 1 to 8 segments. First, program USEr 5 then program USEr 6. Next recall USEr 5 and then use the "°F or °C SELECT" key to display "16-S". Press "ENTER" to accept this option. Press "1" until the display shows "On". Press "ENTER" to activate the 16 segment option. Press "start" and the controller will fire USEr 5 until complete and then will fire USEr 6.

CnoS (Cone Offset) - Used to raise or lower the final cone temperature. The final cone temperature can be raised or lowered a maximum of 50°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 increases heat work
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 decreases heat work
9005	Lower the final cone temperature by 5°F " " "
9045	Lower the final cone temperature by 45°F " " "

This option does not affect the VARY-FIRE (Ramp-Hold) mode but it will show up on the menu.

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

Step	Press	Display	Comment
1	°F or °C SELECT	CnoS	If CnoS does not show on the display, press the "°F or °C SELECT" key until "CnoS" displays.
2	ENTER	Alternately flashing: ConE & #	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	0 7	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	ENTER	Alternately flashing: °F0S & 9000	°F OS and the previous offset setting alternately flash. Enter the new offset temperature using the rules above, in this example, "9020".
5	9 0 2 0	9020	The selected offset temperature is displayed. If you type a wrong number, press zero 4 times, then enter the correct number.
6	ENTER	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 alternating with IdLE.

CONE TABLE

The cone table is a list of pyrometric cone temperature equivalents. To look up a cone temperature, press the CONE TABLE key. The display will flash CONE and a number. Use the key pad to select the desired cone number (cone # 022 through cone # 10), then press the ENTER key. The display will flash the cone temperature then return to the IdLE condition.

PREVIEW

The PREVIEW key is used to review the parameters of the program that is currently in memory (the program that will be running if the START key is pressed). Simply press the PREVIEW key and the display will scroll through the program information then return to the IdLE condition.

ALARM

The alarm function simply turns on an audible signal (a beeping sound) at a predetermined temperature setting. To set an alarm press the ALARM key; the display will flash ALAR. Enter the desired temperature then press the ENTER key. To silence the alarm during operation, press the ALARM key.

BASIC CONTROL OPERATION

CONE FIRE MODE (SIMPLE AUTOMATIC FIRING)

In the CONE FIRE mode, optimal firing patterns for each cone number have already been programmed into the control**. Only three pieces of information need to be provided:**

1) The cone number required for the type of ware being fired.
2) The desired firing speed.
3) The hold time, if one is desired. Hold time is optional and is not needed under most firing conditions.

If no hold time is desired enter zero. The display now reads IdLE and the control is ready to execute the firing.

**** IMPORTANT: THE ZEROES IN A PYROMETRIC CONE NUMBER ARE A NECESSARY PART OF THE NUMBER. OMITTING THESE ZEROES WILL RESULT IN A SERIOUS OVERFIRE.***
(CONE O6 IS MUCH COLDER THAN CONE 6 !)

SETTING UP A CONE FIRE MODE PROGRAM:

1) Turn on the master power switch located below the control on the front of the kiln panel.
2) Press the CONE FIRE key; the display prompts you to enter a cone number. Use the 10 digit key pad to select the appropriate cone number (be sure to include the zeroes), then press the ENTER key.
3)The display now prompts you for a speed. Press the appropriate speed key located below the CONE FIRE key, then press the ENTER key.
4) The display now prompts you for a hold time (if needed). Use the 10 digit key pad to enter the desired amount of time, hours first (left of the decimal point), then minutes (right of the decimal point), then press the ENTER key. (see example below)

To set hold time of 1 hour and 25 minutes you would do the following steps:

Press 1	display shows 00.01
Press 2	display shows 00.12
Press 5	display shows 01.25

The following is an example of entering a CONE FIRE program for a firing at cone 06 at medium speed with no hold time.

STEP	PRESS	ACTION	DISPLAY / PROMPT
1	CONE FIRE	Selects CONE FIRE mode	ConE
2	06	Selects desired cone number	06
3	ENTER	Inputs (stores) new cone number	Spd
4	MED	Selects desired speed	MED
5	ENTER	Inputs (stores) new speed	HOLd
6	0	Selects desired hold time	0
7	ENTER	Inputs (stores) new hold time	IdLE
8	START	STARTS FIRING -ON- then temperature	

OPTIONS

ALARM

Before starting kiln program, to set an optional alarm setpoint press the ALARM key, then use the 10 digit key pad to select the desired temperature. Then press the ENTER key and the control will return to the IdLE condition. After starting a kiln program, your can program ALARM, then the kiln will return to temperature instead of IdLE after a few seconds.

PREVIEW

To review the program, press the PREVIEW key. The display will scroll through the parameters of the program then return to the IDLE condition.

CONE TEMPERATURE OFFSET

The CONE FIRE mode target temperature may be adjusted up or down by as much as 50°F. This may be used to affect the bend of the pyrometric cones if needed.

Each of the cone numbers (cone # 022 through cone # 10) may be independently adjusted for an increase or a decrease in target temperature.

To do so press the CONE FIRE key (when displaying IdLE), select 999 as the cone number, then press the ENTER key. Select the cone number to offset then press ENTER. The display will read °F or °C OS and the current offset value.

To raise the temperature enter 00, then the number of degrees of change (1-50) and press ENTER. To lower the temperature enter 90, then the number of degrees, and press ENTER. Then finish the remainder of the CONE FIRE profile.

The offset value will remain in memory and will not need to be reentered

STARTING THE PROGRAM:

Press the START key and the control will run the program. The display will first read ON, then will display the kiln temperature. At the end of the firing the display will flash CPLt and the run time. Pressing the STOP key will display the kiln temperature; pressing either the PREVIEW, CONE FIRE or the RAMP HOLD keys will return the display to the IdLE mode.

DELAY START: Warning; delay start should only be used for convenience while someone is present. It should not be used to start the kiln at a time after the kiln operator leaves the area. Press F/C key. Then press the number 3. The control will flash "DELA". Enter Hrs.:Min. Press the "ENTER" key. Then the kiln goes to IDLE. When you start your program by pressing the" START" key, the kiln will start after the delay time that was input. The optional exhaust fan starts when the program starts and works during the delay start period.

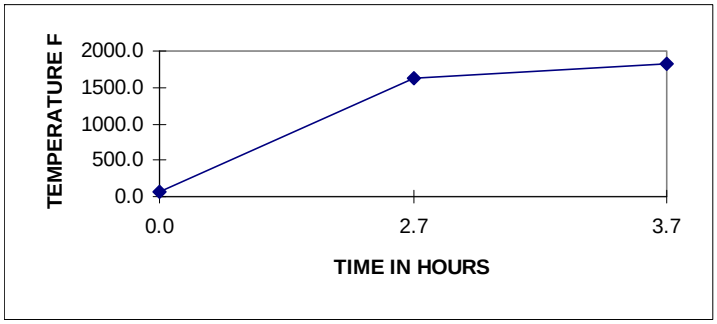
STOPPING THE PROGRAM

If it is necessary to stop a program while it is running simply press the STOP key. To correct an entered number, clear the display by entering all zeros, then reenter the desired value and press ENTER.

CONE FIRE PREPROGRAMMED FIRING PROFILES

The following are the firing profiles for the five speed options in the CONE FIRE mode.

FAST (cone 06 example)



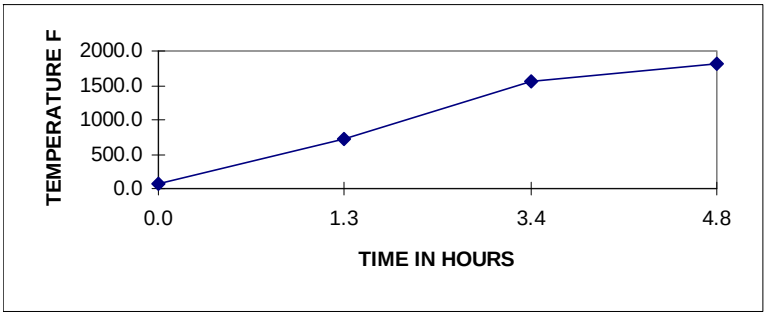
570°F per hour temperature rise until the kiln reaches 200°F below end setpoint (selected cone temperature), then 200°F per hour rise until the setpoint is reached. (Do not use this firing speed for firing above cone 05)

The segment profile chart for FAST is:

SEGMENT	RATE	TEMPERATURE	HOLD
1	570 °F	200 °F below setpoint	0
2	200 °F	setpoint	0

The firing time varies depending on the load and the cone selected. Because it takes time for moisture to evaporate from the ware and for chemical changes to occur, FAST is not recommended for thick hand made pieces.

