

# CROMARTIE KILNS LIMITED

...at the centre of ceramics...

## Customer Safety Instructions

### Perfect Fire III

#### HDTP-55 Multi Segment Programmer

*This Document should be read carefully before using your new Cromartie Controller.*

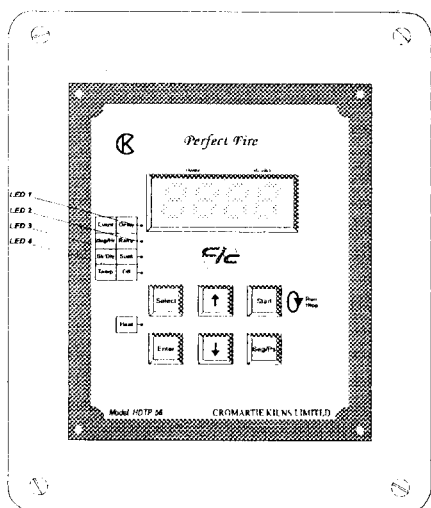
The New Perfect Fire III uses state of the art microprocessor technology which has been designed specifically for use with pottery kilns and Glass Slumping. The controller has a wide range of facilities which provide the user with a versatile, easy to use instrument. The controller contains a L.E.D display as a guide for both firing and programming, and to enable the user to determine what segment the controller is in whilst the controller is in operation.

#### Principal features include the following.

- Delay Start Facility, 0 to 99Hr. 59 mins.
- 55 Segments
- 55 Heating/Cooling Ramps, 1 to 1000°C/Hr, to fully adjustable 'Set Points'.
- 55 Soak Periods, 00:00 to 99Hr. 59 mins.
- Constant temperature read-out.
- Built in fault detection and self test.

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**For Great Results Every Time**



Explanation of Graphical Symbols:



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of non insulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

#### WARNING

To prevent fire or electrical shock hazard, Do not expose this unit to rain or moisture.



#### PLEASE...

##### Familiarise yourself:

Scan the contents list and look through the manual, note sections of interest.



**Controller connections to the kiln must be made in a workmanlike manner. Failure may result in damage to the controller or kiln.**

**Such damage is not covered by warranty.**

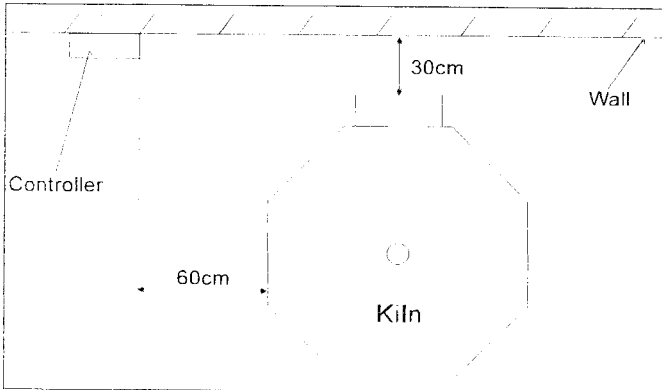
## 1 Installation



Check that the Perfect Fire III and thermocouple type match, otherwise proper control will not be possible. Check also that the Perfect Fire III if fitted with a plug is compatible to the kiln, check with kiln manufacturer. **Note!** Failure to do this may result in your controller being damaged.

The Perfect Fire III should be fixed to a wall near the kiln using the bracket found on the back of the instrument, number 8 screws should be used (not supplied).

Do not position closer than 600mm to the kiln or above the kiln. (so that the unit is not damaged by heat from the kiln).



N.B. Always isolate from the mains supply before opening the case (Note there are no user alterations that can be made inside the instrument and damage could be caused by unskilled tampering).

## 2 Connection to the Kiln

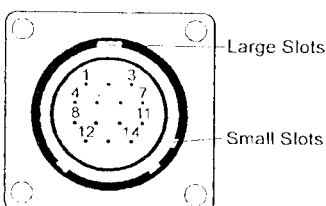
Ensure the controller and kiln are compatible, and simply plug the connection lead into the kiln. (If no plug is provided see below) If in doubt contact your kiln supplier or Cromartie. Connection to the kiln must only be carried out by a qualified electrician.



If no plug is provided, the electrician should connect as follows:-

Wire Colour	Mains Supply		T/Couple	
	PCB Terminals	Function	Colour	Polarity
Brown	L	Supply	White	+
Green	E	Earth	Blue	-
Blue	N	Supply		
Black	C	Common		
White	O	Relay		

### Standard Control Socket



### Pin Connections

- Pin 3. Transformer
- Pin 4. Transformer
- Pin 5. Transformer
- Pin 6. Relay
- Pin 7. Relay
- Pin 11. Thermocouple +
- Pin 12. Thermocouple -

## 3 L.E.D Lights

There are 4 L.E.Ds on the unit that indicate different functions depending on the mode of the unit. The meanings are as follows:-

L.E.D	STEADY	SLOW FLASH	FAST FLASH
1	DELAYING	Event code entry	P band entry (degrees)
2	RAMPING	Ramp rate entry (deg/Hr)	1 entry (seconds)
3	SOAKING	Soak time entry (Hrs:Min Delay)	D entry (seconds)
4	OFF (program end)	Soak temp	-

\* All 4 L.E.Ds on with slow flash PAUSE mode (see below).

