www.ibexdental.com

Apex Three Stage Burnout Dental Oven

User Manual

IBEX Dental Technologies, Inc.
850 N. Dorothy Drive, #502
Richardson, TX 75081
877-370-4242

READ FIRST BEFORE USING OVEN!

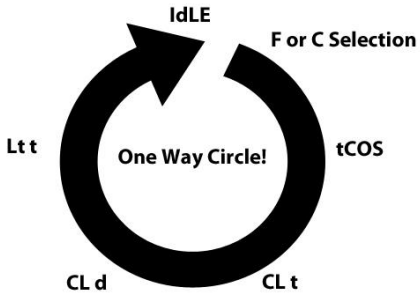
Programming Instructions for the IBEX 3 Stage Burnout Oven

Turn on the oven. The oven will beep for 3 seconds then display "**6F 7**". This is for self tests and operating system upload. Upon completion, the oven will alternately display "**IdLE**" and the temperature. **"IdLE" is the central starting and stopping point for all oven functions. The oven is now ready to perform all operations.**

1. CONFIGURATION: Changing the Display Temperature to °C and setting the Real Time Clock:

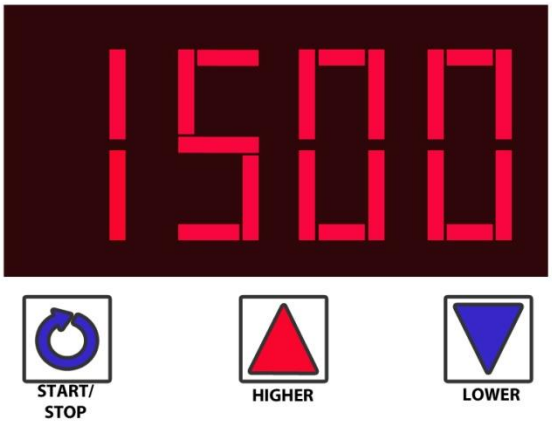
The Configuration Section is for setting your displayed temperature to °C and for setting the Real Time Clock. All other settings have been set at the factory and should not be altered. Review the diagram below. The configuration steps are arrange in a one direction circle. **(YOU CANNOT GO BACKWARDS.)**

If you use °F and do not use the Delay Start feature, skip this section and proceed to section 2, Selecting a Program Slot.



Press the HIGHER button to enter the Configuration Mode.

Press the "START/ STOP" button to step through.



After power up, the oven is in the "**IdLE**" state.

a. Press the "**HIGHER**" button to enter the configuration mode. The display will alternate between "**CFG**" and **F.** By pressing either the "**HIGHER**" or "**LOWER**" buttons, the **F** will change to **C**.
NOTE! <u>The temperature will reset to °F every time the power is turned off.</u>

b. Each press of the "**START/ STOP**" button will record the displayed value and move you to the next configuration step.

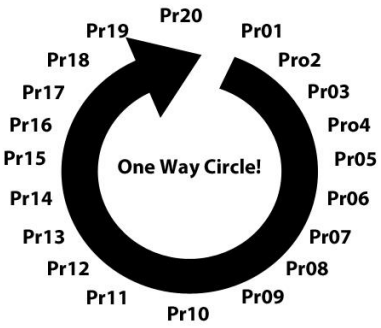
Review the list below to see the remaining configuration steps:
NOTE! If you are not using the Delay Start feature, press the "**START/ STOP**" button repeatedly to step through the remaining steps until "**IdLE**" appears on the display.

tCOS – Temperature Offset. This is the temperature correction used to calibrate the oven.
Change only for temp. calibration.
CL t – Real Time Clock time. This is a 24 hour clock. Using the "**HIGHER**" or "**LOWER**" buttons, time is entered in Hours.Minutes. Examples, 8:45AM will be entered as 08.45 and 3:45PM will be entered as 15.45.
CL d – Real Time Clock day. Press the "**HIGHER**" of "**LOWER**" buttons to select the appropriate day.
<u>DAY TABLE</u>
Monday = **–On**, Tuesday = **tUE**, Wednesday = **–Ed**, Thursday = **tHU**,
Friday = **Fri**, Saturday = **SAt**, Sunday = **SUn**

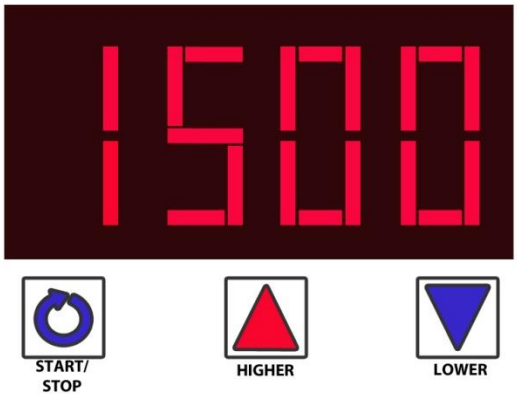
NOTE! <u>The Real Time Clock will reset to Monday, 12.00 every time the power is turned off.</u> If the Delay Start feature is used, the correct time and day must be re-entered for proper Delay Start operation.