MED-FAST (cone 06 example)

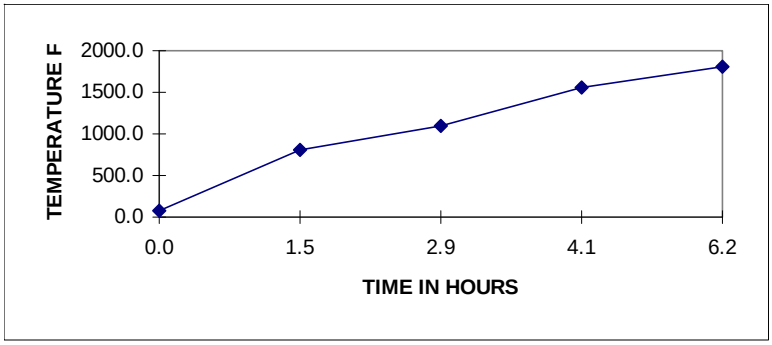


500°F per hour temperature rise until the kiln reaches 1100°F, then 400°F per hour until the kiln reaches the final 250°F of the firing, then 175°F per hour until the setpoint is reached. (Do not use this firing speed for firing above cone 05). The segment profile chart for MED-FAST is:

SEGMENT	RATE	TEMPERATURE	HOLD TIME (HH:MM)
1	500 °F	1100 °F	0
2	400 °F	250 °F below setpoint	0
3	175 °F	setpoint	

Firing time varies according to load density and cone selected.

MED (cone 06 example)



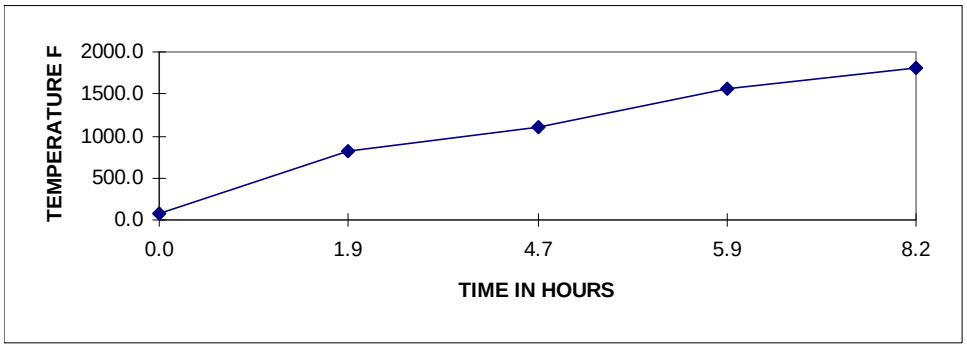
500°F per hour temperature rise until the kiln reaches 1000°F, then 200°F per hour until the kiln reaches 1100°F, then 400°F per hour until the final 250°F of the firing, then 120°F per hour until the setpoint is reached.

The segment profile chart for MED is:

SEGMENT	RATE	TEMPERATURE	HOLD TIME (HH:MM)
1	500 °F	1000 °F	0
2	200 °F	1100 °F	0
3	400 °F	250 °F below setpoint	0
4	120 °F	setpoint	

Firing time varies according to density of load and cone selected. Examples of the type of ware most often fired at this speed would be low fire glazes, thick greenware, or cast earthenware.

MED-SLOW (cone 06 example)



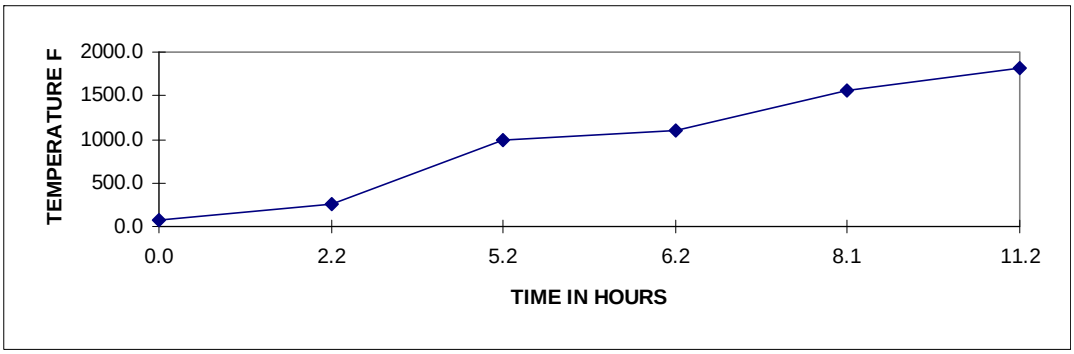
400°F per hour temperature rise until the kiln reaches 1000°F, then 100°F per hour until the kiln reaches 1100°F, then 400°F per hour until the final 250°F of the firing, then 108°F per hour until the setpoint is reached.

The segment profile chart for MED-SLOW is:

SEGMENT	RATE	TEMPERATURE	HOLD TIME (HH:MM)
1	400 °F	1000 °F	0
2	100 °F	1100 °F	0
3	400 °F	250 °F below setpoint	0
4	108 °F	setpoint	

Firing time varies according to load density and cone selected.

SLOW (cone 06 example)



80°F per hour temperature rise until the kiln reaches 250°F, then 250°F per hour until the kiln reaches 1000°F, then 100°F per hour until the kiln reaches 1100°F, then 250°F per hour until the final 250°F of the firing, then 80°F per hour until the setpoint is reached.

The segment profile chart for SLOW is:

SEGMENT	RATE	TEMPERATURE	HOLD
1	80 °F	250 °F	0
2	250 °F	1000 °F	0
3	100 °F	1100 °F	0
4	250 °F	250 °F below setpoint	0
5	80 °F	setpoint	

Firing time will vary according to the load density and cone selected. Thicker pieces, hand built, or hand thrown pottery, stoneware, and porcelain are examples of ware which would be fired at this speed.

RAMP HOLD MODE

The RAMP HOLD mode is used to create custom firing profiles. If the end firing temperature is to correspond to a pyrometric cone firing, that temperature can be retrieved from the cone table file or from the cone / temperature chart on page 26 of this manual. Keep in mind, however, that the temperature at which a given cone will bend varies according to the rate of temperature rise and the length of hold time as well as the absolute temperature. More on the nature and use of pyrometric cones may be found on the section on cones. It is essential to have an understanding of the properties of cones before creating custom programs based on temperature / cone setpoints. (The firing profiles in the CONE-FIRE mode are already preprogrammed for optimal firing curves for each cone.)

Since it takes time for heat to soak into a piece of ceramic ware, the faster the rate of temperature rise the more the internal temperature of the ware will lag behind the temperature in the kiln. For this reason, the last segment of a firing should approach the desired setpoint relatively slowly (no greater than 108 °F per hour) to allow the ware to absorb the heat and to prevent overfiring. (An analogy which might be helpful is to think of cooking a roast. If you roast it for a short time at high heat, it will be seared on the outside, but " rare" on the inside. If you roast it at a low heat for a longer time, it will be cooked uniformly throughout. Since ceramic ware needs to be fired uniformly throughout the piece, we must approach the final temperature slowly enough to allow the heat to penetrate the ware without overshooting.)

In RAMP HOLD mode there are six user files available. Each file holds one custom program in permanent memory. Each program may contain up to eight segments, and each segment has its own firing rate (degrees per hour of temperature rise), its own temperature setpoint, and an optional hold time.

Temperature rate is the number of degrees per hour you wish the temperature in the kiln to rise in an hour. Although the control will accept temperature rates from zero to 9999 degrees per hour, the kiln is limited by power available, voltage, element condition, and the load. The kiln can not heat at a faster rate just because you set the control to a rate exceeding its limitations. If you set the control for a rate faster than the kiln is able to heat, you will cause an overfire because the cone table in the control will set the temperature unrealistically high for a fast rate that is unachievable. A fast firing may have a temperature rise setting of 500 °F per hour for the initial segment, but the final segment should not be set higher than 108 °F per hour, or 80 °F per hour if firing to a temperature above cone 6.

Temperature is the number of degrees you wish to reach in that segment before either holding ("soaking") for a specified time or continuing on to the next segment. You may not exceed 2350 °F without damage to your kiln.

Hold is the amount of time you wish to "soak" the load at a given temperature before continuing on to the next segment. If no hold time is desired, program in 0. The highest possible hold time is 99 hours 99 minutes. In the display, numbers to the left of the decimal point represent hours; numbers to the right of the decimal point represent minutes.

CREATING A CUSTOM PROGRAM

1) To create a custom program, from IDLE press the RAMP HOLD key. The display flashes USEr and a number; select a user file number (1-6) to hold the program, then press the ENTER key.
2) The display flashes SEGS. Select the required number of segments (1-8), then press ENTER.
3) The display flashes RA 1. Select the heat up rate for segment #1 (measured in degrees per hour), then press the ENTER key.
4) The display flashes °F (or °C) 1; select the end temperature for segment #1 (maximum temperature is 2400°F), then press the ENTER key.
5) The display flashes HLd 1; select the hold time for segment #1(if necessary). Hold is an option. Leaving the time at 00.00 means that there is no hold time; a time setting of 99.99 means that the hold time is set to 99 hours and 99 minutes.
6) Repeat steps 3 through 5 for each additional segment.
7) The alarm function is also an option. Leaving the setting at 9999 means no alarm is set; otherwise select the desired temperature at which the alarm should sound. To silence the alarm, press the ALARM key.

To review the new program, press the PREVIEW key. To start the new program, simply press the START key.

STARTING AN EXISTING CUSTOM PROGRAM

To start an existing (previously programmed) custom program, from IDLE press the RAMP HOLD key. The display reads USEr. Select the file user number of the program to run, then press ENTER. The display reads SEGS. Press STOP. To check the program press the PREVIEW key, otherwise press the START key to run the program.
the controller is preloaded with six Ramp-Hold user programs that can be recalled at any time.those programs are:
User 1is a glass slumping program.
User 2 is a glass tack fuse program.
User 3 is a glass full fuse program.
User 4 is a glass bead-annealing program.
User 5 is a lost-wax burnout program.
User 6 is a slow cooling cycle that can be added to the end of a cone firing with a 16 segment option.
If you create a customprogram on the Ramp-Hold file, then you can recall the six preloaded programs by going into the hidden menu. To do this press °F or °C select key until REST appears on the display the press 4,4,3 NOTC will be displayed. Press F or °C select key until REST appears on the display, press enter and that willrestore the six preloade programs.