### Red Display:- During active mode

The display shows the temperature, it can also display numbers being entered or the segment number ("S-0" to "S-55"). It can temporarily show the remaining time in a soak, or the remaining time in a delay.

To return to showing the temperature if the menu L.E.Ds are flashing, press the SEG key twice. If all 4 L.E.Ds are on (the display will be showing "S- x") then press the key once.

### During Programming Mode

The event has 4 possible settings:

End: Indicates the end of a program.

Cont: Continue to do the ramp and soak as set. The soak is timed from when the temperature reaches the final temperature.


Dly: Delay segment. The ramp and temperature settings are ignored, the heat is held off for the time set for Soak/Dly. Delay time can be set from 1 min to 50 hours.


Conr: Continue regardless. When this is selected the instrument works in the following way. If we, for example, take a 250°C/hr ramp from 100°C to a 1100°C setpoint the firing time should take approx 4 hrs. Now if the kiln, after 4 hre has only reached 850°C the controller is able to advance to the "Cont" mode. The kiln temperature would have to reach 1100°C for this to happen. This is particularly useful for ramping downwards.





The unit will run each segment from S-1 upwards that has "Cont", "Dly" or "Conr" as the event until it runs into a "End".


**Key Functions**

 Used to increase the number in the display when setting. If held down, the speed of increase accelerates. If tapped, the speed stays the same. If left released for a brief time, the speed decelerates.


 As above for decreasing.

 Start/Stop the program. In particular, if the "off" light is not on, it forces the program to a segment 0, whereas if it is on, the program goes to segment 1. To start a program at a segment other than 1, the SEG key and UP \DOWN keys are used to select the desired segment, then ENTER starts the program at the desired segment.

 To allow entry, into the programming mode. While it is held, it shows the current segment for entry, which starts at segment 1 (see below under SEG key for how to start at other than 1).

 This key enters a number into the memory, which it retains even if the power is removed. If enter is not pressed the number is not changed/stored even if UP/DOWN keys are used.

If ENTER is pressed briefly while in the soak portion of a segment or during a Delay segment the display will change (after less than one second) to showing the remaining time in hours and minutes. At the next press of the ENTER key or the beginning of the next segment, the display will revert to showing the measured temperature.

-  1. When pressed, changes the display to show the current segment that is running. All 4 L.E.Ds flash to indicate Pause Mode (see below).  
 2. A second press is used to return to run mode.  
 3. A double press of this key is used to terminate entry mode from any menu. If the UP \DOWN keys are used to change the segment number, and then if ENTER is used, the program will begin to run at the start of the new segment. Press the SEG key again to run segment properly.

To begin examining or entering a program at a segment other than segment 1, press the SEG key first, then use the UP \DOWN keys to alter the segment number to the desired segment. Then press SELECT to begin examining or setting the program.

To check or modify a segment different from segment 1 press the SEG key followed by the UP/DOWN keys, to choose the required segment. After that press the SELECT key to start checking/modifying the program details. If the segment number has to be changed by the UP/DOWN keys followed by pressing the ENTER key, the program will start running from the beginning of the new chosen segment. Press the SEG key again to run segment properly.

**Pause Mode**

While displaying the segment, the programmer enters Pause Mode, and all 4 L.E. Ds will flash at a slow rate. The clock is effectively stopped in this model so that the set point will not change and the soak time will be extended indefinitely.

**6 Programming Instructions**



Before starting the programming examples we would like to give some tips regarding dividing a firing cycle into segments and what a segment contains.

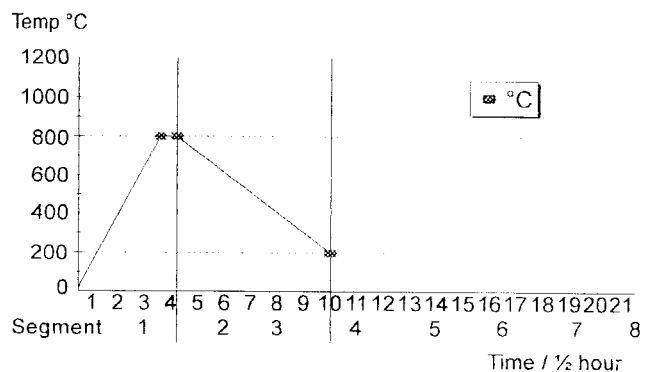
A firing cycle is nothing more than a display of how you want to fire a kiln load. You can either write this cycle on paper, in columns or diagram form.

