U D C 2000

INSTRUCTION

M A N U A L

This is the roadmap that will unlock the magic in your UDC 2000. Study and save for future reference.

CONTENTS

BEFORE YOU START

Introduction

Congratulations on your purchase of a UDC 2000 controller. Once you've studied these instructions and used the controller a few times, the UDC 2000 will be as easy to use as a digital wrist-watch. But be prepared to spend some time learning to use it.

The typical digital wrist-watch will do some amazing things once you know how to use it. But if you never read the instructions for it, that same wrist-watch will annoy you by beeping at odd hours. If you study this manual, you will be delighted at the firing power at your disposal. If you don't read it, you'll never really appreciate your controller.

If you purchased the controller as part of a kiln or furnace, you will find a furnace manual in this instruction packet. Please read the furnace manual first, then this manual.

While you're learning to use the controller, leave your furnace's on/off switch in the OFF position. This will allow you to experiment with the controller without powering the elements. After you complete a firing, turn the on/off switch to the OFF position.

Thank you for purchasing this controller. We trust that it will open a new world of convenience for you.

Warranty

The UDC 2000 controller is warranted for two years. This warranty includes immediate technical assistance via a toll free telephone number and complete replacement of the controller if necessary. For technical assistance, dial

1-800-423-9883.

Your model and serial number is

0C2003-0-00B0-0000-00-0111

Here's how to remove the controller from your kiln in the event that you need to return it to the factory under warranty:

1. Loosen the screw on the face of the controller.

2. Pull the controller out.

When reinstalling, make sure the controller slides under the guide clip at the bottom of the controller. Push the controller in all the way.

Important Safety Rules

An electric kiln or furnace is safe to operate provided you follow these basic safety rules:

- **Do not touch hot sides.**
- **Keep unsupervised children away.**
- **Place kiln on stand before connecting power.**
- **Do not install closer than 12" from any wall or combustible surface.**
- **Do not open lid or door until kiln has cooled and is completely shut off. If you must open while hot, wear appropriate protective gear.**
- **Fire only in well ventilated, covered and protected area.**
- **Dangerous voltage: Do not touch heating elements with anything.**
- **Disconnect kiln before servicing.**
- **Do not leave unattended while firing.**
- **Turn on/off switch to OFF position when firing is completed.**

Inspect the Controller for Freight Damage

Carefully inspect your controller as soon as it arrives. If it is damaged, call your dealer. Then notify the freight agent at once and request an inspection. Save all packing materials for inspection by the freight claims adjuster. Refer to your packing list for more information.

INSTALLING THE PORTABLE P 2000

If you purchased a furnace with a UDC 2000 controller already installed, skip this section. This section applies only to the P 2000, which is a portable UDC 2000 controller.

1. Position the P 2000 far enough away from your furnace to avoid heat damage.

2. Install the thermocouple on your furnace. (The thermocouple is the temperature-sensor rod with ceramic insulators on it.) First, decide which vent hole (also called peephole) to use. Find a 1/2" vent hole on your furnace. Most four-sided furnaces have a vent hole in the top, the door, and the back. The hole in the back would be the best choice, but you could use any of the others, too. If your furnace, by chance, has no vent hole, drill one. Drill a 1/2 hole in either a row of blank bricks or at the seam line where two rows meet. (This is to avoid drilling closer than 1" to an element.)

If your furnace or kiln has two holes, one above the other, use the top hole for the thermocouple. If your kiln has only one peephole, you will need to drill a separate hole for the thermocouple, because you should always have one for viewing the firing chamber.

If you are mounting the thermocouple in a kiln with tapered peepholes (where the outside of the hole is larger than the firing chamber side), insert the thermocouple into the drilled peephole plug provided. Place peephole plug into the top peephole of your kiln.

3. You will need to bend the thermocouple at a 90° angle so that you can fasten the thermocouple block to the outside kiln case. To bend, first break off one of the ceramic insulators by squeezing with pliers.
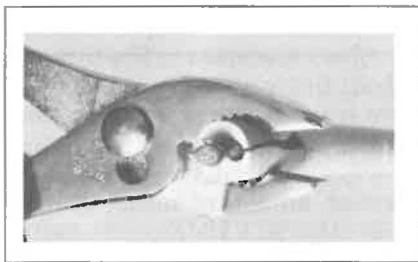
4. Then bend the thermocouple where it will extend into the firing chamber by 1 - 1 1/2" when the thermocouple block is pressed against the outside kiln case. Hold thermocouple with pliers when bending.