Lt t – Safety Temperature. This is the maximum safe operating temperature for the oven. **This value is preset at the factory and should not be altered.** The factory setting is 1950º F.
IdLE – After stepping through all configuration steps, the oven will return to "**IdLE**".

2. Selecting a programs slot:



Use the HIGHER button to step through program slots!



There are 20 available program slots. They arranged in a one directional circle as shown in the diagram above.

a. From "**IdLE**", press the "**START/ STOP**" button one time. The last program selected accessed will now display. (This is usually "**Pr01**", as it is the program slot used by the factory for testing and calibrating the oven.)

b. To select a different program slot, **only** press the "**HIGHER**" button. **(YOU CANNOT GO BACKWARDS.)** For each press of the "**HIGHER**" button the display will change accordingly, "**Pr02, Pr03…PR20**" and will wrap around back to "**PR01**". To go to a program slot with a lower number then the current number, you must circle forward through all the slots in between.

NOTE! "**Pr01**" is factory programmed with a single stage program using the following parameters: 1st Stage H/R: 30° F/min, 1st Stage Temp: 1600° F, 1st Stage Hold: 0 Hours : 30 Minutes, 2nd Stage H/R: 0°/min. This program can be used as is or modified.

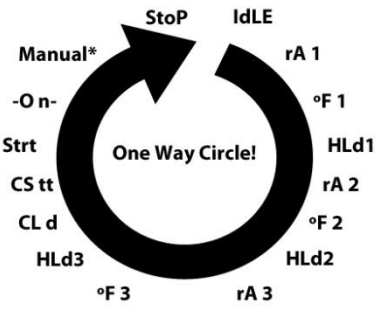
3. Creating or Modifying a program:

a. Once the desired program slot has been selected, press the "**START/ STOP**" button to enter the programming mode. The display will alternate between "**rA 1**", (1st Stage H/R), and the current programmed value.

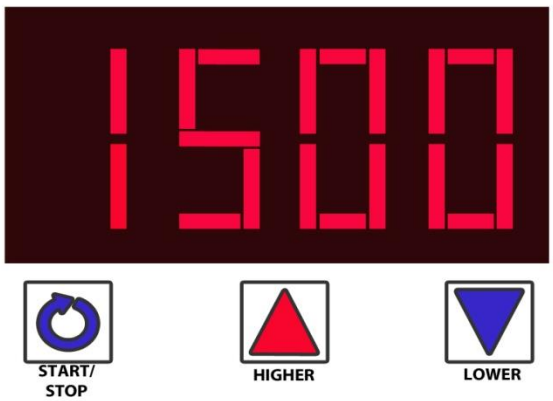
b. Press the "**HIGHER**" or "**LOWER**" buttons to change the current programmed value. Holding either the button in accelerates its rate of change. Example: "rA 1" displays a value of 45. Press the "**LOWER**" button to lower the displayed value to 30.

c. Press the "**START/ STOP**" button to record the new value and step to the next program step. Repeat steps b and c for all program parameters. If the value displayed is correct and does not need changeding, press the "**START/ STOP**" button.

The diagram below illustrates the order in which the program steps will appear after each press of the "**START/ STOP**" button. Use the same process for displaying and recording all program steps.
(YOU CANNOT GO BACKWARDS.) If a mistake has been made or a correction is required, you must step through the entire circle returning back to "**IdLE**" and then re-enter the program mode.



Use the "START/ STOP" button to change program steps!



The following list explains all the steps shown in the program circle diagram. The step order is identical for all program slots. Pressing the "**START/ STOP**" button records the diplayed value and to proceed to the next program step.

Press the HIGHER or LOWER buttons to change the values when entering H/R, Temperature and Time Values.