The following is an example of a custom firing profile. To fire at a 300 °F rise per hour up to 1600 °F; at 108 °F rise per hour up to 1900 °F with a five minute hold time and an alarm to sound at 1800 °F, use these steps:

STEP	PRESS	ACTION	DISPLAY / PROMPT
1	RAMP HOLD	Enters RAMP HOLD mode	USEr
2	Number (1-6)	Selects desired user file number	1
3	ENTER	Inputs user file number	SEGS
4	Number (1-8)	Selects number of firing segments	2
5	ENTER	Inputs number of segments	rA 1
6	Temperature (1-9999) 300	Selects temperature rate of rise per hour for first segment	300
7	ENTER	Inputs rate of rise	°F 1
8	Temperature (1-2350) 1600	Selects end temperature for first segment	1600
9	ENTER	Inputs end temperature for first segment	HLd 1
10	Time in hours and minutes 00.00	Selects hold time at end of first segment	00.00
11	ENTER (zero for this example)	Inputs hold time for segment 1	rA 2
12	Temperature (1-9999) 108	Selects temperature rise rate (2nd segment)	108
13	ENTER	Inputs rate of rise	°F 2
14	Temperature (1-2350) 1900	Selects end temperature for segment 2	1900
15	ENTER	Inputs end temperature for segment 2	HLd 2
16	Time in hours and minutes 00.05	Selects hold time at end of second segment (five minutes for this example)	00:05
17	ENTER	Inputs hold time of five minutes for second segment	ALAr
18	Temperature (1-9999) 1800	Selects temperature that alarm will sound	1800
19	ENTER	Inputs alarm temperature	CPLt
20	START	Starts the program in action	

Before entering your custom program, create a chart to show the three components of each segment you wish to use. You may have up to eight segments in your program, though you may choose to use fewer segments.

SEGMENT	RATE in degrees per hour	TEMPERATURE	HOLD TIME (hh:mm)
1			
2			
3			
4			
5			
6			
7			
8			

Segments of custom programs may be used to ramp the temperature down and cool the kiln more slowly, if desired, than it would if the kiln were turned off at the highest setpoint.

To change one value in a complicated RAMP HOLD profile without having to reenter the entire program simply press ENTER to move through each value you wish to keep the same until you reach the one you wish to change. Then enter the desired value, press ENTER, and continue.

To change a firing profile while the firing is in progress, press STOP. Use either CONE FIRE or RAMP HOLD to enter new instructions for the remainder of the firing profile. Then press START to continue.

ERROR CODES

The following are error codes that may appear in the display window if the controller diagnoses a problem. If this occurs, please reset the control by turning the power off, then on. If the problem continues call your dealer or Cress tech support line at 775-884-4397.

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 degrees 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 temp. Persists > 18 sec.
Err3	During a hold segment the temperature is more than 50 degrees below the hold temperature which was set. The temperature must stay 50 ° below this set temperature for 18 seconds before the error is displayed.	Hold segment > 50°F below set temp. Persists > 18 sec.
Err4	The temperature is more than 50 degrees 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 temp. Persists > 18 sec.
Err5	The temperature is more than 50 degrees below the local set-point 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 temp. Persists > 18 sec.
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 degrees above the local set-point 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 temp. Persists > 18 sec.

Err8	When using the Cone Fire Mode, the temperature is decreasing during the last ramp segment. indicating the a kiln sitter has turned the kiln off.	Cone fire mode only Temp. 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.	
ErrE **Or** **Errt**	A hardware error has been detected by the controller software. The controller must be returned for service.	Hardware error
Errd	Zone controller error. One of the zones is more than 100 degrees F above the travelling set point.	Normally caused by an output or t/c switched to the wrong zone or a stuck relay
ErrA	Invalid program variable.	Reprogram; if problem persists have board sent in for service
StUc	Key was held too long or is stuck	If problem persists after releasing key have key pad replaced
FAIL	Steady display all t/c's have failed. If flashing tc x / fail then the x t/c of a zone control kiln has failed.	Change t/c

PREPARATION FOR FIRING

Before loading the kiln, there are several things you should do to prepare for a firing:

Remove all dust and chips that may have resulted from shipping (or previous firing). A small vacuum cleaner is very useful in keeping your kiln clean. Dust in the kiln could cause imperfections in glazed ware.

Prepare a small amount of kiln wash. Kiln wash is a refractory material that prevents glazed pieces from sticking to shelves. It is usually purchased as a dry powder and is then mixed with water to the consistency of skim milk. Use only high fire kiln wash. Clean all your new shelves, then kiln wash only the top side of each shelf and the floor of the kiln, applying with a paint brush. This will seal the dust and prevent glazes from adhering to these surfaces. Apply a paper thin coat, or it may chip off. When the kiln wash wears off, bare spots only should be recoated keeping the kiln wash thin but the top of the shelves covered. If glaze has dripped onto shelves, chip it off, smooth and re-apply kiln wash to these areas. Sandpaper may be used to smooth these small areas before reapplying kiln wash. CAUTION: Do not coat the sidewalls, lid or bottom of shelves. Take care to keep kiln wash off of the elements to avoid burning them out.

Plug the kiln in, making sure that the cord does not touch the kiln case which will become hot during firing.

KILN BREAK -IN

The purpose of the first (break in) firing is to get rid of any moisture in the kiln, and to burn off the protective coating on the elements. (This will produce some smoke) Be sure to read all safeguards (page 2) and study directions on firing before you test fire your kiln. We recommend firing the kiln with the shelves and posts but empty of ware to cone 05.
This firing will produce a good oxide coating on the elements which will help protect them and increase element life.

We do not recommend firing ware in the first kiln firing (the fumes could be hard on the unprotected elements). The first firing will test the shelves, a very small percentage of which may crack on the first firing. (Test firing shelves is a wise precaution for any new shelves.)

LOADING

Careful loading of ware in the kiln is important for satisfactory results. You need to plan the placement and distribution of the items to be fired. Careless, hurried loading might result in mishaps which could ruin hours of work. Also be sure your hands are clean since dirt or oil may contaminate colors or affect the finish of your ware.

Remember that the insulating firebrick used in ceramic kilns is soft and fragile. Care should be taken to avoid damaging the liner when loading (or unloading) the kiln. After several firings the brick may show fine cracks, particularly if the kiln is fired to high temperatures (such as cone 6). This is normal and will not effect the function or structural integrity of your kiln.

The lid brace locks the lid in the open position for loading and unloading the kiln. Pull the lid up until the lid brace engages the slot on the arm, then lower until the lid is solidly braced before letting go. To unlock, pull the lid brace arm up while raising the lid a few inches, then lower the lid past the locking slot and gently close the lid. Do not drop the lid, as the firebrick is fragile.

Make sure that any ware you put into your kiln is bone dry (not cold to the touch). If pieces are hand molded make sure that no air pockets remain in the clay. This causes small “explosions” when fired, since the air expands and the moisture turns to steam. Hollow out the solid pieces whenever possible. Thick solid pieces can be fired safely only at very slow heating and cooling rates. Solid pieces tend to crack and break more easily during firing than hollowed pieces.

Your kiln is designed to provide as uniform a heat as possible throughout the firing chamber. The kiln should be loaded in a balanced manner; mix heavy pieces and light pieces. When firing in the same load, light and heavy ware should be alternated on the same shelf and distributed throughout the kiln to help the kiln heat evenly. This will assure that all pieces receive the same heat treatment.

Your ware will fire more evenly if you allow for sufficient air circulation around pieces. If it is necessary to place pieces on the floor of the kiln, it is recommended that you stilt them to allow for air circulation underneath. It is best to fire with a shelf at least 1/2" off the floor of the kiln.

Never place ware closer than 1/2" from the elements in the kiln. One inch is preferable. Place large, flat pieces that take up the full width of the kiln so that their edges are between element grooves. This will prevent the edges from heating up before the center of the piece, causing possible damage by cracking from uneven expansion. To prevent unstable objects from falling during firing use stilts to make sure they do not wobble. Take care that stilts will not strain rims and other delicate areas.

It is important to always place shelves so that there is at least one element groove between shelves or between a shelf and the lid. This will allow each compartment to heat evenly up to the proper temperature. WHEN PLACING POSTS, LINE THEM UP SO THAT EACH POST IS DIRECTLY ABOVE THE POST BELOW TO PREVENT STRESSING AND POSSIBLE WARPING OF SHELVES. POSTS MUST RUN IN COLUMNS THROUGHOUT THE KILN.

Remember when loading to place a large (witness) cone behind each of the peepholes for each firing so that you can monitor the progress of that firing. For an accurate reading, cones should be placed 2" to 3" behind peepholes to avoid a cooling draft. For more information on cones and their use, see the section on pyrometric cones.

There are variations in loading techniques depending upon the type of ware being fired. The following are recommendations for loading different kinds of ware.