5. Position outer part of thermocouple sideways or downwards against the kiln case. (Avoid placing the thermocouple block above the peephole, which would expose it to heat rising from the peephole.) Place the thermocouple holddown bracket over thermocouple
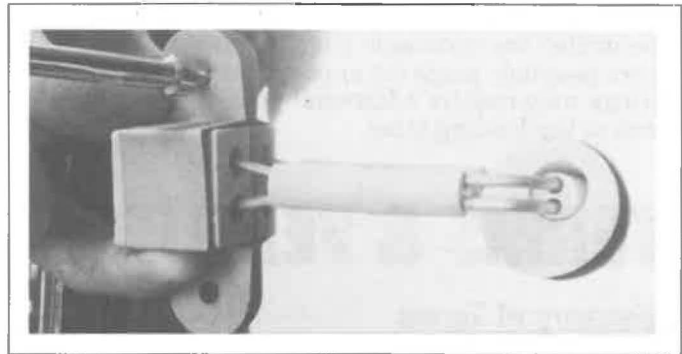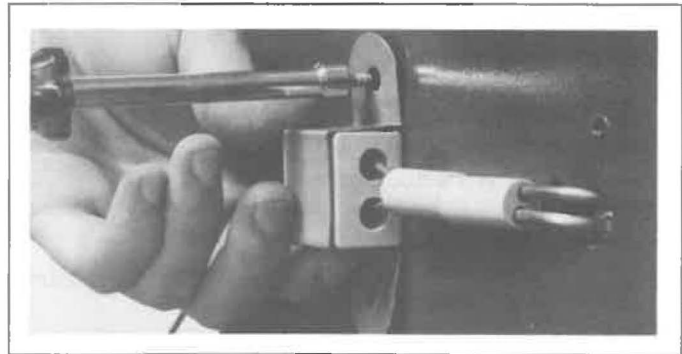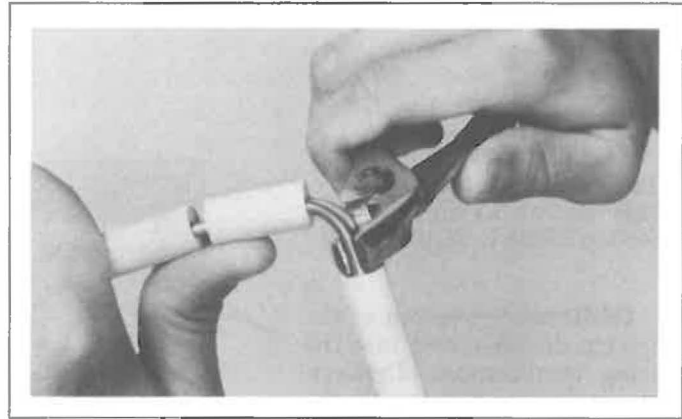
block and drill two 1/8 holes. Fasten with screws provided.

Do not fire kiln without holddown bracket in place, because your kiln will overfire if the thermocouple should fall out.

6. Plug your kiln or furnace into the P 2000.

7. If your kiln has switches, turn all switches to the On or High position. Leave all your kiln's switches on full power when firing your kiln with the P 2000.

8. If you're using a kiln sitter or limit timer as a back up shut-off for the P 2000, place a cone in the kiln sitter. Set the limit timer for half an hour longer than expected firing time. It will be necessary to use a new cone for every firing even if the previous cone didn't bend.

9. If you decide not to use the kiln sitter or limit timer as a back up shut-off, disconnect limit timer. Raise the kiln sitter weight, press in the plunger, and gently lower the weight. Your kiln sitter is now on manual control. Do not use the firing gauge to lock the kiln sitter weight in the up position, for this could damage the kiln sitter.
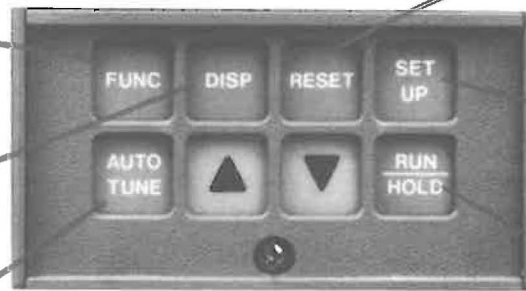
Summary of Keys

FUNC brings the Function Switches into display. This key works only when a Set-Up Mode is displayed.

DISP takes you out of the Set-Up displays and into the firing temperature displays. Also takes you through the firing messages in the bottom of the display.

AUTO TUNE runs a test program on the controller that adjusts the controller to run at its best on your particular furnace.

RESET is used in a Function Switch display. It will cancel a new adjustment. This is useful if you make a mistake with the arrow keys.

SET UP brings the Set-Up Modes into display.

RUN/HOLD turns a firing schedule on or puts it on hold. NOTE: This key does not turn the furnace off.

Arrow Keys change temperature, time, and turn features on and off.

If you would rather remove the kiln sitter entirely, consult a kiln technician.

10. For automatic venting, drill a 1/2" hole in the center of the kiln lid (on top loading kilns) and leave peephole plugs out. (The only peephole plug left in place will be the drilled thermocouple plug.) On front loading kilns, leave peephole plugs out or peephole covers open. Some firings may require additional venting through the lid prop of top-loading kilns.

TERMS & FEATURES

Glossary of Terms

Display Messages, Operation and Set-up There are two types of messages in the display window: operation and set-up. During firing, the display window gives you information on firing progress. These are operation messages. When you make adjustments on the controller, the display window shows you which adjustment you are making. These are the set-up messages.

12-Segment Program The SPPROG program, one of three methods to fire your furnace. This is the heart of your controller. The 12-segment program is a set of instructions your controller uses to control firing speed, temperature, soaking time, etc. It has six ramps and six soaks. You can use a factory pre-set 12-segment program, or you can enter your own 12-segment program into the controller. We will show you how.

Function Message All the adjustments made on the controller are organized under 8 Set-Up Modes. You must have the correct Set-Up Mode displayed on the screen before making an adjustment. Then you must press the **FUNC** key until the adjustment you are making appears in the display window. This adjustment display is called a Function Message.

Normal Temperature Display Furnace temperature. When you are running a SPPROG or SPRAMP program, the controller display window shows the firing display. When you are not running a program, the window shows the normal temperature display. The controller shows normal temperature display when you first plug it in. In normal temperature display, the bottom display is blank.

Ramp A ramp is a stage of programmed firing where the temperature is either raised or lowered. Time is the only thing you can adjust in each ramp.

Segment The controller fires your furnace or kiln in stages. A stage is called a segment. There are two types of segments: ramps and soaks.

Set Point This is the temperature the furnace is either trying to reach or is soaking at. There is always a set point, whether you are firing a program or not. An example: if you set the thermostat in your home to 70°, 70° would be the set point for the thermostat.

If you just want to fire to temperature without caring about firing speed or shut-off, you can Single Set Point fire without a program. (See Single Set Point.)

Set-Up Mode The controller has eight different adjusting modes. To make an adjustment, you must be in the correct adjusting mode, or Set-Up Mode. When you press the **SET UP** key, the controller will enter a Set-Up Mode. This works the same way as the mode button on a digital wrist-watch.

