Sentry Xpress 2.0
Digital Temperature Controller

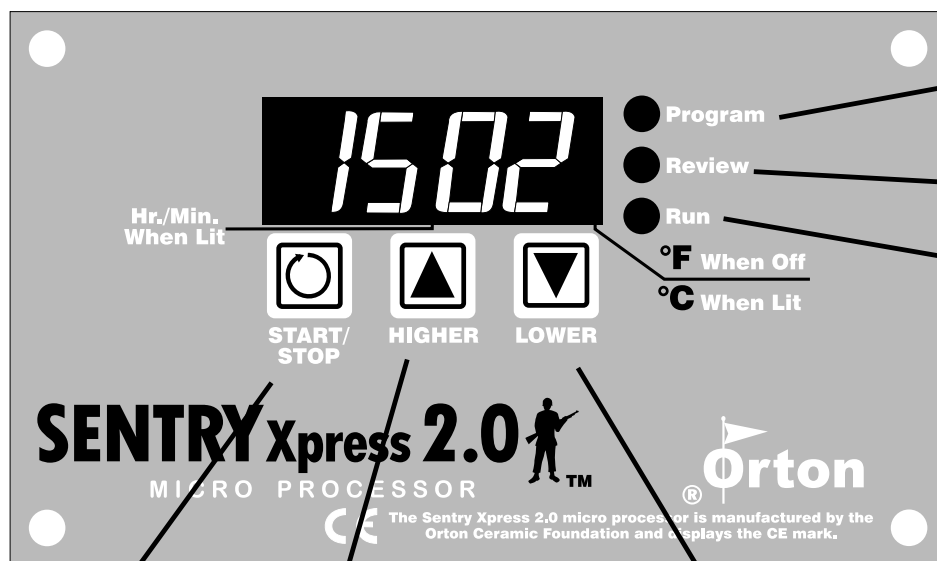### Single Segment & Ramp-Hold 4 Segment Instructions

Temperature Display
Temperature is in °F when no display dot appears.

Temperature is in °C when lower right display dot appears. See page 6 for instructions on selecting °F and °C.

Time Display
During time display, a center display dot separates hours from minutes.

Indicator Lights

Top: Lights during programming.

Middle: Lights during program review.

Bottom: Blinks during firing.

Hr./Min. When Lit

Program
Review
Run
°F When Off
°C When Lit

START/ STOP   HIGHER   LOWER

SENTRY Xpress 2.0
MICRO PROCESSOR ™

The Sentry Xpress 2.0 micro processor is manufactured by the Orton Ceramic Foundation and displays the CE mark.

Orton

START/STOP Key
1) Starts and stops a firing.
2) Press after each programming step.

Up Arrow Key
1) Increases values during Programming.
2) Skip Segment: during Ramp-Hold firing, skips to the next segment. After pressing Up Arrow, SStP will appear. To skip, press Up Arrow again.

Down Arrow Key
1) Decreases values during programming.
2) Review: from IdLE or during firing, press Down Arrow. The program will appear one step at a time.

Contents

Safety

The warranty on your Sentry controller does not cover damage from overfiring, regardless of the circumstances. It is the operator's responsibility to make sure the kiln turns off at the proper time. Follow these safety rules in addition to the ones in your kiln or furnace manual.

When the kiln is not in use, disconnect the power.

Do not leave the kiln unattended, especially near the expected shut-off time.

Wear firing safety glasses when looking into the peephole of a hot kiln.

Do not touch hot sides of kiln or furnace. Keep unsupervised children away.

Install your kiln or furnace at least 12 inches from any wall or combustible surface.

Do not open lid or door until kiln or furnace has cooled and all switches are off.

Fire only in a well-ventilated, covered and protected area away from combustible materials. Keep cordset away from hot sides of kiln or furnace.

DANGEROUS VOLTAGE! Do not touch heating elements with anything. Disconnect kiln or furnace before servicing.

General Guidelines

Thermocouple Inspection

The small rod protruding into the firing chamber is the temperature sensor, or thermocouple.