Display	Step Name	Step Explanation
rA 1	– 1st Stage Heat Rate.	For all stages - Any value from 1º F to 50º F or "**FULL**". "**FULL**" = on continuously.*****
ºF 1	– 1st Stage Temperature.	For all stages - Any value from 100º F to 1950º F
HLd 1	– 1st Stage Hold Time.	For all stages - Any value from 00.01 to 99.59. (in Hours. Minutes)
rA 2	– 2nd Stage Heat Rate.	For a single stage program, enter a "0" value here. The next program step will be "**CL d**".
ºF 2	– 2nd Stage Temperature.	
HLd 2	– 2nd Stage Hold Time.	
rA 3	– 3rd Stage Heat Rate.	For a 2 stage program, enter a "**0**" value here. The next program step will be "**CL d**".
ºF 3	– 3rd Stage Temperature.	
HLd3	– 3rd Stage Hold Time.	
CL d	– Delay Start Day.	Select the day that the oven is to start. If today is Monday and Tuesday is the desired start day, select "**tUE** " for Tuesday. See the "Day Table above for all day codes."
CS tt	– Delay Start Time.	Enter the program completion time in HH.MM. This is the time that you want to start casting, not the program start time. (This is a 24 hour clock. 6:30AM is 06.30, 1:00PM is 13.00)
St r t	– Nothing is entered at this step .	It marks the end of programming inputs. You must press "**START/ STOP**" to proceed.
-O n-	– Delay Start.	This step initiates the Delayed Start feature. The display alternates between "**-On-"** and the time to program start in Hours.Minutes.

NOTE! – For proper Delay Start operation, the internal Real Time Clock must be set to the correct time and day first. Read the configuration instructions for setting the Real Time Clock.

NOTE! – For the immediate start of the program, press the **"START/ STOP"** button. An audible click will be heard and the oven temperature will show on the display. Note that the current stage level LED will be lit to the right of the display.

StoP – Stops a Program: Pressing the "**START/ STOP**" button once, whether in manual or Delay Start, will terminate the program. "**StOP**" will appear on the display and an audible click will be heard. The display alternates between "**StOP**" and the temperature for 30 seconds at which time the oven will return to "**IdLE**". Pressing "**START/ STOP**" prior to the 30 seconds will bypass the timer and go to "**IdLE**".

This completes the programming cycle. To enter additional programs, press the "**START/ STOP**" button and go to the "Selecting a Program Slot" instructions above. Follow all instructions as before.

4. Additional Operation Notes:

Quick Program Start

Once a program has been entered, it is not necessary to step through all the program steps to manually start a program.

Select the appropriate program slot. Press the "**LOWER**" button two times followed by pressing the "**START/ STOP**" button two times. An audible click will be heard and the program has been manually started.

Delay Start Operation

There is not a quick start for the Delay Start feature. Each time a program is to start using the Delay Start feature, you must step through each step to get to "**CL d**" and "**CS tt**" and enter the appropriate start time and day. When the program completes its last Hold Time, the values for "**CL d**" and "**CS tt**" are cleared and must be reentered.

Last Stage Temperature

While running a program, the last stage temperature programmed will be held indefinitely. The programmed hold time is for soak times only. At the completion of the final Hold Time, the alarm will beep indicating the completion of the program and that the rings are ready for casting or pressing. The final temperature will hold until either the "**START/ STOP**" button is pressed, stopping the program or the power is turned off. This feature allows for hot burn out functionality without having to run a program over and over again.

***"OPEn" error. If this error occurs, reprogram the Heat Rate to not exceed 35° F/min for single stage programs and the 1st stage of multi-stage programs. Subsequent stages above 800° F have no heat rate limitation.**

If you have any questions or difficulties with programming or operating your Apex oven please call: IBEX Tech Support at 877-370-4242. We will be glad to help you.

Initial Setup

Thank you for your purchase of the IBEX Apex Burnout Oven. Your Apex Burnout oven comes ready to plug in and program. The only installation or setup would be the installation of the Floor Tray, pictured below. Due to the nature of the cast muffle, the floor has a slight slant, or decline, from manufacture. The Floor Tray has a high temperature pad adhered to the underside of the Floor Tray to raise the front end level with the back, also pictured below.

Floor Tray with Lift Pad attached.

Floor Tray installed.

1 General

User Program heating/cooling rate unit

The Heating and cooling rates for the Dental Oven will be programmed in units of Degrees per minute .

Range is 1 to 50° F/minute + (FULL) – Full On translates to approximately 76° F per minute from room temp to 1600° F.

1.1.1 F/C Option

Pressing the INCREASE button from the IdLE prompt will display the CHG option. This option is the same as the AF3000 controller to allow temperature units to be displayed in degrees Fahrenheit or Centigrade. CHG alternates on the display with the default setting. Press increase button or decrease button to change the setting. Press PROGRAM to advance to the next option.

CHG Selections	
F	Default setting
C	

1.1.2 Thermocouple Offset

tCOS is currently available to the operator from the START prompt. This option shall be moved to the new option menu. The operator can increase or decrease the temperature display in 1 degree increments. The default offset value is zero. The offset range is increased from +/-20°F(11°C) to +/-180°F (100°C)

INCREASE/DECREASE buttons are used to set the TCOS. Press PROGRAM to advance to the next option

1.1.3 CL t

The controller should keep real-time with internal clock and calendar. Clock will not be battery back-up so if power is lost to the controller, it will be necessary to reset the clock options.