The firing cycle can be divided into parts called segments. Every segment contains the following information necessary to control the temperature according to the required process. Both ways, written and graphics are shown below.

**Example 1**

We want a top temperature of 800°C, climb rate (ramp) of 200°C/Hr. 10 minutes soak time at 800°C, cooling rate (ramp) 100°C/Hr to 200°C then finish the program.

Step	Temp Change	Rate / Hr	Total Time	Soak Time
1	20°C to 800°C	200°C/Hr	234 mins	10 mins
2	800°C to 200°C	100°C/Hr	360 mins	None
3	End			

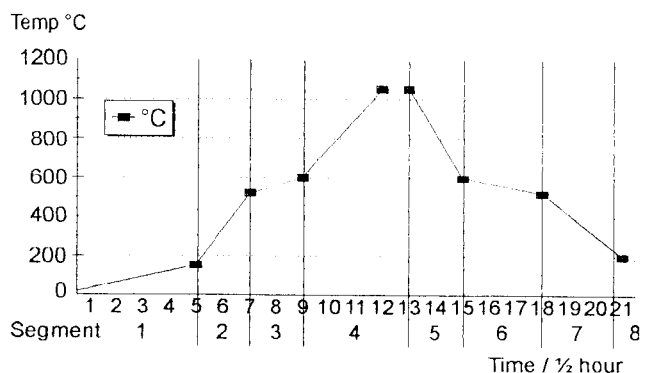


Example 1 in Diagram Form

**Example 2**

Below is a further example of a firing cycle taking into account the quartz conversion from Alpha to Beta during the firing and cooling. Because of the high speed (fast ramp) between 600°C-1000°C a soak is required.

Step	Temp Change	Rate / Hr	Total Time	Soak Time
1	20°C to 150°C	65°C/Hr	120 mins	None
2	150°C to 520°C	370°C/Hr	60 mins	None
3	520°C to 600°C	80°C/Hr	60 mins	None
4	600°C to 1050°C	300°C/Hr	90 mins	15 mins
5	1050°C to 600°C	300°C/Hr	90 mins	None
6	650°C to 520°C	80°C/Hr	98 mins	None
7	520°C to 200°C	300°C/Hr	64 mins	None
8	End			



Example 2 in Diagram Form

### Segment Activity

For programming, we call every step of the firing cycle a Segment, entering the program details per segment. In every segment the details below are required:

1. Segment activity
2. Ramp (=temperature change in °C/hour)
3. Soak time
4. Final temperature of each segment

### Segment activity

"End" Indicates the end of a firing cycle (e.g. a program). All programmed segments will be run until the first segment programmed with "End". If we consider finishing the firing cycle as a separate step, as shown in graph 2, then you must enter "End" in the last segment of each program.

"Cont" Tells the controller to continue the program as per entered values. Soak is timed from the moment the kiln reaches the setpoint final temperature of this segment.

"Dly" Delay segment, etc. etc.

"Conr" Tells the controller to continue the program as per entered values. Soak is timed from the period as calculated by the controller, regardless of the temperature reached at that point. Useful when cooling down.

### Ramp

The ramp indicates the rate of firing up or cooling down, expressed in °C/hour. The controller calculates the time required and allows a corresponding feed to the heating elements. The ramp rate can be from 1°C to 4000°C/hour. The total time for a ramp to take place in a segment may not exceed 40 hours.

If ramp is set less than 1°C/hour the display will show "Full", indicating full power will be used to heat the kiln, without ramping.

### Soak

In this part of programming, you instruct the controller to maintain the final temperature of a segment. Soaking is used, for example, to help mature the kiln load. Soak time is set in hours and minutes and can not exceed 50 hours.

### Temperature

Each segment has it's own final temperature, indicating the temperature the segment is firing to whether that be heating or cooling. This can also be the soak temperature of the segment, if set.

### Entering The Program

#### Example 1

We want a top temperature of 800°C, climb rate (ramp) 200°C/Hr. 10 minute soak at 800°C cooling rate (ramp) 100°C/Hr to 200°C then to finish the program.

Note! Segment 1 has been left blank for delay if required.

Push	Display	L.E.D
Select Button	S-2	
Select	End or Cont or Dly or Cont	Upper Slow Flash
Push until	Cont	
		Second Slow Flash
	200	
		Third Slow Flash
Push until	0:10	
		Fourth Slow Flash
Push until	800	
	S-3	
		Upper Slow Flash
	Cont	
	100	
		Slow Flash
or	0	
		Slow Flash
or	200	
		Upper Slow Flash
	S-4	
Push until	End	
	S-0	

#### Second Program Example

Below is a further example of a firing cycle taking into account the quartz conversion from Alpha to Beta during the firing and cooling (see explanation in glossary of terms). Because of the high rate of climb (fast ramp) between 600°C-1000°C a soak is required. The firing cycle explained step by step.

In the first example we finished with END in segment 4. Below following the first program is a further example. We will leave this segment to use it for delay a program.