> **Caution:** Bumping the thermocouple can push it out of the firing chamber. This could cause an overfire! The controller does not contain an alarm to detect this type of failure.

■ A 1/8" diameter thermocouple should extend into the firing chamber ½" - 5/8".

■ A ¼" diameter thermocouple should extend into the firing chamber 1" or more.

■ Keep shelves, posts and ware 1" - 1 ½" away from the thermocouple.

How to Get IdLE to Display

Operations begin from **IdLE**. You can't fire the kiln until **IdLE** appears in the display window.

■ If **CPLt**, **SToP**, or other message appears instead of **IdLE** when the kiln is first turned on, press the **START/STOP** key (the key with the circular arrow). **IdLE** will appear.

■ If you press **START/STOP** during a firing, **SToP** will appear. To get back to **IdLE**, press **START/STOP** again.

■ If the display shows an error message such as **FAIL** instead of **IdLE**, see page 6.

■ **CPLt** (firing completed) appears at the end of a firing. To make **IdLE** appear, press **START/STOP**.

Firing Modes: Single Segment and Ramp-Hold

There are two ways to fire the Sentry Xpress:

■ **Single Segment** Choose one of five firing speeds. Then enter the temperature you are firing to.

■ **Ramp-Hold** This method includes four "segments."

Use the Single Segment firing method for simple firings. Reasons to use the more complex Ramp-Hold mode:

■ To use more than one firing rate. An example: firing at a fast rate and then slowing down near the end to avoid a temperature over-shoot.

■ To hold, or maintain, a temperature for a period of time, at some point below the target temperature.

■ To cool at a controlled rate.

Program Review

With Program Review, you can check that the correct rate, temperature, etc. are entered. It is a good habit to do this before every firing. See "How to Repeat a Firing," next page.

■ **Program Review during firing:** press the Down arrow key. The rate, temperature, hold, etc. will display one after the other. Firing will continue.

■ **Program Review from IdLE:** press the Down arrow key. After rate, temperature, hold, etc., **Strt** will appear. Press the Down arrow again. **IdLE** will appear.

Definition of a Segment

A segment is the most basic part of a firing. A segment includes a target temperature and a heating rate to reach that temperature. Shown in diagram A is a segment with a target temperature of 750°.
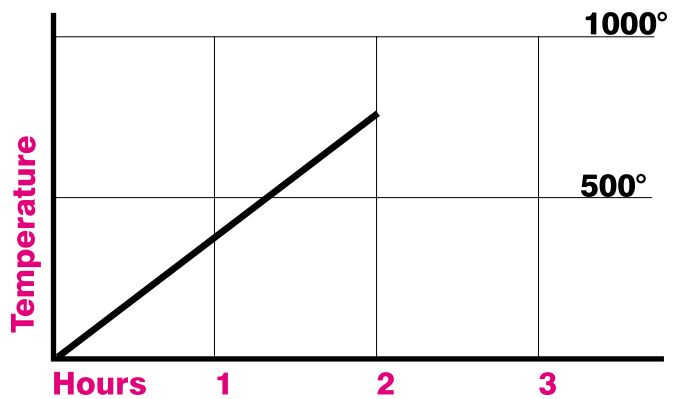
Diagram A: a single segment.

Firing rate is figured in degrees of temperature per hour. Since the temperature above takes two hours to reach 750°, the rate is $750 \div 2 = 375°$ per hour.

Diagram B below shows three rates. A rate of 1000° will reach 1000° in 1 hour. A rate of 500° will reach 1000° in 2 hours. A rate of 333° will reach 1000° in 3 hours.

Diagram B: Rate is degrees per hour. This diagram shows 3 rates.

Diagram C: a single segment with hold.

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A segment, which is a target temperature and a rate of heating to reach that temperature, can also have a hold. Hold means maintaining the target temperature for a length of time. (Diagram C, page 3.)