Time will be a 24 hour clock 0000 – 2359 set by the operator. Default time is 1200. INCREASE/DECREASE buttons are used to set the clock time. Press PROGRAM to advance to the next option. If power failure occurs, the clock time will reset to 1200

CL d

The controller should keep real-time with internal clock and calendar. Clock will not be battery back-up so if power is lost to the controller, it will be necessary to reset the internal clock.

The Day is a 7 day calendar ranging Monday - Sunday

Monday – Sunday display codes as below

Monday	_On
Tuesday	tUE
Wednesday	_Ed
Thursday	tHU
Friday	FrI
Saturday	SAt
Sunday	SUn

INCREASE/DECREASE buttons are used to set the date. Press PROGRAM to advance to the next option.

If power failure occurs, the clock date will reset to Monday.

1.1.4 Lt t

The operator can program a safety limit temperature. This option appears only if the OEM option J3-2 is set for Safety relay.

If the limit temperature is detected during a firing, the controller will abort the firing with the display code OTL

Ready to Cast programming

The controller programming should allow the operator to program a ready to cast time and date. These program options will appear at the end of the final hold segment HLD3.

After entering a value for **HLD3**, press the PROGRAM button to display **CStd** [Cast DATE] alternating with real-time clock date. Operator uses the INCREASE/DECREASE buttons to set a ready to cast date.
NOTE: operator can check the real-time date is correct before setting a new cast date.

Press PROGRAM to advance to the TIME segment.

After entering a **CStd**, press the PROGRAM button to display **CStt** [Cast TIME] alternating with real-time clock time. Operator uses the INCREASE/DECREASE buttons to set a ready to cast time for the cast date.
NOTE: operator can check the clock time is correct before setting a new cast time.

After entering the **CStt**, press the PROGRAM button to advance to the normal Strt [START] prompt.

To begin the new firing, press the PROGRAM button again to initiate the delayed firing.

Clarifications: The setting in option menu for date and time will allow the operator to set the actual date and time for the controller. This time and date will need to be reset only if the controller power is lost. The operator must only set this time and date option once if the controller will remain powered on indefinitely. Once the time and date is set by options, the controller is expected to keep and update actual time as long as power is not interrupted.

In programming of the firing cycle, the operator will set a desired time and date for the firing to be at the READY stage. The operator must program the 3 step firing cycle and then program a time and date for the controller to calculate when to start the actual firing.

For example: The operator programs this firing cycle at 4PM (16.00) Monday afternoon.

Stage 1 20°F/min to 1000F - hold for 30 min
Stage 2 35°F/min to 1400F - hold for 30 min
Stage 3 50°F/min to 1500F - hold for 1 hour

Next, the controller offers the parameters for Casting time and date. This is the time the operator plans to come in the next morning and have the burnout oven preheated and ready to load the product.

The controller will show CStt alternating with actual time [16.00]. The operator can adjust the cast time to 8AM the next morning or [08.00]

The controller then offers the parameters for date. This is the day the operator plans to come in the next morning and have the burnout oven preheated and ready to load the product.

The controller will show CStd alternating with actual day [_On]. The operator can adjust the cast day to Tuesday the next morning or [TUE]

The controller then advances to the Strt prompt to begin the firing cycle at the calculated delay time.

Delay Start for Ready to Cast time

The controller must calculate from the firing schedule and from the programmed ready to cast time/date a delay start time.
The delay start time will be programmed automatically from the calculation.

Delay time should include
Program segment 1 ramp and hold time (adjusted for current burnout oven temp at start)
Program segment 2 ramp and hold time
Program segment 3 ramp and hold time
Time difference between current time/data and programmed ready time/date.

Clarification: When the operator presses the Start button from the Start prompt [Strt], the controller will determine or calculate the necessary delay time to begin the firing.

For example: The operator programs this firing cycle at 4PM (16.00) Monday afternoon. To be Ready at 8AM on Tuesday.

1000F/hour to 1000F hold 1hour
500F/hour to 1400F hold 1 hour
300F/hour to 1500F hold 1 hour

the controller should calculate a delay start and begin a delay period. In the example program above, the delay would be calculated with these values

Calculate Difference of cast time/date and actual time/date (Tuesday 0800 - Monday 16:00) = 16hours
Calculate the total firing time;
Ramp/hold stage 1 = (75F current TC start temp, .925hours ramp + 1hour hold) = 1.925 hours
Ramp/hold stage 2 = (0.800 hours ramp + 1 hour hold) = 1.800 hours
Ramp/hold stage 3 = (0.333 hours ramp + 1 hour hold) = 1.333 hours
Total time of firing = 5.058 hours

Calculate delay time by (time/date difference – firing time), (16 hours – 5.058 hours) = 10.942 hours

The controller would start at 4PM on Monday afternoon with delay time of 10.942 hours. This would allow the firing cycle to begin at 3AM on Tuesday morning when the delay time expires. Then the firing will proceed for the next 5 hours and be ready at the stage 3 cast temp at 8AM the same morning.