Loading Bisque

Low fire ceramic greenware pieces will not adhere to each other when fired, therefore they may touch one another. They may be stacked and set directly on shelves without sticking. In some cases they may be nested or placed on top of one another, if the weight is evenly distributed on the piece below. Do not, however, place a heavy piece upon a small piece or the weight may cause the lower piece to warp or crack. Tile and large flat pieces should be fired flat on a shelf so they do not warp. Slow firing is required in such cases because the shelf mass effects the temperature uniformity across the flat piece. Strain on any delicate portion of a piece could result in distortion. Fire bisque items with their lids in place to assure a good fit. Remember that although low fire greenware pieces may be touching there must still be enough room for sufficient air circulation around pieces for even firing results.

Loading for glaze firing

Glaze is finely ground glass suspended in a liquid. Two glazed pieces, if allowed to touch each other will adhere to one another when the glazes melt and re-solidify. Glaze will also adhere to the kiln or kiln shelf. Therefore stilts are used when firing most glazed pieces. Stilts are small ceramic or pointed metal supports; a wide variety is available. In some cases a piece may be dry footed (the base left unglazed). Be sure that the glaze is not applied too heavily, or it may “run” and stick to the shelf or the bottom of the kiln.

Remember to prepare the kiln with kiln wash, as described earlier, especially when firing a glaze to prevent any glaze from permanently adhering to the kiln bottom or shelves.

Glazed pieces should not be placed closer than 1/2" to one another since glaze bubbles before it smoothes to its final surface. Bubbles and fumes from this process will contaminate adjacent pieces if spacing is not at least 1/2". We do not recommend that glazed pieces and bisque be fired in the same load, since they are normally fired at different temperatures and since this could cause discoloration. Bisque is normally fired one cone hotter than the same piece when glazed fired.

Do not stack or nest glazed pieces. Do not fire glazed pieces requiring lids with the lids in place as they will stick together permanently.

Loading Overglaze, China Paint, Lusters, and Gold

Loading for overglaze pieces is the same as for your glazed ware, except that lusters should be spaced at least 1" apart to avoid cross contamination.

Loading stoneware and porcelain

It is necessary to fire stoneware and porcelain at a much higher temperature than that used for low fire ware or glaze. At this heat the ware becomes much softer than ceramic bisque. For this reason it may stick to other pieces and so should not be stacked or nested. It will also tend to distort in shape unless the maximum temperature is accurately controlled and the piece is properly supported. Hollow greenware pillars made of the same material as the ware are often used for support so that the expansion and shrinkage of the support is the same as that of the ware. Do not support high-fire ware on ordinary stilts. Often simpler shapes are supported by a reusable “setter” shaped for a particular piece. Do not place ware closer than 3/4" from the elements to avoid uneven heating and distortion of the piece.

Glazed porcelain and stoneware pieces, because of the high temperatures used, are always dry-footed to prevent them adhering to the shelves.

Use high fire kiln wash. Some prefer to load stoneware unto surfaces sprinkled with silicaflour, sometimes called “flint”. Keep “flint” away from the elements - it will cause them to burn out.

Loading glass

Do not fire small thin pieces of glass and large thick pieces in the same load. Glass sagging is very sensitive to variation in temperature. Load only one or two shelves; keep the bottom shelf 3" or more off the kiln floor and keep glass pieces at least 3" or more from the kiln top. Do not crowd pieces at any time. Terra cotta molds, dusted with whiting (calcium carbonate) to prevent the glass from adhering to the mold, are used in sagging sheet glass to shape. Do not use ceramic bisque molds for sagging glass.

PYROMETRIC CONES

The most widely used method for monitoring the temperature achieved inside a kiln is the pyrometric cone. A cone is a small elongated pyramid shaped indicator made of ceramic material which is formulated to melt when subjected to a sufficient amount of heat. It does not indicate temperature per se but the effects of temperature over a period of time. Cones react very similarly to the ceramic ware, since they are similar in composition. They deform as a result of the influence of heat, time, and kiln atmosphere, revealing what is happening in the kiln and when the proper firing temperature has been reached.

A whole series of cones is available (see cone number - temperatures chart), made to melt at different temperatures. Cones are available in two sizes. The large (senior or witness) cones may be used at any location in the kiln to check temperature uniformity and firing progress. Small (junior) cones are used specifically in kilns equipped with Kiln Sitter^{R} mechanical shutoff devices.

It is a good idea to make use of witness cones during firing, especially if exact temperatures are critical. They are helpful both during the firing, allowing you to check on how the firing is progressing and enabling you to turn the kiln off should maturity be reached before the kiln shuts off, and after the firing, when you can make notes of the results to use in adjusting the programming and increasing the accuracy of future firings. Witness cones also monitor the accuracy of the thermocouple, which may degrade over time and eventually need replacing.

Always use a large cone of the number corresponding to the maximum desired temperature behind each peephole during every firing in order to monitor firing progress and check the operation of the control. Place the cone 2" to 3" behind the peephole to avoid cooling drafts and obtain an accurate indication. Do not unplug the lower peepholes for more than a few seconds to avoid creating a convection draft which can cool the cones and shock the ware. Do not place the cone too close to the elements. Be sure to position it so that you will be able to see the tip when it bends and so that it will not contact any ware when it bends. At high temperatures it is difficult to see the cones; using dark glasses when looking through the peephole may help.

It is important always to stand pyrometric cones at the pre-cut angle provided by the base of each cone; this should be approximately 8 degrees away from vertical in the direction the cone is expected to bend. Setting the cones consistently at this angle assures that each cone (of the same number) will bend at uniformly the same temperature. Cone plaques or wire cone holders are commercially available. Holders may also be made from brick or clay. Holders made from fire brick are generally reusable and trouble free. Standard cones may also be purchased with wider self-supporting bases.

Periodically view the witness cones during firings. The kiln should shut off at about the time the cones bend to a 90 degree angle. This cone will continue to bend a little after the kiln is shut off as the cooling is slow. This effect is more dominant at lower cone numbers.

Placing at least one cone (more if you wish to check temperature uniformity) in each firing, even if not visible from a peephole, is a good idea since noting its condition when you unload the kiln will confirm that the load was properly fired.

An excellent way to check the temperature on any shelf in any location in the kiln is to use a cone plaque containing three large cones. One is for the desired maximum firing temperature. The other two should be numbered above and below the firing cone. For example, if firing to cone 06, use a cone 05, 06, and 07. These are often referred to as the guide cone, firing cone, and guard cone. The lower temperature (guide) cone bends as a warning that the desired temperature will soon be reached. The firing cone should bend until the tip is at a 90 degree angle, and the guard cone, if bent too far, signals overfiring.

Be sure to keep pyrometric cones bone dry so that they will not crack in the kiln. Once dropped, roughly handled or exposed to moisture, cones develop small cracks which tend to make them bend prematurely and give an inaccurate temperature indication.

The cones generally used in firing clays and glazes in pottery work are numbered ranging from 07 to 04. A very common one which works satisfactorily in most cases is 06. Cones used to fire china paint, gold, and decals range from 015 to 019. Cone 4 to cone 6 is used for porcelain. Stoneware may be fired to cone 8 or cone 10. All clay and glaze manufacturer's recommend the correct heat treatment for their products. Clays and glazes do vary, so check labels or ask your local ceramic supply dealer for advice on the proper cones to use, since he knows the characteristics of the clays and glazes he handles.

FIRING

A kiln is designed to produce the extremely high temperatures necessary to chemically alter ceramic materials. Use caution and common sense to avoid burns when the kiln is in operation, since the kiln surfaces will be hot. It is therefore imperative that you read and observe all safety precautions.

Safety cautions

Do not leave the kiln unattended, such as firing over night. Even though your kiln has an electronic control, it is advisable to use a large cone visible through the peephole to check firing progress. Check witness cones at (1) hour intervals through firing, at the expected shutoff time and every half hour thereafter until the cone is properly bent or the control has turned off. Always check to see that the control has operated correctly. Always monitor the progress of each firing.

Never open the lid while the kiln is firing. This could cause serious burns as well as damage to the ware and kiln. After firing always allow the kiln to cool with the lid closed until it is cool enough for you to unload it with your bare hands.

A two position lid prop is provided. The highest lid prop position is used for normal venting at the beginning of the firing cycle. It operated simply by rotating a prop to engage the catch mounted on the lid. After the kiln reaches 1000 degrees F, release the prop by raising the lid by the handle (use protective glove) so that the prop swings out of the way, and gently lower the lid. The lowest lid prop position is used for the later portion of the firing cycle for china, lusters, and gold firing to obtain the best results.

The peepholes, as the name implies, allow you to look into the kiln and, along with witness cones placed on the shelves, to monitor firing progress. In most instances, the kiln is fired with the lower peephole plugs in place and the top most peephole open.

Firing Speed

The main consideration for firing speed is that you should not fire faster than the ware will absorb heat, and you should not cool faster than the ware will release heat. A specified amount of heat over a certain amount of time is necessary to produce the chemical changes that result in a finished piece. Firing and cooling rapidly will result in stressing and even cracking or crazing the ware due to uneven expansion. Very thick pieces, such as hand molded sculptures, require very slow heating and cooling. Slow heating also allows moisture to escape without damaging the ware, and slow cooling allows glazes, which may bubble when gases escape during the vitrification process, to return to a smooth finish.

The maximum degree of heat and the length of time necessary vary widely according to many factors such as the type of ware (porcelain, earthenware, stoneware, etc.) or glaze, paint or decal, the thickness of the piece, the size of the load being fired, the voltage available and the condition of the elements.