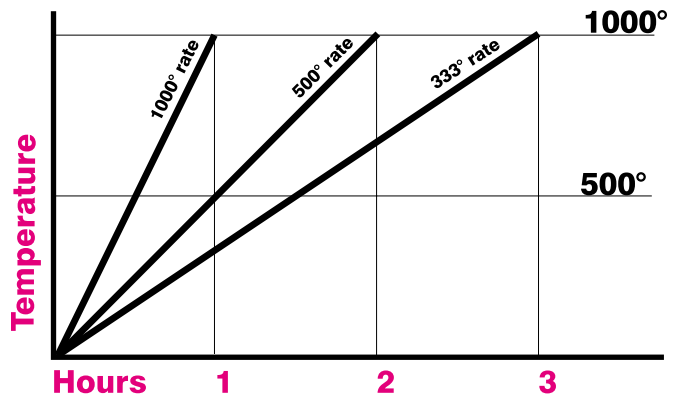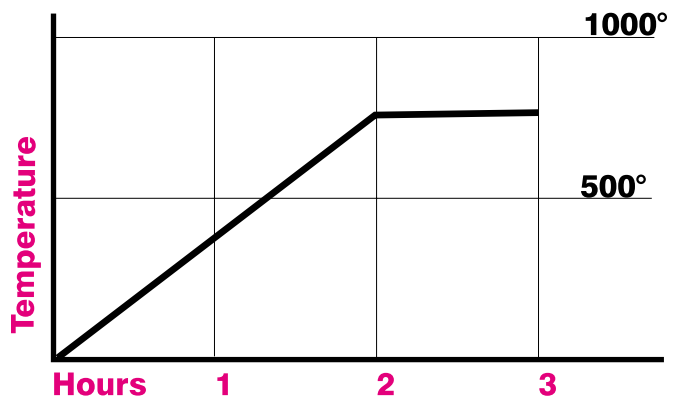Firing to a temperature at a single rate would need only one segment. Reasons to add more segments:

■ To have more than one heating rate

■ To add a hold somewhere below the shut-off temperature (see diagram D below)

■ To change the temperature direction. Example: to control the cooling rate.

Diagram D, below, shows a 3 segment firing. Two segments were used on the way up in temperature. Another segment was added for controlled cooling.
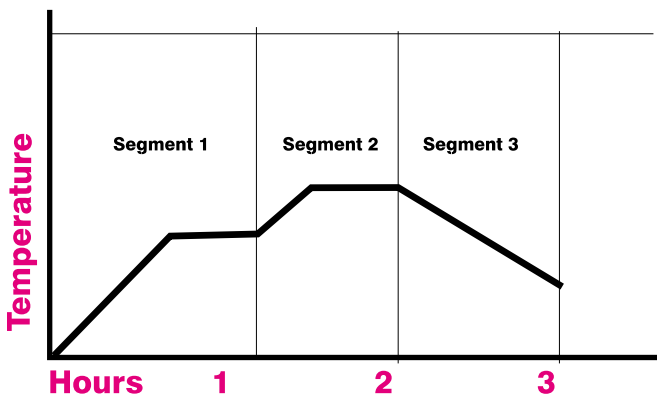

Diagram D: a 3 segment firing.

Hold (Displays as HOLd)

Hold gives the temperature time to become more even throughout the kiln. Hold can be used in either heating up or cooling down segments.

When Hold is set to 99.59 hours, the Sentry will remain at that temperature indefinitely, until you press **STOP**. To program a 99.59 hour hold, press the Down arrow once from 00.00 during programming. (See next page.)

> **Note:** During firing, Hold will display as temperature and the hours and minutes left in Hold.

Delay (Displays as DELA)

The Delay feature sets a timer that starts the kiln later. You might find Delay useful in arranging a long firing to shut off at a time that is convenient for you.

DELA appears last when programming a firing. To delay the firing, enter the delay time in hours and minutes. (To skip Delay, leave it set at 00.00.) Then press **START**. After a delay has started, the controller will show time remaining before firing begins. Delay zeroes out after each firing.

> **Note:** Press **START/STOP** during Delay to end the delay and go back to **IdLE**. The maximum delay is 99 hours and 59 minutes.

> **Note:** For safety, do not leave the kiln alone during a delay or a firing. We cannot guarantee your kiln against overfiring even though the controller is automatic. The operator assumes full responsibility for shutting the kiln off at the proper time.