If the calculated delay time is equal to or less than zero, start the firing immediately with zero delay. For example, if the firing cycle example above requires 5 hours but the operator has programmed a casting time and date of only 4 hours from actual time and date, it is not possible to have the oven ready at cast temp in only 4 hours.

1.3.1 Normal delay start

The normal delay start that is accessed from the Strt prompt is no longer active.

Status Indicators

The controller LEDS will be used to identify the firing status.

1.4.1 LEDS

The dental oven will use the 3 discrete LEDs to show the progress of the firing program.

Top LED – on when the #1 ramp segment and hold is in progress or complete
Middle LED – on when the #2 ramp segment and hold is in progress or complete
Bottom LED - on when the #3 ramp segment and hold is in progress or complete

Note: the graphic overlay will identify the 3 LEDs from top to bottom as STAGE 1, STAGE 2, STAGE 3

1.4.2 READY Display message

When the burnout oven is ready to cast (ramp 3 hold segment is complete) the controller will toggle the message REdI and the current burnout oven temperature. The onboard buzzer will beep for 30 seconds to announce the Ready condition.

Indefinite Hold at Ready

At the end of the program, the controller will hold the final hold temperature indefinitely. The operator must stop the controller firing. During the indefinite hold period, the controller display will show REdI alternating with the current temp.

Deviation alarm (Open Door)

A new alarm is required for the temperature range 500 -800F. This alarm will be a safety shutdown in case of the burnout oven door being left open during the firing. Note: if the door is left open, the burnout oven temperature is expected to stall near 650F.

The OPEn alarm aborts the burnout oven firing if the following 3 conditions are met for a duration of 10 seconds

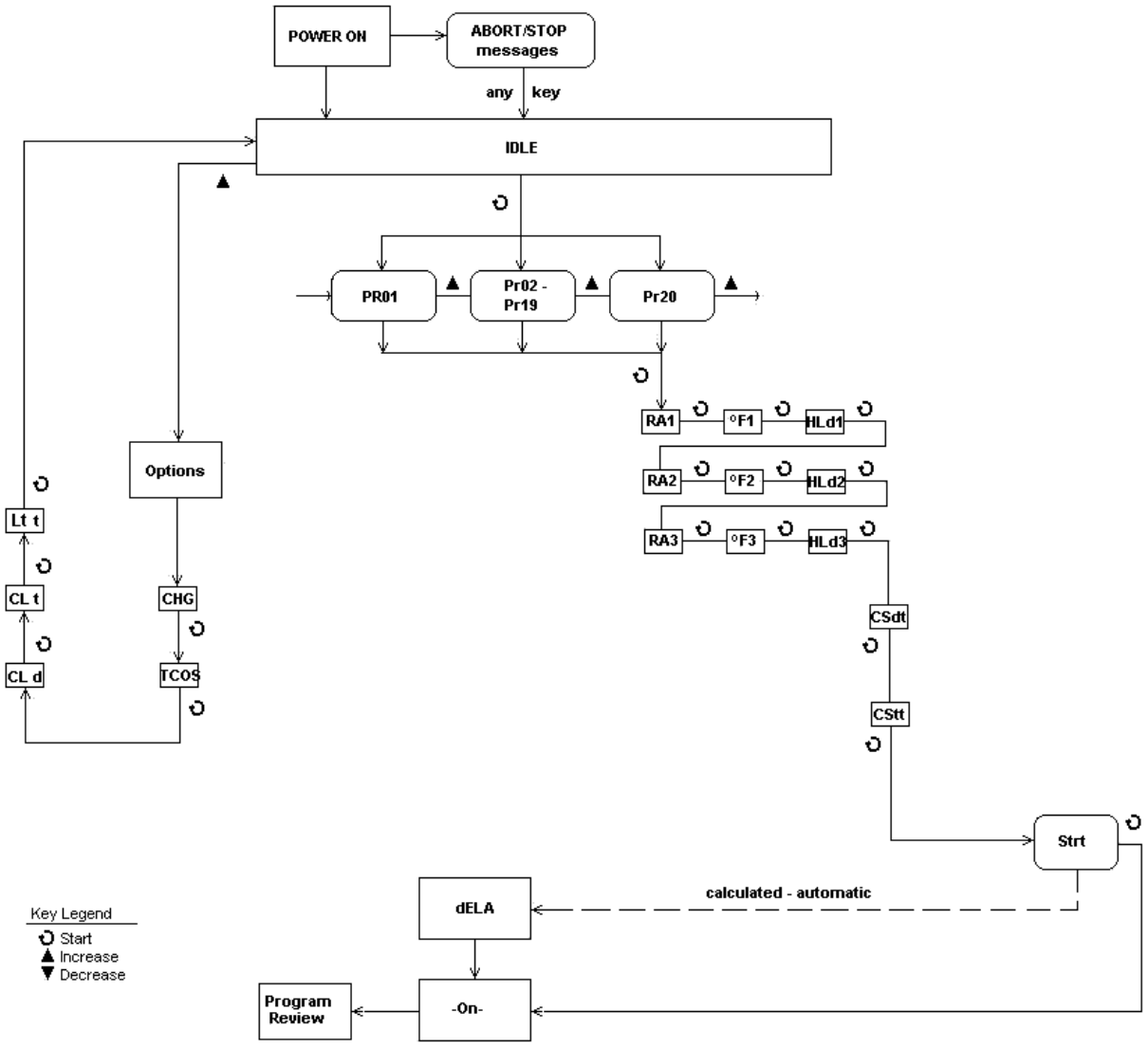
1. The burnout oven temp is between 500 – 800F.
2. The burnout oven temp is lagging the set-point by more than 50F
3. The output power to the heater relay is at 100%