Remember that during firing you will not endanger your ware by turning the kiln off before maturity. If you ever hear pieces cracking or falling, or if your kiln has been jarred, turn the kiln off. Wait until it is cool, then open and check for problems that may have developed. Replace all cones with new ones before firing again.

Element life varies depending upon the frequency and temperature of firings. They will last for many firings if treated properly. Keep the element grooves free of debris of any sort which will eat through the element and cause it to burn out. Also keep in mind that after repeated firings elements become brittle and will break if struck or scraped. Do not fire your kiln hotter than the temperature for which it is rated.

Venting

Conventional venting consists of propping the lid during the first part of the firing cycle and firing with the top peephole unplugged to allow fumes to escape. The optional Cress Fanfare kiln exhaust system is an excellent way to provide ventilation and has many advantages. Besides removing fumes coming off the ware from the kiln room and eliminating the need to prop and then lower the lid during firing, the Fanfare increases temperature uniformity, provides for less cross contamination of colors during glaze firings, and achieves the clearest, brightest and purest colors possible.

Firing Glass

Glass is very sensitive to variations in temperature of only a few degrees. Glass must be allowed to pass through the lower temperatures slowly to prevent shattering, then it may be fired rapidly up to temperature (firing rapidly at this point helps preserve colors). Glass softens quickly once the critical temperature is reached and sagging begins (usually approximately 1500 ^{O}F for glass slumping); it is wise to check it often at this point (at 10 minute intervals) and when it has slumped properly, turn off all switches, crack the lid at the lower lid prop position for up to ten minutes to prevent over softening of the glass, then close the lid and allow to cool completely.

Glass is slumped onto terra cotta molds dusted with whiting (calcium carbonate) to prevent sticking. Be sure to the glass loading section.

Firing charts

It is a valuable practice to keep a written record of each firing, noting the settings (even the degree of deformation of witness cones and their locations.) This firing chart allows you to repeat good results and successful firings and avoid repeating less than satisfactory firing results.

AFTER FIRING

When the firing cycle has been completed, the display will read CPLt. If you need to monitor the temperature as the kiln is cooling, press "stop", then turn the power switch off at the end of the cooling. Otherwise turn power switch off when the display reads CPLt.. Allow the kiln to cool naturally, and do not open the peepholes or prop the lid (unless working with glass, metallics, or lusters in which case some special venting techniques may be necessary) until the kiln has cooled to at least 130 ^{o}F and you can unload it using your bare hands. If the kiln is opened prematurely, the ware and even the kiln could be damaged. You should expect the cooling period to take at least twice as long as the firing cycle took to complete.

FIRING FOR BEST RESULTS

- Don't try to hurry the firing or cooling of your ware. It can absorb and release heat only so fast without damage to the ware. Slow heating and cooling rates add quality and minimize crazing, cracking and breakage problems. Let the kiln cool at least over night, then crack the lid and let pieces cool until they may be handled with bare hands. If this suggestion is not observed you will put permanent stress in your pieces making them weaker and more subject to breaking and crazing.
- Watch firings closely to protect from overfiring. Firing too hot will damage fine detail and fade colors.
- Keep the inside of your kiln free from dust and chips, which cause imperfections in pieces. A vacuum cleaner is useful in this regard.
- Always fire only bone dry ware.
- A cone plaque containing three cones (guide cone, firing cone, and guard cone- see section on pyrometric cones) is often useful as a monitoring and warning device. Always place witness cones uniformly at an 8 degree angle from vertical.

RECOGNIZING FIRING FAULTS

Blotchy bisque is likely to be caused by stacking too compactly, not allowing for sufficient air circulation during firing which results in uneven firing. Try loading more loosely and refiring.

Warped bisque may be due to one the following causes:

- Overfiring.
- Placing ware too close to the elements.
- Stressing delicate area by improper support.
- Removing ware incorrectly from the mold.

Failure of glaze or underglaze to adhere to the ware (crawling glaze) can be attributed to one of the following causes;

- Dirty bisque surface. Dust and skin oil are the most common offenders. Try to clean, recover and refire the ware.
- Damp bisque. Allow to dry completely, then reapply and refire.
- Underfired or overfired bisque. If underfired, refire to proper cone, then reapply glaze and refire. Overfired bisque becomes too hard to absorb the glaze media.
- Too thick a coating of underglaze.
- Incompatibility of glaze and/or underglaze and ware.
- Your ceramic supply dealer can best advise you on clays and glazes that are compatible (expand and shrink at the same rate and do not chemically ruin each other.)

Puddling and rippling of glazes is caused by applying an excessively thick coating of glaze. If this effect is not desired, merely coat pieces more lightly on future ware.

Dropping glazes on vertical surfaces is caused by overfiring glaze and by excessive glaze thickness.

Shiny surface on a mat or textured glaze can be attributed to overfiring. Also textured glazes are often applied too thinly. If this is the case. reapply and refire to the proper cone.

Cloudy appearance can be caused by dirty brushes, by placing the piece too close to the elements, by too heavy an application of glaze, or by placing pieces too close to one another in the kiln, resulting in cross contamination.

Discolored glazes are often caused by one of the following reasons;

- Contamination of glaze by chemicals in the ware, especially if one-fired.
- Dirty brushes.
- Loading pieces too closely, causing cross contamination of glazes by fumes or bubbles.
- Placing pieces very close to the kiln elements, creating hot bands across the piece due to direct radiation from the elements. This can leave a band of slightly faded glaze across the piece.
- Overfiring. Too high a heat will frequently cause colors to fade.
- Glazes applied directly to the greenware.
- Incompatibility of colors.

Pinholes, bubbled glaze and craters may be attributed to one of several causes;

- Immature bisque. If your bisque is not fired hot enough to complete the vitrification and remove all vapors from chemical reactions that come from the ware, they may erupt into the glaze.
- Dust on the ware or in the kiln.
- Firing too rapidly.
- Cooling too rapidly. Craters are sometimes formed by cooling the ware too rapidly, which freezes the crater formed when the glaze bubbles. You can try merely refiring to minimize the effect of these defects, or you may apply a thin coat of glaze and refire to the proper cone which may correct the problem.

Faded decals are usually due to under or over firing. Check the manufacturers' recommendations and refire underfired ware to the proper cone.

Trouble with reds is common; they are quite sensitive and often they appear faded or contain washed out areas or dark spots. Probable causes and corrective measures (where possible) are listed below:

- Too thin a coating of the red glaze. Try reapplying a thicker coat and refiring.
- Overfiring. Reds are generally fired to a temperature ranging from cone 07 to cone 06. They do not do well at greater heats.
- Incompatibility with other colors. Some colors (such as green and yellow) due to chemical composition tend to make achievement of bright reds difficult. If you suspect this problem, ask your ceramic supply dealer which glazes may be used with his reds.
- Insufficient air circulation during firing. This usually results in black spots. Reds need sufficient oxygen to mature. Try leaving peephole plugs out until true red (no pun intended) heat has been reached.
- Soaking too long at maximum temperature.

Cracking and crazing (crazing is characterized by many very fine cracks running throughout the glaze surface) may be caused by one or more of the following reasons;

- Entrapped moisture. Make sure greenware or bisque is bone dry before firing.
- Internal stress due to rough handling.
- Too rapid or uneven heating or cooling (especially in heavy, thick pieces.) If this occurs, then all of the piece does not expand or contract at the same rate, resulting in stress which is released by crazing or cracking. You can usually tell if a glaze cracked during heating or during cooling by carefully examining the crack. Smooth rounded, and/or sealed cracks indicate crazing during the heating phase & sharp angular edged or separated cracks indicate too rapid cooling (possibly a draft from opening the lid or peephole too fast). If you suspect you are firing at too fast a rate for your ware to properly absorb the heat, the following is a useful check. Place a cone on a shelf in the middle of the load. Put a bisque bowl over it, and fire as usual. Afterward compare this cone with the witness cone you used for the firing. If it is not deformed to the same degree, you are firing too rapidly for the weight of the load.
- Incompatible clays and glazes. Check with your dealer for compatible materials. Crazing may often be minimized by refiring slowly to a slightly higher temperature than that to which the ware was previously fired.

Delayed crazing (crazing which does not develop immediately but may appear months after firing) is the result of internal stress, usually caused by too rapid cooling (which may seem very slow to the hobbyist). Permanent internal stress combined with a small jolt, or vibration, can crack the piece months after firing. If delayed crazing is a problem, try refiring to the proper temperature and cooling very slowly. Do not open the lid or peepholes during the cooling period.

KILN MAINTENANCE

You can protect your kiln and add many extra years to its life by using this maintenance guide. Before each loading:

Visually check kiln and its furniture.

Remove glaze spots on shelves, posts, kiln bottom or kiln sidewalls.
Clean kiln by removing chips and dust. A vacuum cleaner works well for this purpose.

Check kiln shelves for cracks. Sand any rough spots on shelves and recoat with kiln wash. Also recoat areas where the kiln wash has worn off. Avoid thick kiln wash layers. There is no need to kiln wash shelves every time you fire.

Kiln wash floor where it has worn thin. This may not be required every firing. Sand rough spots, recoat. Keep a smooth layer not over 1/16" thick. Kiln wash built up to a thick layer may damage kiln floor by pitting due to differential thermal expansion.
Whenever possible, use a clean kiln-washed shelf on the kiln floor to protect it.