Power Failures

After a power failure, the controller will continue firing provided that:

■ The kiln temperature is above 212°F/100°C when the power comes back on.

■ The temperature dropped no more than 180°F/100°C while the power was off.

Power Failure Messages

PF 1 The power failed during firing, and temperature dropped more than 180°F/100°C.

PF 2 The power failed during firing, and kiln temperature was below 212°F/100°C when the power came back on.

How to Repeat a Firing

1 From **IdLE**, press the Down Arrow key. The speed, temperature, and hold from the last firing will display one after the other.

2 **Strt** will appear. Press **START**. **DELA** will appear. To delay the firing, enter a delay time (e.g. 1 hour 10 minutes = 01.10). No delay: leave the delay set to 00.00. The kiln will begin firing after a 20 second pause or after you press **START**.

Controlled Cooling in Ramp-Hold

Use Ramp-Hold mode to program a slow cooling. The Single Segment mode cannot control cooling rate.

For controlled cooling, program a segment to a lower target temperature than that of the preceding segment. The controller, of course, cannot speed cooling beyond the kiln's natural cooling rate.

During fast cooling, do not open the lid or door all the way. Do not force-cool the kiln with a fan.

Starting a Firing in a Hot Kiln

Some firings begin in a hot kiln after a power failure, or other interruption. In a single segment firing, the controller will begin firing from the current temperature to the target temperature. In Ramp-Hold, the firing will begin from the first segment that encompasses the current temperature.

> **Note:** If the kiln is already hotter than the programmed target temperature when you begin firing, **CPLt** will flash.

Skipping a Segment in Ramp-Hold

During Ramp-Hold firing, you can skip a segment as follows:

1 The kiln is firing. Press the Up Arrow key.

2 **SStP** will appear. Press the Up Arrow key again. The firing will skip to the next segment.

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Single Segment Firing Instructions

Note: Single Segment firing is all you will ever need if you are enameling or firing silver clay.

1 From `IdLE`, press **START**.

2 Use the Up Arrow key (not the Down Arrow) to select a firing rate (temperature rise per hour) from 1 through 5:

`Spd1` / (200°F or 111°C)

`Spd2` / (500°F or 277°C)

`Spd3` / (1000°F or 555°C)

`Spd4` / (1500°F or 833°C)

`Spd5` / (Full Power)

`ProG` (Selects Ramp-Hold firing: see next column.)

Then press **START**.

3 `°F` or `°C` and the target temperature from the last firing will appear. To change the target temperature, press the Up or Down Arrow keys. Then press **START**.

4 `Hd` and the hold time from the last firing will appear (e.g. 1 hour 10 minutes = 01.10). Use the arrow keys to change the hold time. Then press **START**.

5 `Strt` will appear. Press **START**. `dELA` will appear. To delay the firing, enter a delay time (e.g. 1 hour 10 minutes = 01.10), or leave the delay set to 00.00. The kiln will begin firing after a 20 second pause or after you press **START**.

When the kiln begins firing, the run light will blink.

To stop a firing before completion, press **START/STOP**. `STOP` will appear, alternating with kiln temperature.

Note: Do not be concerned if your kiln makes a clicking sound during firing. Kilns use relays to power the elements. The relays click each time their electrical contacts come together.

Note: The firing speed you select (see step 2) is a pre-programmed speed. The kiln's actual firing speed may be less, depending on the kiln model, available voltage, density of load you are firing, etc.

When the kiln fires to completion, the controller will beep for 30 seconds. The display will show the following:

■ Firing time

■ Present temperature

■ `CPLt`

To return to `IdLE`, press **START**.

Ramp-Hold Firing Instructions

Note: If you don't need all four segments that are available in Ramp-Hold, zero out the unused segments. See step 6 below.

1 From `IdLE`, press **START**.

2 Using the Up Arrow key (not the Down Arrow), by-pass firing speeds and select `ProG`. Then press **START**.

3 `Ra 1` will appear. Enter firing rate (temperature change per hour) for segment 1. 1° = slowest rate. 1799°F/999°C = full power. Then press **START**.