Single Set Point The controller is never idle. It is always working. It's like the thermostat in your home. It is always trying to maintain a certain temperature inside your furnace. When you are not firing a program, the controller is still set for a temperature, which is called the Single Set Point. After you run a SPPROG or SPRAMP program, the last temperature of the program becomes the Single Set Point.

Soak A soak is a stage of firing where the temperature is held steady for a certain length of time. There are two adjustments for each soak: time and temperature.

SPRAMP: Set Point with Ramp SPRAMP firing, one of three ways to fire with the controller, is a single-ramp firing program. You can select the temperature you will fire to and the length of time you want the furnace to take to reach that temperature. (See set point.)

SPPROG: Set Point with Programming SPPROG firing is one of three types of firings you can do with this controller. With the SPPROG firing program, you can enter up to 12 stages of firing into the controller (six ramps and six soaks). It uses the 12-segment program. (See set point.)

USING THE KEYS

Plug your controller in. During normal temperature display, which is what you see after you first plug in, the top part of the display window shows the furnace temperature in large numbers. The bottom part of the display window is blank. Press the **DISP** (display) key. Each time you press this key, the display window shows a different message.

The messages displayed on the bottom half of the display window are of two types: operation and set-up. Operation messages tell you what your furnace or kiln is doing while firing or while in normal temperature display. Set-up messages guide you through all the set-ups.

The set-up adjustments that you can make on the controller are organized under a series of Set-Up Modes. Press the **SET UP** key. While the **SET UP** key is held down, the display window reading will take you through the eight Set-Up Modes one after the other. (See box this page.) Or you can press **SET UP** once for each Set-Up Mode. Each time you press the **SET UP** key, you will see a different Set-Up Mode. The furnace temperature disappears when the Set-Up Modes are displayed.

If you do not touch a key after a minute, the display goes back to normal temperature display.

Press the **SET UP** key again to get one of the eight Set-Up Modes in the bottom of the display. Then press the top left **FUNC** (function) key. Each time you press the **FUNC** key, you will see a different message. These messages are the Function Messages for the Set-Up Mode you are in. For instance, "CYC TI" is a Function Message under the "TUNING" Set-Up Mode.

*The **FUNC** key works only when a Set-Up Mode is displayed. So if you get "KEYERR" when you press the **FUNC** key, you are not in a Set-Up Mode.*

Set Up Modes

If you press the **DISP** key while a Set-Up Mode is displayed, the controller display goes back to normal temperature display.

The Function Messages are lists of adjustments that you can make under each Set-Up Mode. After you use the **FUNC** key to display a Function Message, you can use the up and down arrow keys to make adjustments. Arrow keys will raise or lower time and temperature settings and turn features on and off. If you make an adjustment and then decide you want to go back to the setting you had before, you can do that by pressing **RESET**.

*The **RESET** key will work only if the Function Message is still displayed and you have not yet pressed the **DISP** key.*

Exercise 1: Press the **SET UP** key until **INPUT 1** appears in the bottom of the display window. Then press the **FUNC** key until **UNITS** appears in the display. Use an arrow key to change the **F** to a **C** (or vice versa). Now press the **DISP** key to take you back to the normal temperature display.

You have just changed the temperature reading from °F. to °C. (or vice versa). You entered the **INPUT 1** Set-Up Mode, and changed the **UNITS** Function Message with an arrow key. Now change the **UNITS** Function Message back to the way you had it if you want.

Exercise 2: Your controller temperature display is in normal temperature mode. (Note: If **RUN** or **HOLD** appear in the display window alternating with a temperature, skip this exercise until later.) Turn off the on/off switch for the elements so that the furnace will not begin firing.

Press the **DISP** key. **SP** will appear in the bottom of the display window. Write down the number that appears. Use the arrow keys to change the number. Then press the **SET UP** key, which will take you out of the **SP** display. (More later on what **SP** means.) Now press the **DISP** key to get back into normal temperature display.
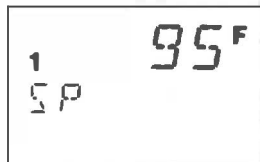
Exercise 3: Change the **SP** number back to what it was before Exercise 2. Experiment with this time-saving tip:

Time-saving tip: When you press an arrow key to change a time or temperature setting, the numbers will change one at a time, but you can go into fast mode if you want. Let's say you want to enter 500 into a program from a zero setting. Hold down the "Up" arrow key. You'll notice that the numbers increase slowly by one's. Continue to hold down the "Up" arrow key, and press the "Down" arrow key once. The numbers will go up in tens instead of ones. If you press the "Down" arrow again, the numbers will go up in hundreds.

The **RUN/HOLD** key starts (runs) a programmed firing. You can also press this key to pause (hold) a programmed firing. When the furnace or kiln is firing, the temperature will show in the top of the display, alternating with **RUN**.

If you touch the **RUN/HOLD** key during firing, the firing will pause (hold). The top of the display will then alternate back and forth between **HOLD** and the temperature. If you press **RUN/HOLD** again, the firing will continue.

Pressing **RUN/HOLD** *during a firing will NOT turn the furnace off. It will only pause the firing, keeping the furnace at the temperature it was at when you pressed* **RUN/HOLD**.

The UDC 2000 is designed to fire many different types of furnaces. To fire each furnace correctly, it must know the heating properties of that furnace. To find this information, the controller puts the furnace through a trial-run, called *Auto tune*. The **AUTO TUNE** key on the lower left starts this operation. We will show you how to use this later.

At this point, the Set-Up Modes and their Function Messages will probably read like Greek to you. Don't let this concern you. You will probably never use most of them; they're already set up at the factory for you. But we will explain fully how to make the Set-Up adjustments you will need.