Keep the outside of the kiln clean. It is easier to clean before burning contaminants onto the stainless jacket. Use glass cleaner when kiln is cool.

RARELY NEEDED MAINTENANCE

Lid Brace: Be aware of lid brace operation every time the kiln is fired. Replace lid brace if it becomes bent, or does not function perfectly. WARNING - Do not use kiln if lid brace is not in perfect operating condition.

Lid Band: Tighten lid band when necessary. The normal differential expansion and contraction of the brick and lid band cause a gradual loosening of the lid band.

Stainless Steel Case: Ordinarily the case does not need tightening from normal use, but tighten if needed.

Push button power switch light: Replace switch if light fails, is damaged or fails to operate.

Cord: Check the cord every month for heating. If cord becomes hot during firing, replace cord and wall receptacle. Check cord for heat near wall plug after the kiln has been firing for over three hours. Have a licensed electrician replace the cord with a CRESS cord and receptacle to make sure the heat specification as well as the amperage and voltage specifications are met. Do not unplug by pulling on cord; pull on cord cap only when unplugging.

Improved Hardware Features

1. **Fourteen segment displays –** Improvement from the seven-segment displays on the SMT 600. All letters can be represented on these displays; some messages will change from the SMT 600 to SMT 700 design.

2. **Selectable thermocouple type** – Improved accuracy and increased resolution of the analog-to-digital converter allows one board to accept multiple thermocouples. The SMT 700 software requires both a keypad setting and a jumper change on the rear of the circuit board to change the thermocouple type. The jumper selection is a precaution to prevent a software change of thermocouple type without accessing the back of the controller to also change the extension wire and thermocouple.

3. **Added filtering –** Filtering on the power inputs, control outputs, thermocouple inputs, and keypad inputs will decrease the susceptibility of the controller to damage or erratic operation due to static electricity, RF interference, and power line spikes.

4. **Five outputs –** This is an increase of one over the number of outputs on the SMT 600 board. The outputs include the three zone outputs for temperature control with high current transistors, a safety output to power a safety relay and a programmable output for controlling a fan, an alarm, floor elements or lid elements. The safety output and the three switching outputs are still controlled by a capacitor-coupled control signal to prevent a stopped microprocessor from latching an output in the on condition.

5. **Voltage and Current Measurement** – The output voltage of the transformer is used to calculate the line voltage. Each board must be calibrated when it is installed on the kiln (usually at the factory). The amperage reading requires a current sensor that clips around one of the power cord's hot wires. The default range for the calibrated sensor is 50A. For larger kilns the controller can be adjusted for a higher range sensor.

6. **Microprocessor with flash memory and on-chip analog-to-digital converter -** Motorola's 68hc908gp32 microprocessor's phase-locked-loop clock system decreases the chance of reset due to outside electrical noise. It has increased memory to allow added software functions as well as added inputs to take advantage of features such as current sensing.

7. **RS485 communication to allow connection to a personal computer** – The optional KISS software can be used to graphically track a firing, program the controller, or monitor the kiln remotely.

8. **Larger EEPROM memory to allow storage of preset Ramp-Hold programs** – The controller has six preset Ramp-Hold programs stored in EEPROM that can be recalled at any time.
    a. User 1 is a glass slumping program
    b. User 2 is a glass tack fuse program
    c. User 3 is a glass full fuse program
    d. User 4 is a glass bead-annealing program
    e. User 5 is a lost-wax burnout program
    f. User 6 is a slow cooling cycle that can be added to the end of a cone 6 firing with the 16-segment option.

IMPROVED SOFTWARE FEATURES

1. PROGRAMMABLE COOL DOWN SEGMENT ADDED TO CONE FIRE PROGRAMMING - Enabling the cool option in the hidden menu, allows an additional segment to be added to a cone profile. This satisfies the need of many cone 6 glazes to have a slow cool down after reaching the top temperature.

2. CONE FIRE PROGRAM TRANSITIONS TO A RAMP HOLD PROFILE - Using the 16-segment option in conjunction with a Cone-Fire profile gives the crystalline glaze artist seven segments after the top temperature to grow more crystals. It can also be used for a cooling program for cone 6 glazes.

3. WRITE YOUR OWN CONE-FIRE PROFILE - Use the Ramp-Hold programs to write your own Cone-Fire profile by using the CONE TABLE key to specify the top temperature for the profile and which segment the cone correlation function will be performed. Additional segments after the "cone segment" can be used but must have soak temperatures less lower than the cone temperature

4. PREVIEW BUTTON STEPS BACKWARDS DURING RAMP HOLD FIRING - If you make a mistake or want to review one of your previous entries in a Ramp-Hold program, simply press the PREVIEW key to back up to the previous entry.

5. PREVEIW KEY STEPS BACKWARDS IN THE °F OR °C SELECT MENU - Pressing the PREVIEW key while navigating the "other" menu will act as a back key. The user may press this key to return to the previous menu option without the need to cycle all the way though the menu.

6. TWO-KEY START - The two-key start sequence is a option to prevent an accidental start of the kiln because of a stuck key or inadvertent key press. This option is enabled in the hidden menu. To start the kiln press START and ---- will be displayed. Press ENTER and the controller will start the firing.

7. FULL POWER RAMP - A full power ramp will be enabled if a ramp rate of 9999 degrees per hour is programmed. At the start of a full power up ramp the elements will continuously be on until the soak temperature is reached. At temperatures 50 degrees less than the programmed soak temperature the elements will begin to cycle to minimize overshoot. A full power ramp is the quickest way to reach a specified temperature.

8. FIRING COUNTER - The firing counter will help the user to keep track of the number of firings on their kiln and to help plan routine kiln maintenance. It is incremented five minutes into each firing. The number of firings can be viewed during a program review after the word FIRE.

9. ADJUSTABLE CYCLE TIME - The cycle time is the length of time between an element turning on two consecutive times. Using a short cycle time may improve temperature control while using a longer cycle time may improve relay life. Cycle time can be programmed anywhere in the range of 10 seconds to 60 seconds. For mechanical relays the default cycle time is fourteen seconds.

10. TWO HUNDRED MILLISECOND CYCLE TIME - Using both solid-state relays and very short cycle times can have beneficial effects on element life and temperature control. Programming a cycle time of zero will set up the controller to operate with a 200 millisecond cycle time. This feature will work only if the kiln is equipped with solid-state relays.

11. HOT KEYS DURING FIRING - These keys can be pressed at anytime during the firing.

a. REVIEW PROGRAM will show the current program.

b. VIEW SEGMENT will show the current segment, traveling set point and circuit board temperature.

c. The ALARM key will allow the reprogramming of the alarm to either a low or high temperature alarm.

d. Pressing the 5 key will display the current rate of temperature rise in degrees/hour.

e. Pressing the 7 key will run the amperage diagnostic routine displaying the amperage rating for each section of the kiln. If the kiln is not equipped with the optional current sensor all amperage readings will be zero.

f. Pressing the 8 key will activate the 1000's, 100's and 10's decimal points to be pilot lights. The 1000's decimal point represents that output one is currently on, 100's output two, and 10's output three.

g. Pressing the 0 key will display the time that has elapsed since the start of the firing.

12. IMPROVED LAG FUNCTION FOR ZONE CONTROL - The ramp rate now determines the LAG. If one section lags behind the traveling set point by more than one LAG value then the rate of rise of the traveling set point is slowed as shown in the table. This allows the tightness of control to be balanced against speed by setting your ramp rate.

a. Rate of rise between 1°F/hour and 70°F/hour; LAG = 3

b. Rate of rise between 71°F/hour and 500°F/hour; LAG = 7

c. Rate of rise greater than 500°F/hour; LAG = 10

13. FINAL RATE OF RISE OR ERROR CONDITION RATE OF RISE - The V6-CF stores the final rate of rise for the last up ramp of the most recent firing. The final rate of rise is displayed during the ERTF routine in the hidden menu. If an error condition is triggered during a firing the final rate of rise will be over written with the rate of rise just before the error condition was triggered. This number can be used to help understand what was happening in the kiln immediately before an error occurred.

PROGRAMMING EXAMPLES

EXAMPLE 1: CONE-FIRE TO VARY-FIRE - This feature allows you to use a Cone-Fire program then automatically transition to a Ramp-Hold program. Here is a sample cooling program that can be added to a cone 6 glaze firing to enhance the glaze. The Ramp-Hold program must be located in user 6.

Segment	Rate	° F	Hold	Remarks
1	9999	2232	0	Over written by controller
2	9999	1900	0	Fast down ramp to save elements
3	150	1500	0	Slow cooling to 1500 to enhance glaze

Only two cooling segments will be used but we must still program user 6 for 3 segments because the controller will ignore the first segment. The steps to program the controller are as follows

1. Press the **RAMP-HOLD** key.
2. Press **6** and then press **ENTER** to program User 6.
3. Program user 6 with desired program. User 6 will fire when the cone-fire program reaches complete.

NOTE: Segment one of user 6 is utilized by the controller and cannot be used for the program. Therefore, the number of segments will need to be one greater than the number used for programming. When the display asks for ra 1 press **ENTER**, **ENTER**, **ENTER** to begin programming the Ramp-Hold portion with segment 2.