4 `°F 1` or `°C 1` and the target temperature from the last firing will appear. To change the temperature, press the Up or Down Arrow keys. Then press **START**.

5 `Hd 1` and the hold time from the last firing will appear (e.g. 1 hour 10 minutes = 01.10). Use the arrow keys to change the hold time. Then press **START**.

6 Continue entering values for the segments needed. When `RA_` appears for the first segment you don't need, select `0000`. Then press **ENTER**. This will zero out the remaining segments.

7 `Strt` will appear. Press **START**. `dELA` will appear. To delay the firing, enter a delay time (e.g. 1 hour 10 minutes = 01.10), or leave the delay set to 00.00. The kiln will begin firing after a 20 second pause or after you press **START**.

When the kiln begins firing, the run light will blink.

To stop a firing before completion, press **START/STOP**. `STOP` will appear, alternating with kiln temperature.

Note: Do not be concerned if your kiln makes a clicking sound during firing. Kilns use relays to power the elements. The relays click each time their electrical contacts come together.

Note: The kiln's actual firing rate may be less than the rate you programmed, depending on the kiln model, available voltage, density of load you are firing, etc.

When the kiln fires to completion, it will beep for 30 seconds. The display will show the following:

■ Firing time

■ Present temperature

■ `CPLt`

To return to `IdLE`, press **START**.

Error Messages

BadP / Bad Programming

The kiln will not fire because the Ramp-Hold program just entered has a rate of 0000 in segment 1. Program the firing again.

EtH / Electronics Too Hot

The temperature of the electronic circuit board is above 185°F/85°C. This could damage the controller, so the firing has been stopped. To prevent this, keep the firing room cooler. Use better ventilation.

FAIL / Thermocouple Failure

The thermocouple, or temperature sensor, failed during firing. Causes:

- Defective thermocouple
- Disconnected thermocouple lead wires
- Defective board
- Electrical noise

TCR / Thermocouple Reversed

Thermocouple lead wires are reversed.

FtL / Fired Too Long

This message appears when both of the following conditions are met:

- The temperature rise is less than 27°F/15°C per hour
- The firing is 4 hours longer than programmed

    Causes of the FtL message:

- Low voltage
- Burned out or worn heating element
- Defective relay

PF 1 / Power Failure

The power failed during firing and temperature dropped more than 180°F/100°C by the time the power came back on.

PF 2 / Power Failure

The power failed during firing and kiln temperature was below 212°F/100°C when the power came back on.

TcO / Thermocouple Failure

The thermocouple failed during the **IdLE** display.

Selecting °F or °C Display

1 UNPLUG kiln or disconnect power.

2 Remove the four screws that hold the controller to the front of the kiln. Carefully remove the controller from the kiln. Leave wires attached.

3 Look at the back of the controller. A plastic jumper on the back of the board determines the type of temperature display. When the jumper connects two pin-type terminals, display reads °F. When the jumper is removed, display reads °C. Remove or insert the jumper as desired. (You can purchase the jumper from a computer supply store if necessary.)
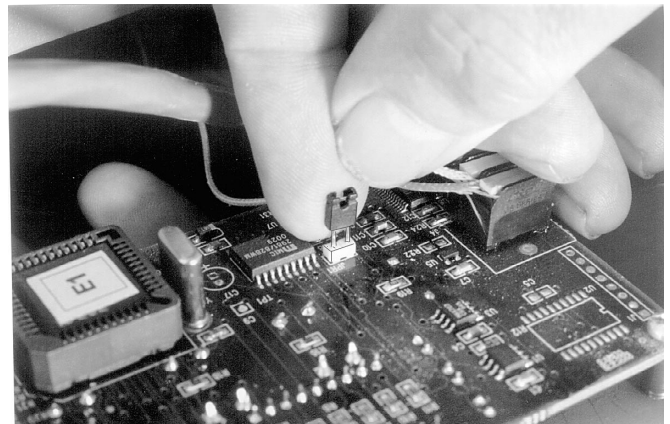
4 Install the controller being careful not to jar components on the back of the controller against the kiln case.