DISPLAY MESSAGES

Display Messages While Firing a Program

When you're firing a program, the controller shows the furnace temperature in the top display window. The bottom display shows a series of operation messages that tell you what the furnace is doing while firing.

To view these bottom display messages, press the **DISP** key. Each time you press it, one of four different messages will display. This bottom display message will stay on throughout the firing unless you press **DISP** again. Here is what these messages mean:

1 1.29 (SPPROG) or RP 1.20M (SPRAMP)

SPPROG: (We'll explain shortly what SPPROG and SPRAMP mean.) The first number is the firing segment the controller is in. The second number is the time left in that segment. A ramp (temperature rise or fall) is an odd number, and a soak (holding temperature steady) is an even number. In this example, one hour and 29 minutes remain in segment 1, a ramp.
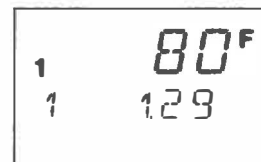
SPPROG program: ramp 1, 1 hour and 29 minutes left.

If you use rate as a ramp unit, the bottom display during firing will not show time left in a ramp (1 1.29). Instead it will show degrees per minute (1 10— segment 1, 10 degrees per minute).

SPRAMP: RP means you are in the single-ramp program. The number is total time in minutes of the program.
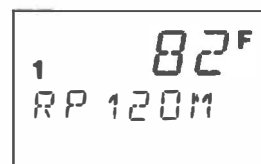
SPRAMP program: total time in minutes

OT 100.0

The controller cycles the heating elements on and off to reach a temperature. This reading tells you in percentage how long the elements stay on during each on/off cycle. In this case, the elements stay on 100% of the time. **OT** means output.
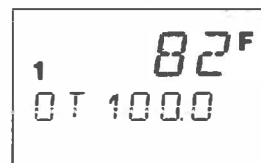
SP 502

SP means set point. In this case, the set point temperature is 502°. Set point is the temperature the controller is trying to maintain inside the furnace. The actual furnace temperature is in the top of the display in large numbers.
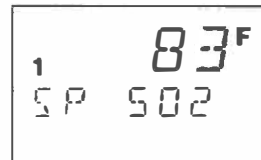
DE - 420

This is the difference in degrees between the temperature of the furnace and the set point, or the temperature it is working towards. **DE** means deviation. In this case, the furnace is 420° off from the temperature it is working towards.
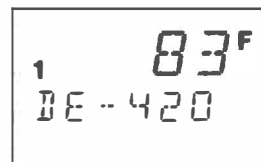
Single Set Point Display Messages

When the controller is not firing a program, it is running in Single Set Point. You can set the Single Set Point for room temperature, and the elements will stay shut off. Or you can set the Single Set Point for any temperature you want up to the kiln's rated temperature. The controller will hold your kiln or furnace at that temperature indefinitely. We'll explain this more fully under "Firing."

In Single Set Point, the normal display is the furnace temperature. This shows in the top part of the display. The bottom of the display is blank. Whenever the bottom display is blank, you know you are viewing the actual furnace temperature.

When you press the **DISP** key, **SP** appears in the bottom of the display and the Single Set Point temperature appears in the top display. SP means set point. The SP temperature may differ from the furnace's actual temperature. If so, the controller is firing the elements or has shut them off to make the furnace temperature the same as the Single Set Point temperature.
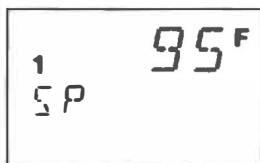
When you press **DISP** again, **DEV** appears in the bottom of the display, and the top of the display shows the number of degrees off the furnace is from reaching the Single Set Point.
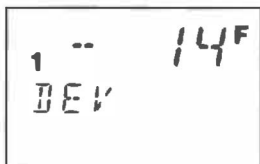
Press **DISP** again, and **OUT** appears in the bottom of the display. The top of the display shows the percentage of time that the elements receive power. (At 100%, elements stay on all the time.)

How do you get back to the normal idle temperature display? Just leave the display alone for a minute. It will switch back to normal display from **SP**, **DEV** or **OUT** automatically. Or you can press **SETUP**, then **DISP**.

FIRING

Three Ways to Fire Your Controller

The controller is always trying to maintain a certain temperature inside your kiln or furnace. This temperature is called the set point. The controller is either firing a program, or it is in Single Set Point. So whenever the controller is plugged in and receiving power, it is always working. It is never idle.

The UDC 2000 controller has three methods of firing your kiln. The first method is with the Single Set Point. In this mode, the controller has one temperature that it maintains your furnace at.

The second method is with the SPPROG program. SPPROG is a 12-segment program. It uses six ramps and six soaks. The SPPROG program is the heart of the controller.

The third method is with the SPRAMP program. SPRAMP is a single-ramp program.

The controller is either in a program (SPPROG or SPRAMP), or it is in Single Set Point. When the controller is out of the SPPROG and SPRAMP programs, it is automatically in Single Set Point.

Single Set Point Firing

The controller goes into Single Set Point right after you plug it in and also after it has finished a firing program. In Single Set Point, the controller will maintain your furnace at the Single Set Point temperature. Most people would want the furnace to be "off" when not running a program, but some people need their furnaces to stay on at a certain temperature constantly (glass blowers, heat treaters, etc). You can adjust the Single Set Point for room temperature or any temperature up to the maximum your furnace or kiln is rated for.

Here is how to change the Single Set Point from the normal temperature display:

1. The normal temperature display has a blank bottom display. Press the **DISP** key; you'll see a temperature in the top of the display with **SP** in the bottom display. **SP** (set point) is the temperature the furnace or kiln will maintain.
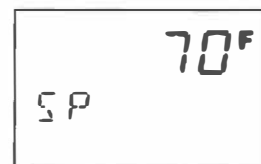
2. Press the arrow keys to change the **SP** temperature displayed. The furnace will automatically begin heating until it reaches the **SP** temperature.