4. Press the **CONE-FIRE** key
5. Press the desired **CONE-FIRE** speed button.
6. Enter desired Cone-Fire program. This will program the Cone-Fire portion of the program.
7. Press the **ˆ F OR ˆC SELECT** button until the message “16-S” is displayed. Press **ENTER** key.
8. Press the **1** key until the desired option is displayed. “On” will allow Cone-Fire to transition into Ramp-Hold User 6 and “Off” will disable this option.
9. Press the **ENTER** key. Programming is now complete. If the16-segment option is on then the controller will perform the Cone-Fire program, when finished with the Cone-Fire the controller will transition to the program stored in Ramp-Hold user 6.

NOTE: 16-S will appear in review if the **PREVIEW** key is pressed.

EXAMPLE 2: write-your-own cone fire program *- This feature gives the user the heat work calculation of a Cone-Fire program and the versatility of a Ramp-Hold program. It is useful for very fast or very slow cone firings, crystalline glaze firings or other specialty glaze firing.*

The following program will duplicate the cone 6 firing with a slow cool down but will **not** require enabling the 16-s option each time the kiln fired.

Segment	Rate	°F	Hold	Remarks
1	100	200	00.15	15 minute hold for drying ware
2	300	1000	0	Faster ramp after ware is dry
3	100	1100	0	Slow down for dunting stage and carbon burnout
4	200	2000	0	Speed up until the last 2 hours of the firing
5	108	Cone 6	0	Controller will calculate the top temperature based on firing speed.
6	9999	1900	0	Fast ramp to save elements
7	150	1500	0	Slow ramp to enhance glaze

Programming is the same as for any other Ramp-Hold program until you get to °F 5. Instead of typing in the temperature for cone 6, press the **CONE TABLE** key, press **6**, and press **ENTER** and you will be at the hold 5 stage of programming. Finish the programming as you normally would. Now, when you fire this user program, you will get a cone 6 firing with a cool down stage.

To erase a cone correlation stage, press **PREVIEW** to step backward to the rate before the cone entry and then proceed as a normal Ramp-Hold. All temperatures after the cone correlation stage must be less than the cone temperature.

Hidden Menu Addendum

These features have been added to the hidden menu of the controller. A short description of each feature and how to use the feature follows.

1. **CYCL (Cycle Time)** – Sets the output cycle time. The cycle time is the length of time between an output coming on two consecutive times. If the cycle time is set for 14 seconds the output will come on every 14 seconds as needed. Cycle time can be set from 10 seconds to 60 seconds. A cycle time of zero can also be programmed; this option will use a cycle time of 200 milliseconds and can only be used if the kiln uses solid-state relays.

2. **MAX (Maximum Kiln Temperature)** – Sets the maximum temperature that can be programmed into a Ramp-Hold or Cone-Fire program. The maximum temperature cannot be set above 2400 degrees Fahrenheit (1315 degrees Celsius).

3. **TYPE (Thermocouple Type)** – Allows changing of the thermocouple type. The controller supports both type K and type S thermocouples. To change from type K to type S requires changing this software setting to type S as well as placing a jumper on the circuit board. To change from type S to type K requires changing this software setting to type K and removing a jumper from the circuit board.

Note: Make sure the software and jumper setting matches the type of thermocouple you are using. If these two settings do not match an error will occur and the controller will display the message ERR9.

4. **2KEY (Two Key Start)** – Makes starting the kiln a two-key sequence. The first key is the **Start** key. The second key is the **Enter** key. The kiln will not start unless these two keys are pressed in the correct order.

5. **E-BD (Error Board Temperature)** – Sets the maximum allowable temperature of the circuit board. The default value is 200 degrees Fahrenheit (93 degrees Celsius). This feature is aimed at people that use their kilns in a small, enclosed space and who need to make sure the kiln room does not exceed a given temperature. If the circuit board temperature exceeds the error board temperature the controller will terminate the firing.

6. **REST (Restore Default User Programs)** – The controller is preloaded with six Ramp-Hold user programs. The restore default user programs feature will overwrite all six Ramp-Hold profiles. The six profiles that will be restored to the Ramp-Hold profiles are:
    a. Glass slumping program
    b. Glass tack fuse program
    c. Glass full fuse program
    d. Glass bead annealing program
    e. Lost-wax burnout program
    f. Slow cooling cycle to be added to the end of a cone 6 firing with the 16-segment option. To use this feature program a cone 6 firing and set the 16-segment option to on.

7. **ERTF (Error Temperature, Error Time, and Final Rate of Rise)** – If an error occurs while firing, the controller saves the temperature of the kiln, the firing time and current rate of rise when the error occurred. During each firing the final rate of rise is saved and can be viewed by using this menu option. The final rate of rise is the number immediately after the message ROR.

8. **COOL (Cone Fire Cooling Segment)** – Allows the user to toggle on or off an optional cooling segment after any Cone-Fire program. When COOL is set to on, the controller will prompt the user to enter a cooling segment while programming a Cone-Fire profile. The user is able to set a cooling ramp rate, a soak temperature and a hold time just like in a Ramp-Hold program. If a rate of zero is programmed the cooling segment will be ignored during a firing. This is only a cooling segment; therefore the soak temperature must be less than the final cone temperature.

9. **VOLT (Voltage Measurement)** – Allows the user to test the voltage where the kiln is set up. This option helps to diagnose firing problems when the kiln is not able to reach a programmed temperature. Press **Enter** and the display will flash NOLd to indicate the next number displayed is the no load voltage. Press **Enter** again and FLLd will be displayed to indicate the next number displayed is the full load voltage. The elements will come on momentarily while the controller is displaying full load voltage. After four seconds the kiln will return to IDLE.

10. **DTCT (Current Detector Settings)** – Allows the user to change the current detector rating. This option will only be used if your controller came with the optional current sensor.

OUTPUT DIAGNOSTICS ROUTINE

The SMT 700 kiln controller is able to turn on each output consecutively for diagnostic purposes.

1. Press °F OR °C SELECT key one time. The message "RSET" will be displayed.
2. Type in key sequence 4, 4, 3
3. "NOTC" will be displayed. Press °F OR °C SELECT until "DIAG" is displayed.
4. Press ENTER key.
5. "OUTS" will be displayed. To run the output diagnostic routine press the ENTER key.
6. "OUT1" will be displayed and output one will come on. Press ENTER key to go to next step. After ten seconds the controller will automatically switch to the next step even if a key is not pressed
7. "OUT2" will be displayed and output two will come on. Press ENTER key to go to next step. After ten seconds the controller will automatically switch to the next step even if a key is not pressed.
8. "OUT3" will be displayed and output three will come on. Press ENTER key to go to next step. After ten seconds the controller will automatically switch to the next step even if a key is not pressed.
9. "OUT4" will be displayed and output four will come on. Press ENTER key to return to idle. After ten seconds the controller will automatically return to idle even if a key is not pressed.

CURRENT SENSOR INSTALLATION

The SMT 700 kiln controller is able to measure amperage draw for each section of a kiln. To take advantage of this feature an optional current sensor must be installed. Installing the current sensor requires access to the back of the circuit board.

The current sensor has two wires that need to be connected to the circuit board. One wire is black. One wire is white. On the top left corner of the circuit board is a terminal with inputs marked black and white. See SMT 700 layout.

1. Insert the white wire in the terminal that has been marked white.
2. Insert the black wire in the terminal that has been marked black.
3. Use a screwdriver to tighten the two screws on the terminals so that the wires will not come lose.
4. The circuit sensor clips around one of the power cord's hot wires.

The SMT 700 is now able to measure the amperage draw using the controller's diagnostic routines.

AMPERAGE DIAGNOSTICS ROUTINE

To display the kiln's current draw the optional current sensor must be installed. If the sensor is not installed or it is not installed correctly the controller will display zero amps for all sections of the kiln.

1. Press °F OR °C SELECT key one time the message "RSET" will be displayed.
2. Type in key sequence 4, 4, 3.
3. "NOTC" will be displayed. Press °F OR °C SELECT until the message DIAG" is displayed.
4. Press ENTER key.
5. "OUTS" will be displayed. Press ONE key.
6. "AMPS" will be displayed. Press ENTER key.
7. The message "AMP1" will now be displayed and the elements should turn on. The number shown after this message is the amperage for section one of the kiln.
8. The message "AMP2" will now be displayed. The number shown after this message is the amperage for section two of the kiln.
9. The message "AMP3" will now be displayed. The number shown after this message is the amperage for section three of the kiln.

The amperage diagnostics routine is now complete. The controller will return to idle.

VOLTAGE CALIBRATION

To display voltage using the controller kiln controller a calibration must be done. Before calibration make sure the relays and elements are connected.

1. Press °F OR °C SELECT key one time. The message "RSET" will be displayed.
2. Type in key sequence 4, 4, 3
3. "NOTC" will be displayed. Press °F OR °C SELECT until "VOLT" is displayed.
4. Press ENTER key. "NOLD" for no load will be displayed for two seconds. After "NOLD", a number will be displayed until either ENTER is pressed or the 443 calibration code is entered. This number is the no load voltage. However, until after calibration this number is meaningless.
5. Type in key sequence 4, 4, 3.
6. "CAL1" will be displayed. Measure the line voltage and enter this number now using the key-pad. This number will be used to calculate no load voltage
7. Press ENTER key.
8. "CAL2" will be displayed. Measure the line voltage and enter this number now using the key-pad. This number will be used to calculate full load voltage.
9. Press ENTER key.
10. The voltage calibration routine is now complete. The controller will return to idle.