Display Messages

Abrt
The firing was stopped.

CPLt
Fired to completion. If the kiln is already hotter than the programmed target temperature when you begin firing, **CPLt** will appear.

dELA
Delay mode. To delay the firing, enter delay time. To begin firing without delay, leave Delay set at 00.00.

°F or °C (and temperature)
The target temperature (the temperature that the kiln will fire to). Each segment in Ramp-Hold has a target temperature. Single segment mode has only one target temperature.

FULL
Full power firing rate. At this setting the kiln will fire at its fastest rate. There are two ways to select full power:

- Select **SPd5** in Single Segment mode.
- Select a rate of 1799°F/999°C at the **Ra 1**, **Ra 2**, **Ra 3** or **Ra 4** prompt in Ramp-Hold mode. A fast way to do this is to press the Down Arrow key once from 0000. **FULL** will appear.

Hd (and time)
Hold time of a segment, shown in hours and minutes. Example: 2 hours and 15 minutes = 02.15.

IdLE
The controller is ready for you to enter a program or to begin a firing.

-on-
Firing has begun. A moment after **-on-** appears, you will hear the relay(s) clicking.

ProG (Program)
Select this option to program a Ramp-Hold firing.

Ra 1, Ra 2, Ra 3 or Ra 4
Rate. This appears in Ramp-Hold programming for each segment. 1, 2, 3 and 4 are segment numbers. Enter the rate of temperature change for that segment. Rate is figured in degrees of temperature change per hour. Examples:

A temperature rise of 100° in two hours = 50° rate.

A temperature drop of 200° in one hour = 200° rate.

Spd1, Spd2, Spd3, Spd4, Spd5
These are firing rates, or speeds, in Single Segment programming. Select the firing speed with the Up Arrow key.

SStP
Skip Step. This message appears when you press the Up Arrow key during a Ramp-Hold firing. If you press the Up Arrow key again, the firing will skip to the next segment.

StoP
The firing was stopped by pressing **START/STOP**.

Strt
The Start message appears after programming a firing and before Delay appears. Press **START/STOP** to make the Delay prompt appear.

Shorthand Instructions

Read the safety guidelines, page 2. After pressing the keys in the left column, the message in the center will appear. For more detailed instructions, see page 5. Once familiar with the controller, you may prefer these shorthand instructions.

Single Segment Shorthand Instructions

Keys to Press	Display	Action
Turn power on	**IdLE** (If different message appears, press START/STOP.)	
START/STOP	**SPd1** - **SPd5**	Select a firing rate.
Up Arrow (not down)	**SPd 1** (Example of rate selected)	
START/STOP	**°F** or **°C**	Enter target temperature.
Up & Down Arrows	**1900** (Example of temperature selected)	
START/STOP	**Hd**	Enter hold time, if any.
Up & Down Arrows	**00.00** or hold time	
START/STOP	**S t r t**	
START/STOP	**dELA**	Enter delay time, if any.
Up & Down Arrows	**00.00** or Delay time	
START/STOP	**-o n-**	The kiln is now firing.

Ramp-Hold Shorthand Instructions

Keys to Press	Display	Action
Turn power on	**IdLE** (If different message appears, press START/STOP.)	
START/STOP	**SPd1** - **ProG**	Select "ProG" (program).
Up Arrow (not down)	**ProG**	
START/STOP	**Ra 1**	Enter segment 1 rate.
Up & Down Arrows	**500** (example of rate selected)	
START/STOP	**°F 1** or **°C 1**	Enter target temperature.
Up & Down Arrows	**1900** (example of temperature selected)	
START/STOP	**Hd 1**	Enter hold time, if any.
Up & Down Arrows	**00.00** or hold time	

Continue entering values for the segments used. First segment not needed: enter a rate of 0000.

START/STOP	**S t r t**	
START/STOP	**dELA**	Enter delay time, if any.
Up & Down Arrows	**00.00** or Delay time	
START/STOP	**-o n-**	The kiln is now firing.