3. To change the display back to the normal furnace temperature, press the **SETUP** key and then the **DISP** key. Now you can watch the furnace temperature change.

When the furnace reaches the Single Set Point temperature, it will idle at that temperature indefinitely. If your firing is complete when the furnace reaches the Single Set Point, turn the element on/off switch OFF.

Firing the SPPROG Program

Using a Factory-Set Firing Schedule

If your UDC 2000 controller was pre-programmed at the factory to fire on your schedule, you will find a filled-in ramp/soak chart with this manual. Here's how to fire a pre-programmed controller:

1. Set up and load your furnace or kiln according to its manual. Close the door or lid.

2. Plug the UDC 2000 into its wall receptacle. Turn the toggle switch to the ON position.

3. Press the **RUN/HOLD** key on the controller. The display will show the furnace temperature, alternating with **RUN**.

If you are using the furnace for wax elimination, you must remove the wax and wax tray before the furnace heats above 350°F. Do not remove the wax until the furnace has been at 350°F. for at least half an hour.

WARNING! If you heat wax to a higher temperature than 350°F., you could RUIN your furnace.

4. After firing is completed, always turn element on/off switch to the **OFF** position.

Firing With Your Own Firing Schedule

Planning Your Firing Schedule on Paper

At the back of this manual you will find a blank Ramp/Soak Worksheet. Make copies of this worksheet. Use them to plan your firings as follows:

You have 12 segments to work with. A segment is either a temperature change (ramp), or a holding of the temperature for a period of time (soak). But you do not have to use all 12 segments.

First, decide how long you want the furnace to fire, and to what temperature. Draw a line on the chart from 0 to the time/temperature you want. Then draw a horizontal line to show how long the furnace is to remain at that temperature. Angled lines are ramps, and horizontal lines are soaks. Draw these lines for all the segments you need. You can use as few as one segment in a firing or as many as 12. If you use only one segment for a firing, it must be a soak. Multiple-segment firings must end with a soak (odd number).
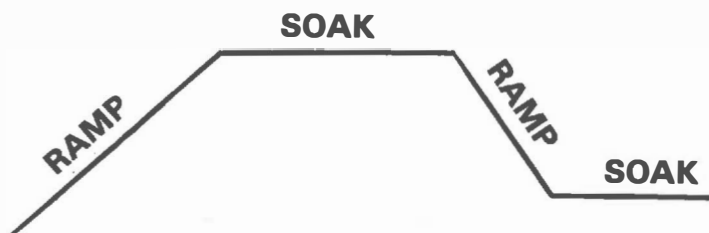
Filling Out the Worksheet

After you draw in the lines, fill in the blanks below the chart. Here is what the entries mean:

STRSEG (Start Segment)

The segment your schedule is starting with.

ENDSEG (End Segment)

The segment your schedule is ending with.

RECYCL (Number of recycles)

Do you want the firing schedule to repeat itself? Write in the number of times. Write 0 if you do not want it to repeat itself automatically.

SOKDEV (Soak Deviation)

During a soak, the controller holds the soak temperature for the length of time you specify. Suppose, however, you're firing a fast schedule, and the furnace hasn't been able to reach the soak temperature when the soak time starts. Do you want the controller to start timing the soak even though the furnace has not reached its soak temperature? Or do you want the soak time to begin only after the furnace reaches its soak temperature?

Example: the first segment (a ramp) is half an hour. The second segment is a 1000° soak for one hour. At the end of the first half hour, the furnace is at 800°, not 1000°. Do you want the one hour soak segment to begin only after 1000° is reached? Or do you want it to begin when segment one runs out of time?

If you don't care whether or not the furnace has reached the soak temperature when the soak timing begins, enter "0" under **SOKDEV**.

If you want the controller to begin timing the soak only after the furnace has reached the soak temperature, enter a number. If you enter 5, that means the controller will stop the soak timing whenever the furnace temperature dips lower than 5° from the soak temperature, or higher than 5°. You can enter any temperature from 1 to 99 degrees.

SG1 RP (Ramp Time for Segment 1)

The length of time for segment #1, which is a ramp. The maximum time you can enter is 99 hours and 59 minutes (99.59).

You can also enter time as degrees of temperature rise per minute (999° per minute maximum). We'll explain this more fully in **RPUNIT** below.

SG 2 SP (Soak Set Point)

The temperature for segment #2, which is a soak. This is the temperature the furnace will work towards during ramp #1.

SG 2 TI (Soak Time)

The length of time of segment #2, a soak. Maximum time is 99 hours and 59 minutes or 99.59.

Continue filling out the chart for as many segments as you need.

What temperature do you want your furnace to be at after the program is finished? The temperature of the last soak is the temperature the controller will hold your furnace at after the program is finished. It will hold that temperature indefinitely. If you want the elements to shut off after the program is completed, enter a temperature below room temperature for the last soak.

STATE (Program State)

There are two choices here: **HOLD** or **DIS**. Your selection here determines what the controller will do at the end of the program. After the controller completes the firing of this program, it will either close (disable) the program, or keep it open. If you select **HOLD**, then you can start this program again just by pressing the **RUN/HOLD** key. If you select **DIS**, then you will have to open this program by pressing the **SET UP** key twice, **FUNC** once, and an arrow key.

RPUNIT (Ramp units in time or rate)

When you plan the ramps of your schedule, you can figure them as either reaching a temperature in a certain length of time (**TIME**), or as degrees of temperature rise per hour (**RATE**). If you use **TIME**, write in the length of time for the ramps on your chart. If you use **RATE**, write in degrees per minute for each ramp on your chart. Most people prefer time as a unit. The maximum time you can enter is 99.59 (99 hours, 59 minutes). The maximum rate is 999° degrees per minute.

If you use rate as a ramp unit, the bottom display during firing will not show time left in a ramp (example, 1 1.30). Instead it will show degrees per minute (1 10—segment 1, 10 degrees per minute).