DISPLAY NO LOAD AND FULL LOAD VOLTAGE

To display no load and full load voltage the elements must be connected. If the elements are not connected these values will be incorrect.

1. Press °F OR °C SELECT key one time. The message "RSET" will be displayed.
2. Type in key sequence 4, 4, 3
3. "NOTC" will be displayed. Press OTHER until "VOLT" is displayed.
4. Press ENTER key. "NOLD" for no load will be displayed for two seconds. The number displayed after this message will be the no load voltage.
5. Press ENTER key. "FLLD" for full load will be displayed for two seconds. The number displayed after this message will be the full load voltage.

The controller will return to idle. After calibration the temperature will take a few seconds to adjust.

RESTORE DEFAULT USER PROGRAMS

The following profiles will overwrite the six Ramp-Hold profiles if the restore default user programs feature is used. This feature can be found in the hidden menu under the heading "REST".

USER 1 - MEDIUM SPEED GLASS SLUMPING PROFILE

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1100	00:05
5	600	1220	00:05
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

User 2 – Medium Speed Glass Tack Fuse Profile

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1250	00:20
5	600	1350	00:10
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

User 3 – Medium Speed Full Fuse Profile

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1250	00:20
5	600	1480	00:15
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

User 4 – Glass Bead Annealing Profile

Segment	Rate	°F	Hold
1	9999	960	08:00
2	9999	960	00:40

User 5 – Lost Wax Burnout Profile

Segment	Rate	°F	Hold
1	9999	300	01:00
2	100	350	00:30
3	350	1350	01:30
4	300	900	99:99

User 6 – Slow Cooling Cycle for Cone 6 Glazes

Segment	Rate	°F	Hold
1	9999	2232	00:00
2	9999	1900	00:00
3	150	1500	00:00

CONE NUMBER	LARGE CONES 108 DEG. F
022	1087
021	1112
020	1159
019	1252
018	1319
017	1360
016	1422
015	1456
014	1485
013	1539
012	1582
011	1607
010	1657
09	1688
08	1728
07	1789
06	1828
05	1888
04	1945
03	1987
02	2016
01	2046
1	2079
2	2088
3	2106
4	2124
5	2167
6	2232
7	2262
8	2280
9	2300
10	2345
11	2361
12	2383

GLOSSARY

BISQUE - Any fired undecorated clay object.
CERAMICS - a general term applying to any fired piece of clay material.
CHINA - A translucent high fire ceramic body.
CLAY - Earth that is relatively pure silica and alumina; usually a blend of different clays and minerals, combined to achieve various effects and different properties.
CONE - see pyrometric cone.
CRATERING - Imperfections in glaze caused by rapid cooling, which "freezes" bubbled glazes before they can smooth out, leaving pits.
CRAZING - A network of hairline cracks in a glazed surface which appears after firing.
DECAL, **CERAMIC** - A design or picture, usually overglaze, which is applied to and fired onto the ware.
DRY-FOOTING - Wiping glaze off of the base of objects before firing. This is an alternative to stilting glazed ware to keep the piece from sticking to the shelf when firing.
EARTHENWARE - Porous ware made of low fire clays.
ELEMENTS - Coils of wire having high electrical resistance and resistance to high temperatures which serve to convert electrical energy to heat in the kiln.
ENAMELING - Application of finely ground colored glass to metals (usually copper or silver) resulting in a glaze-like finish after firing.
FIREBRICK - refractory blocks used in making the insulating firing chamber of the kiln.
FIRING - Applying heat to ceramic materials to cause a change in their chemical composition (see maturity).
FIRING CHAMBER - The space in the interior of the kiln where the ware is heated.
FURNITURE, KILN - Any of a wide assortment of shelves and posts used in loading a kiln. They are used in supporting ware to take full advantage of the firing space.
GLAZE - Finely ground glass, suspended in liquid, applied to ceramic ware to give it a glossy (usually) glass-like surface when melted by firing.
GREENWARE - Any unfired clay object.
HIGH FIRE - Firing to very high temperatures; anything over cone 4. Commonly (cone 6) used with porcelain and stoneware.
KILN SITTER^{R} - A mechanical device for shutting off the kiln at the desired temperature using pyrometric cones. It is intended for consistent controlled firing. This device does not always shut off due to operator induced mechanical variables and must be checked manually.
KILN WASH - A refractory material used as a coating to prevent sticking of ware and glazes to parts of the kiln and shelves. It is a powder which is mixed with water and applied with a brush.
LOW FIRE - Ware fired only to medium temperature as for earthenware, pottery, or terra cotta.
LUSTER - An overglaze giving an iridescent finish.
MATURITY - The point at which bisque is completely fired and glazes reach the intended smooth, glassy state.
NESTING - Stacking one piece of greenware inside another, a technique used in loading for bisque firing.
OHMMETER - An electrical measuring device for measuring electrical resistance. This is used to check elements for aging or an open circuit.
OVERGLAZE - Decorative material applied on top of a glazed surface. Examples are decals, gold and other metallics, lusters, and china paints. They are always low fired (cone 018 to cone 014)
PEEPHOLE PLUG - A piece of refractory material used to close the peephole.
PINHOLES - Imperfections in a glazed surface characterized by tiny holes.
PINS - Short pieces of high temperature wire used to anchor elements in place.
PORCELAIN - A type of clay body which becomes vitreous and translucent when high fired.
POST - Columns of refractory material used to support shelves in the kiln. They are available with square, triangular or circular cross sections and in many different heights.
PYROMETER- A high temperature thermometer consisting of a heat sensing device (thermocouple) connected to a meter readout. Especially important in working with glass. This is an excellent device to measure the progress of a firing and temperature profile of a kiln.
PYROMETRIC CONE - A small elongated pyramid of ceramic material which is formulated to soften and deform at a specific temperature plus time condition, indicating that the ware is mature and the firing complete.
SHELVES -Slab of refractory material used in the kiln to support ware being fired (see furniture).
SILICA - (SILICAFLOUR, FLINT) A mineral powder used to prevent sticking of porcelain and other high fire clays during firing.
SLIP - Liquid clay used in casting shapes with molds.

SOAKING - Heat treating objects in a kiln by keeping them at a particular temperature for a period of time.
STILTS - Small ceramic or high temperature metal prongs used to raise a piece off the kiln shelf. Used chiefly in glaze firings to prevent sticking to the kiln or shelf. Many styles are available.
STONEWARE - A ceramic body which is vitreous but not translucent when high fired. It usually contains a high percentage of grog (fired clay particles) and is usually made of native clays.
TERRA COTTA - A natural, low fire red clay.
THERMAL SHOCK - the result of putting ware through sudden changes in temperature.
THERMOCOUPLE - Two wires of different metals which are inserted into the kiln and comprise the temperature sensing part of the pyrometer. It produces a very small voltage in proportion to the difference in temperature between the tip (hot junction) of the thermocouple inside the hot kiln and the cold junction on the outside of the kiln.
UNDERGLAZE - Decorative material applied to greenware or bisque.
VENTING - Allowing air into the kiln and vapors to escape by propping the lid slightly open and sometimes opening the peepholes. Usually done only in the early stages of firing.
VITRIFY - To fully fuse ceramic material to a glass-like state so that it is nonporous and watertight without glazing.
WARE - General term for any shaped ceramic object whether or not it is in a finished state.
WARPAGE - Deformation of ware during firing, usually due to overfiring or to improper placement in the kiln.

WARRANTY

Limited kiln warranty

Your Cress kiln is warranted for three year from the date of purchase to the original purchaser. If any defects in workmanship or material appear during this time, Cress Manufacturing Company, Inc. will replace or repair defective parts. Written proof of purchase date is required. This warranty is limited to the original purchaser. Warranty repairs are normally handled through the dealer from whom the kiln was purchased. Otherwise, the purchaser may return the defective part to Cress Manufacturing Company, Inc., 4736 Convair Dr., Carson City, NV 89706 along with serial number, model number, voltage, proof of purchase date, and statement of what is thought to be wrong with the product. If a defect is confirmed, a new or repaired part will be shipped, postage paid by Cress Manufacturing Company. A Cress kiln may be returned for warranty work to Cress Manufacturing Company 4736 Convair Dr., Carson City, NV 89706. All transportation costs will be borne by the purchaser. Before shipment, the purchaser will notify Cress Manufacturing Company (phone 775 884-2777) so that we may help advise in order to keep costs at a minimum, should it not be necessary to ship the entire kiln to us. An RMA (return material authorization) number is required before a return may be accepted. This number must be placed on the outside of the returned part or kiln. Repair or replacement of defective kiln parts shall be considered as complete fulfillment of this warranty.

This warranty does not include: kiln damaged by overfiring (exceeding the melting temperature of the material being fired) regardless of cause, kilns damaged by transporting, abuse, improper use, reactive materials being fired (i.e. reduction firing, salt firing, or carbon contamination), moisture, contents being fired, improper electrical installation, kilns used for any purpose other than firing ceramic materials, or ware, kiln furniture or contents being overfired. Kiln elements are specifically not warranted.

Cress Manufacturing Company is not responsible for consequential damage to contents being fired. Cress Manufacturing Company does not authorize any wholesaler, retailer, or employee to assume any other obligation or liability in regard to Cress kilns.

This warranty applies to kilns sold after September 1998 until further notice.

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