If OPEn aborts the burnout oven firing, the display toggles OPEn and current burnout oven temperature. To clear the alarm display, press any Button to return to Idle.

Program Review

The normal program review that advances directly to the start prompt from Idle is no longer active. Program review remains active during the active firing. The discrete LED for program review is not active.

Dental Flow Chart



2 Ready to Cast Programming

Before programming, close furnace door. The controller must be set for the current day of the week and time. (See instruction manual.)
(1) From IdLE, press START (the left button).
(2) Press the Up Arrow key (not the Down Arrow key) to select a program number. Press START.
(3) rA 1 will appear. Use the arrow keys to enter heating rate (temperature change per minute) for segment 1. Press START.
(4) °F 1 or °C 1 will appear. Use the arrow keys to enter the target temperature for segment 1. Press START.
(5) HLd1 will appear. Use the arrow keys to enter the hold time of segment 1 (hours.minutes). (If not needed, enter 00.00.) Press START.
(6) Continue entering values for the other 2 segments. Do you need fewer than 2 segments? When rA appears for the next segment that you don't need, select 0000. (This will zero out any remaining unused segments.) Then press START.
(7) CL d will appear alternating with the current day of week. Use the arrow keys to select the day of week when you will begin casting. Press START.
(8) Cstt will appear alternating with the current time. Enter the military time for the above day when you want to begin casting (i.e. 8:00 a.m. = 08:00; 2:00 p.m. = 14.00).
(9) Press START. Strt will appear.
(10) Press START again. -On- will appear alternating with dELA and the number of hours and minutes before the furnace will be ready for casting. To stop the furnace, press STOP (the left button) twice. STOP will appear. Press STOP again to make IdLE appear.

3 Error Messages

4 bAdP / Bad Programming

The burnout oven will not fire because a) the Ramp-Hold program just entered has a rate of 0000 in segment 1, or b) the target temperature in Single-Speed or segment 1 of Ramp-Hold is lower than the current temperature.

5 EtH / Electronics Too Hot

The circuit board temperature is above 176°F / 80°C. Press any key to return to IdLE .
To lower the board temperature, use a fan to blow air across the burnout oven switch box into the louvers. (But do not blow air into the burnout oven's peepholes.) If you have more than one burnout oven in the room, place them farther apart. Never allow the firing room temperature to exceed 110°F / 43°C. (Measure room temperature three feet away from the burnout oven.)

6 FAIL / Thermocouple Failure

The thermocouple, or temperature sensor, failed during firing. Causes:
Defective thermocouple or disconnected/loose wires
Defective controller
Electrical noise
Thermocouple Paperclip Test
Check the thermocouple wire connections. (See your burnout oven instruction manual.) If connections are tight, perform this test:
1 UNPLUG the burnout oven or disconnect the power. Remove the controller. Remove the two thermocouple wires from the back of the controller.

2 Cut a thin paperclip in half. Insert a U-shaped paperclip piece, or other piece of thin wire, where you removed the thermocouple wires.
3 Plug in the burnout oven. FaIL will appear. Press START. Test results:
A) If the controller displays room temperature and IdLE after you press START, replace the thermocouple.
B) If the display still shows FaIL after you press START, return the controller for repair or replacement.