Entering Your Firing Schedule into the Controller

Have your Ramp/Soak Worksheet in front of you as you enter it into the controller.

1. Load your furnace or kiln following the manual that came with it. Close the door or lid.

2. Press the controller **SET UP** key twice; **SPRAMP** will appear in the bottom of the display; **SET** will appear in the top. You are now in the firing schedule Set-Up Mode. If you wait one minute before pressing another key, the display will go back to normal temperature reading.

3. Once you are in the firing schedule Set-Up Mode, you have the choice of entering either the single-ramp firing (**SPRAMP**) or the 12-segment firing (**SPPROG**).

Note: **SET:SPRAMP** *is the Set-Up Mode you have to be in to program a firing schedule. Within the Set-Up Mode, there are two types of firing schedules:* **SPRAMP** *(single-ramp) and* **SPPROG** *(12-segment). Here's something that may seem confusing:* **SPRAMP** *appears in the lower display for both the Set-Up Mode and for the single-ramp program. But you'll know you're in the Set-Up Mode when* **SET** *appears in the top window. If you're in the single-ramp program, either* **DIS** *or* **ENAb** *will appear.*

Set-Up Mode   Single-ramp program

SPRAMP and **SPPROG** are like Greek, but they mean "Set Point with one ramp" (**SPRAMP**) and "Set Point with a program" (**SPPROG**). We are going to use the 12-segment program, so we want to open **SPROG**.

From the Set-Up Mode **SET:SPRAMP**, press the **FUNC** key. If both firing schedules are closed, you will see **DIS:SPRAMP** and **DIS:SPPROG** as you press the **FUNC** key. If one of the schedules is open, you will see **ENAb** (enabled) in the top of the display.

12-segment schedule open   Same schedule closed

If **ENAb:SPRAMP** appears, press an arrow key to close (disable) the single-ramp schedule. **ENAb** will then change to **DIS**. Press the **FUNC** key again to get **DIS:SPROG**. Press an arrow key to change **DIS** to **ENAb** (enable), opening the 12-segment schedule.

4. The display now reads **ENAb:SPROG**. Press the **FUNC** key. **STRSEG** will appear in the bottom of the display. Use the arrow keys to enter the first segment your firing is starting with. This will usually be 1.
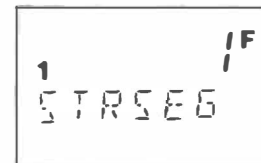
5. Press **FUNC** again. **ENDSEG** will appear in the bottom of the display. Enter the last segment of your schedule using the arrow keys.
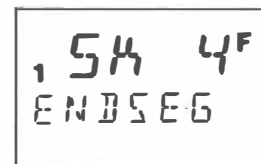
If you are firing with a single segment, enter that segment number in both **STRSEG** *and* **ENDSEG**. *It must be a soak.*

6. Using the **FUNC** key, go through the worksheet Function Messages and enter the values with the arrow keys.

Don't let the **F** *or* **C** *symbol confuse you when you are entering times. The* **F** *or* **C** *symbol stays lit all the time.*

When entering time for ramps, notice whether or not there is a decimal point in the upper display. If there is no decimal point, the program is adjusted for degrees of temperature rise per hour. If there is a decimal point, the program is adjusted for minutes.
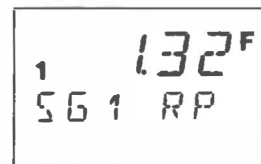
The display shows one hour and 32 minutes in segment one, a ramp.

SET:SPRAMP will appear when you come back to the beginning of the schedule. This means you have finished entering your program. Press **DISP** to get back to the normal temperature display.

7. Then press **RUN/HOLD** to start the firing.

After firing is completed, turn the element on/off switch to the OFF position. Otherwise the controller will heat your furnace at the last soak temperature indefinitely.

Changing a Firing Schedule During a Firing

During a firing, the controller will not allow you to change the firing schedule. If you get into the firing schedule Set-Up Mode (using the **SET UP** and **FUNC** keys) during RUN, you will find that you cannot change any of the settings. However, if you first put the furnace on HOLD with the **RUN/HOLD** key before getting into the Set-Up Modes, you will be able to make changes.

After you put the furnace back on RUN, the segment you were in during HOLD will fire with the original time and temperature. This is even if you changed them during HOLD. But the segments to follow will run with the new settings.

How to Program a Delay Fire

A delay fire will give you the flexibility of not having to be near your furnace or kiln during an entire firing. For instance, if you normally arrive at your studio at 8 a.m., and a firing will take five hours, you can program

your furnace to begin firing at 4 a.m. When you arrive in your studio, your furnace will have only one hour to go before the firing is completed.

When programming a delay fire for wax elimination, you must be present to remove the wax before the temperature rises above 350° F. Otherwise you will ruin your furnace!

You must be near the furnace near the end of a firing to make sure the furnace turns off. If something goes wrong and the furnace does not shut off at the end of the firing, your furnace could be damaged or your ware ruined. Overfire is not covered under warranty, no matter what the circumstances.

1. To program a delay, begin the firing schedule with segment two.

2. Set the temperature of segment two (**SG2 SP**) to the temperature you want during the delay. If you want the kiln to be cold during delay, set the temperature at 0. Set the soak time of segment two (**SG 2 TI**) for the number of hours and minutes of delay.

How to Store More Than One Firing Schedule in the SPPROG Program

You have 12 segments to work with. If you use fewer than 12 segments for a firing, the remaining segments can be used to store a different firing schedule. For instance, if your first firing schedule uses only two segments, you have ten segments left for other firing schedules.

Let's say your firing schedule uses segments 1 and 2. Read "Entering Your Firing Schedule Into the Controller" to turn on the Function Message **SPPROG**. Before firing the schedule, make sure the Start Segment (**STRSEG**) is set at 1 and the End Segment (**ENDSEG**) at 2.

Let's say that on segments 3 through 6, you have a second firing schedule. If you were to run that one, you would set the Start Segment at 3 and the End Segment at 6. You switch from one firing schedule to another with the **STRSEG** and **ENDSEG** Function Messages.

Firing the SPRAMP Program

1. Follow the first three steps of "Entering Your Firing Schedule Into the Controller" on page 8. Only instead of opening **SPPROG**, open **SPRAMP**. Use an arrow key to get **SPRAMP:ENAb**. Don't try to open **SPRAMP** from **SET:SPRAMP**.

2. Once you have opened the single-ramp schedule, you'll see **ENAb:SPRAMP**. Press the **FUNC** key to get **TI MIN** (time in minutes). Enter minutes, from 0 to 255. (A 0 setting will turn the kiln on at high speed when you begin firing with this program.)

Enter total time in minutes that the kiln should take to reach firing temperature. Maximum is 255 minutes.

In the **SPPROG** *program, you can enter ramp time in minutes or in degrees of rise per hour. In the* **SPRAMP** *program that you are in now, you can enter only minutes.*

3. Press **FUNC** again to get **FINLSP** (final set point). Use the arrow keys to enter the temperature you are firing to. The furnace is set for 1000° F. in this example.

4. Press **DISP** to get back to the normal temperature display. Press **RUN/HOLD** to begin the firing.

After the furnace completes the ramp, it will remain indefinitely at the temperature you entered.

How to Stop the Furnace While Firing SPPROG or SPRAMP Programs

If you want to interrupt a firing program, turn the on/off switch to the OFF position. This shuts off power to the elements.

Pressing the **RUN/HOLD** key will pause the firing and place the furnace on HOLD. The furnace will then maintain the temperature it was at when you pushed **RUN/HOLD**. When you push **RUN/HOLD** again, the furnace will start firing the same schedule again, taking up where it left off.

To shut off power to the elements, turn the toggle switch to the OFF position. Pressing the **RUN/HOLD** *key only holds the furnace at its current temperature.*

To end a firing schedule before its completion, press **RUN/HOLD** to put the furnace on HOLD. Then Press the **SET UP** key twice to get to the **SET:SPRAMP** Set-Up Mode. Press **FUNC** once and you will see the firing schedule you're using, with **ENAb** in the top of the display. Press an arrow key to make **DIS** (disable) appear in the top of the display, which will turn off the firing schedule. Press **DISP**; this returns you to the normal temperature display.

Then from the normal temperature display, you can go back into the **SET:SPRAMP** Set-Up Mode and start a different firing schedule, if you want. Just open either the 12-segment or single-ramp program with the arrow key.

How to Tell if There Was a Power Failure

When you program a delay in firing, you will probably be away from the furnace for much of the firing. When you come back to the furnace, how do you know if there was a power failure? This is important, because if there was a power failure, your ware may not have fired to maturity.

Return to the furnace before the firing program is to finish. If the controller is in normal temperature display when you return, you had a power failure. If there is a power failure during a firing, the controller will exit from the firing program and go back to the normal temperature display. So if the controller displays normal temperature when you return to the furnace, either there was a power failure, or the firing schedule fired to completion.

Normal temperature display (blank lower display).

In the event of a power failure, the furnace will fire at the Single Set Point that you set before starting the firing program. See "Single Set Point Firing" to adjust the Single Set Point.

REFERENCE

Auto-Tune

What is Auto-Tune? This is a test that your controller runs to fine-tune the firing cycles. Auto-Tune gives your controller the firing information it needs about your furnace or kiln to run as efficiently as possible. However, it is unlikely that you will ever need to run an Auto-Tune.

1. Put both **SPRAMP** and **SPPROG** firing schedules on **DIS**. See "Entering Your Firing Schedule into the Controller" for instructions.

2. Press **SET UP** until **ATUNE:SET** appears. Press **FUNC** until the Function Message **AT ENB** appears in the bottom of the display.

3. Press an arrow key until **ASTP** reads in the top of the display.

4. Press **DISP** to get back to a normal idle temperature reading.

5. Adjust the Single Set Point to the temperature you usually fire to. (See "Single Set Point Firing.")

6. Turn the toggle switch to the ON position to send power to the elements.

7. When the furnace reaches the Single Set Point temperature, press **DISP** to view the Single Set Point. Press **ATUNE**. **TUNE** will appear in the top of the display.

You can stop the Auto-Tune by pressing the **RESET** key. When the Auto-Tune is finished, the display will show the normal temperature display again.

Changing Your Configuration

If your controller was set up at the factory for your furnace, you will find a Configuration Record Sheet with your wiring diagram. At the factory, we set your controller for such things as the correct thermocouple type, cycle time, etc. If you mistakenly change any of these settings, they're easy to correct.

Use the **SETUP** key to enter the Set-Up Mode and the **FUNC** key to enter the Function Message. Change the settings with the arrow keys.

If the arrow keys have no effect on a setting, bring up the **TUNING** Set-Up Mode, and then the **LOCK** Function Message. Change the **LOCK** to none, make the adjustments you need in the other Set-Up Modes, and then restore the **LOCK**.

Trouble Shooter

KEYERR WHEN YOU PRESS RUN/HOLD

Both firing schedules—the 12-segment SPPROG and the single-ramp SPRAMP—are closed (disabled). See "Entering Your Firing Schedule Into the Controller" for instructions on how to turn on (enable) a firing program.

FURNACE WON'T SHUT OFF

The controller will power the furnace heating elements until the Single Set Point is reached. Remember, as long as the controller is plugged in, it is working. It is never idle. It is always trying to maintain a certain temperature—either a temperature in a program or the Single Set Point. See "Single Set Point Firing" to adjust the set point.