7 FE Error Messages

Message	Problem
FE 1	Memory Read/Write Failure
FE 2	RAM Failure
FE 3	OEM Factory Data Corruption
FE 4	Thermocouple "Noise"
FE 5	Software Error

To return to IdLE from an FE code
Try pressing any key. If that doesn't work, turn the power off for 10 seconds. Call the factory if the error message remains when you turn the power back on.
If you get an FE 4 message, check the wire connections going from the back of the controller to the thermocouple. A loose connection can cause the FE 4 message.

8 FtL / Fired Too Long

This message appears when both of the following conditions are met:
The temperature rise or fall is less than 27°F / 15°C per hour.
The firing is 2 hours longer than programmed.
Programming a cooling segment target temperature that is below or even close to room temperature can also trigger the FtL message.
See "Controller display turns on. No heat in burnout oven," page 14.
Question: The controller on my Paragon SC-2 jewelry burnout oven flashes FtL , but only when I include a controlled cooling. What is happening?
Answer: FtL means "firing too long." But "firing too long" applies to cooling as well as to heating. FtL can appear if you program a segment for slow cooling and the burnout oven is taking too long to cool. Program a slower cooling rate. FtL will also appear if you program a cooling segment target temperature that is below or close to room temperature.

9 HtdE / High Temperature Deviation

Causes:
During a heating-up ramp or a hold, the temperature is 100°F / 56°C above the programmed temperature.
During a cooling-down segment, the temperature is 100°F / 56°C higher than the segment's starting temperature.
A fast rate caused the controller to overshoot the target temperature.
Also, check for a stuck relay.

10 PF 1 / Power Failure

The power failed during a cooling segment, and the burnout oven cooled past the target temperature while the power was off. The burnout oven will not resume firing. To return to the IdLE display, press any key.

11 PF 2 / Power Failure

The power failed during firing and burnout oven temperature was below 212°F / 100°C when the power came back on. The burnout oven will not resume firing. To return to the IdLE display, press any key.

12 PF 3 / Power Failure

The power failed during firing and temperature dropped more than 72°F / 40°C by the time the power came back on. The burnout oven will not resume firing. To return to the IdLE display, press any key.

13 tC / Thermocouple Failure

The thermocouple failed during the IdLE display. See the "paperclip" test under "FAIL," page 11.

14 tCL / Thermocouple Lag

The heating rate is slower than 9°F / 5°C per hour and the actual burnout oven temperature is more than 100°F / 56°C away from the programmed temperature. The tCL alarm becomes inactive above 500°F. To return to the IdLE display, press any key. Causes:
Worn or burned out elements, defective relays, low voltage, and defective thermocouple.
On burnout ovens that use a portable controller, the thermocouple has fallen out of the firing chamber.
A bare spot on the thermocouple lead wires has touched a grounded object inside the burnout oven switch box causing the thermocouple to short out.
You have programmed a cooling segment temperature that is below room temperature.

15 tCr / Thermocouple Reversed

This usually means the thermocouple lead wires are reversed. Check that the thermocouple lead wires are connected to the correct terminals. See your burnout oven's wiring diagram.
The thermocouple may be starting to fail and is sending erratic signals to the controller.
The thermocouple inside the burnout oven is much colder than the controller circuit board.

16 OPEN / Door Open

This error occurs if the door has been left open and the temperature has fallen below 800°F / 427°C for more than 10 seconds while trying to heat up to or maintain a temperature above 800°F / 427°C. This error can sometimes occur when high or full heat rates are used.

Trouble Shooter

17 Problem: Controller display is blank. No heat in burnout oven.

Is the burnout oven connected to the power?
Has the circuit breaker tripped or fuse blown?
Is power reaching the wall receptacle?
Test with a voltmeter or a test light if you are not sure.
Has the burnout oven switch box ½ amp fuse blown?
The burnout oven's ½ amp fuse is located in the burnout oven switch box. Remove by pressing the fuse holder and turning counter-clockwise half a turn. Check the fuse by placing the probes of an ohmmeter on the ends of the fuse. If the ohmmeter reads less than an ohm (digital meter) or reads 0 ohms (analog meter), the fuse is okay. If the reading is OPEN (digital meter) or infinity/no needle movement (analog meter), the fuse is bad.
Replacement fuse:
AGC 1/2 A 250V AC