TEMPERATURE READ-OUT FLUCTUATES

Radio-frequency "noise" from gas furnace blower motors, ultrasonic cleaners, polishing machines, engravers, etc., can cause wide fluctuations in temperature read-out. You can filter out this noise as follows:

1. Press **SETUP** key until **INPUT 1** appears in the bottom of the display.

2. Press **FUNC** until **FILTR 1** appears in the bottom of the display.
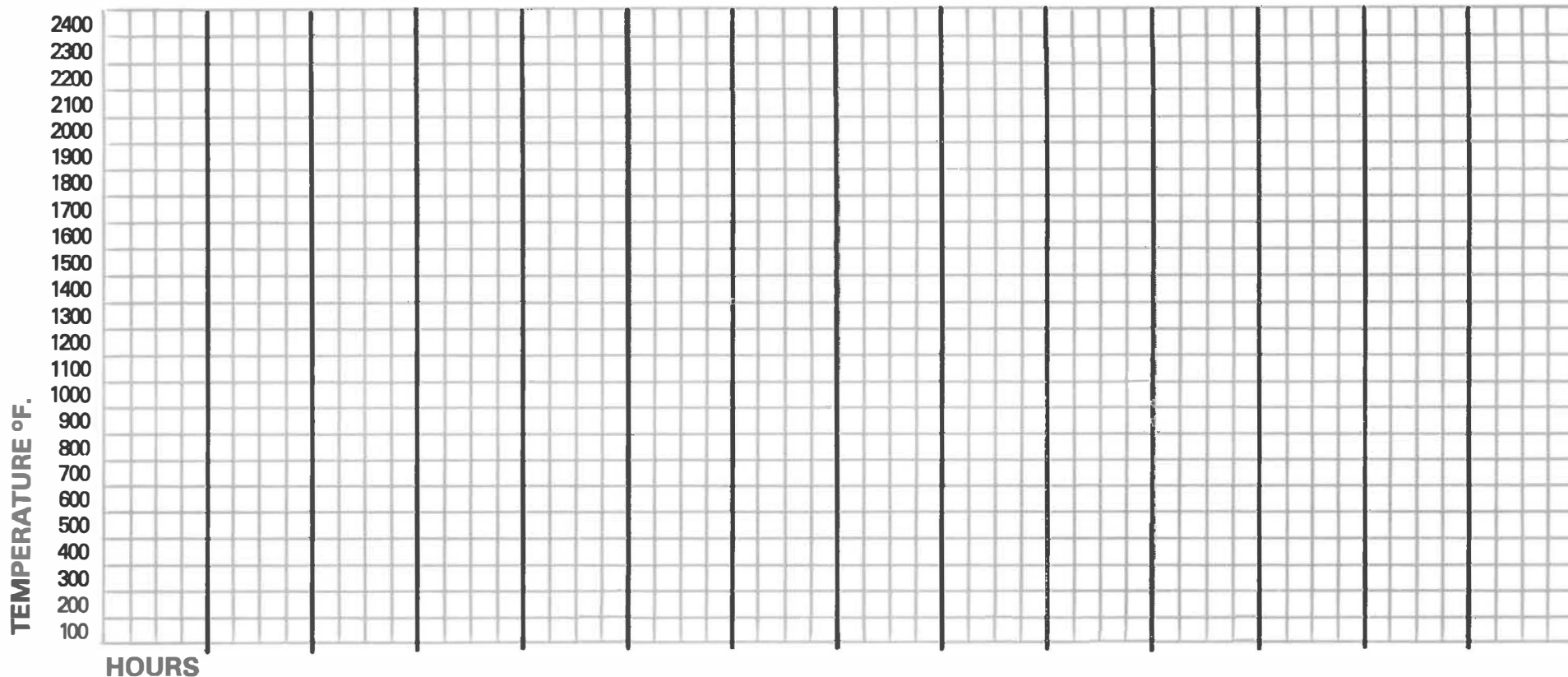
3. Use the arrow keys to enter 15.

4. Press **DISP** to get a normal idle display. If the temperature read-out still fluctuates, repeat these steps and enter a higher number. If the temperature displayed is steady, you may want to lower the filter number to 14 or 13.

FIRING IS AT WRONG RAMP SPEED

This is in the **SPPROG** program. It is likely that the program was set for the wrong type of ramp time. You have a choice in **SPPROG** of using either total minutes of ramp time or degrees of rise per minute. You may have entered minutes of total time when the program was set for degrees of rise per minute, or vice versa. See "Entering Your Firing Schedule Into the Controller."

In the **SPRAMP** *program, you have only one choice: total time in minutes.*

Ramp/Soak Worksheet

TEMPERATURE °F.

2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100

HOURS

Display Prompt	Function	Seg-ment	Enter This Value
STRSEG Segment	Start		
ENDSEG	End Segment		
RECYCL	Number of Recycles		
SOKDEV	Soak Deviation		
SG1 RP	Ramp Time	1	
SG2 SP	Soak Set Point	2	
SG2 TI	Soak Time	2	
SG3 RP	Ramp Time	3	

Display Prompt	Function	Seg-ment	Enter This Value
SG4 SP	Soak Set Point	4	
SG4 TI	Soak Time	4	
SG5 RP	Ramp Time	5	
SG6 SP	Soak Set Point	6	
SG6 TI	Soak Time	6	
SG7 RP	Ramp Time	7	
SG8 SP	Soak Set Point	8	
SG8 TI	Soak Time	8	

Display Prompt	Function	Seg-ment	Enter This Value
SG9 RP	Ramp Time	9	
SG10 SP	Soak Set Point	10	
SG10 TI	Soak Time	10	
SG11 RP	Ramp Time	11	
SG12 SP	Soak Set Point	12	
SG12 TI	Soak Time	12	
STATE	Program State		
RPUNIT	Time or Rate?		