Is the controller receiving power? Test the power INPUT connections on the back of the controller with a voltmeter.
Controller Power Input Test
Unplug the burnout oven. Remove the 4 screws holding the controller faceplate to the switch box. Lift faceplate out of box and let the board hang on the box with the back of the board facing you. Plug the burnout oven back in. Touch voltmeter probes (in AC mode) to both INPUT connections (the white and orange wires).
Do not let the back of the board touch a grounded object. Make sure the voltmeter is in the AC mode when placing the probes on INPUT connections.
Controller Power Input Test Result: No voltage
UNPLUG burnout oven. Check the switch box for disconnected wires between the cord, transformer, and controller. If wiring is okay, replace the transformer.
Controller Power Input Test Result: 20 - 24 volts AC
Correct current is reaching the board from the transformer. But since the board is not lighting up, it is probably defective. Return the controller for repair or replacement.
Controller Power Input Test Result: less than 20 volts
Did you recently replace the transformer? It may be the wrong voltage. The voltage is below 20, which is not enough power for the controller. To find out the cause of low voltage, continue below:
Controller Input Test #2
The back of the board is still facing you and the burnout oven is plugged in. Remove the INPUT plug, which is the white, orange, and blue wires, from the back of the controller. Touch a voltmeter probe to the white wire and the other probe to the orange wire.
Input Test #2 Result: Less than 20 Volts AC
There are two possible reasons: 1) Low voltage at the wall receptacle; 2) defective transformer. If wall receptacle voltage is correct, replace the transformer.
Input Test #2 Result: 20 - 24 Volts AC
The transformer is sending correct voltage to the controller. Yet when the INPUT plug was connected to the controller, voltage was less than 20. This means the controller is draining the voltage and may be defective. Return the controller for repair or replacement.

18 Problem: Controller display turns on. No heat in burnout oven.

Is the relay making its normal clicking sound?
Yes, the relay is clicking.
Test the elements with an ohmmeter:
Element Resistance Test
1 UNPLUG burnout oven/disconnect the power. Open the burnout oven's switch box. Make sure the wires connecting the relay to the elements are secure. If connections are okay, continue to step 2:
2 Touch the ohmmeter leads to the two element connectors of each element. A no-needle-movement reading on an analog meter, or OPEN on a digital meter, indicates a broken element.
If the elements check out okay, replace the relay.
To replace relay, see your burnout oven's instruction and service manual.
No, the relay is not clicking.
We know the controller is receiving voltage, because the display is lit. But the voltage from the transformer may be too low to power the relays. Perform the "Controller Power Input Test," page 13. If your controller passes the Input Test, perform the "Controller Power Output Test":
Controller Power Output Test
Is the controller sending voltage to the relay? Test OUTPUT with a voltmeter:
1 UNPLUG the burnout oven/disconnect the power. Remove the 4 screws holding the controller faceplate to the switch box. Lift faceplate out of box and let the controller hang on the outside of the box with the back of

the board facing you. Then plug the burnout oven back in. Program the controller to fire to 1000°F at FULL rate in Ramp-Hold mode. Press START.
2 Put the voltmeter in DC mode. (It must be in DC mode when testing OUTPUT voltage.) Touch probes to the red wire and black wire connections. Measure the voltage when the relay clicks on.
Output Test Result: No voltage at red and black wires
The controller is not sending power to the relay. Return the controller for repair or replacement.
Output Test Result: 10 - 14 v. at red and black wires
The controller is sending correct power to the relay. Unplug burnout oven/disconnect power. Remove the burnout oven switch box. Look for disconnected wires between the controller, relay and elements. Check the wiring diagram to be sure wires are connected to the correct terminals. Be sure connections are tight. If the wiring is okay, replace the relay.
To replace relay, see your burnout oven's instruction and service manual.

19 Problem: Burnout oven switch box ½ amp fuses keep blowing.

What size fuse are you using? Correct fuse:
AGC ½ A 250V AC
If the fuse is the correct size, perform the following test:
Burnout oven Switch Box ½ Amp Fuse Power Test
1 UNPLUG the burnout oven/disconnect the power. Remove the 4 screws holding the controller board faceplate to the switch box. Lift faceplate out of box and let the board hang on the outside of the box with the back of the board facing you. Disconnect both wire plugs from the back of the controller. Then plug the burnout oven back in. Apply power to burnout oven. If the ½ amp fuse blows, replace the transformer. (If the fuse does not blow, the problem is a board or relay. Go to step 2.)
2 Connect the INPUT plug (orange, blue, and white wires) to the board again. Leave off the OUTPUT wire plug (the one with the red and black wires). Program the controller to fire to 1000°F at FULL rate in Ramp-Hold mode. Press START. If the fuse blows, replace or service the board. (If the fuse does not blow, the problem is caused by a short in the coil of a relay. Go to step 3.)
3 UNPLUG burnout oven/disconnect power. Reconnect the OUTPUT wire plug. Reinstall the board in the switch box. Replace the relay.

20 Problem: The burnout oven over-fires.

Did you see an error message such as HTdE ?
If not, the thermocouple gave a faulty reading, so the controller did not shut off the burnout oven. Sometimes a shelf can bump against the thermocouple and push it out of the firing chamber. Make sure the thermocouple is pushed far enough into the firing chamber.
A 1/8" diameter thermocouple should extend into the firing chamber ½" - ".
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.
Do the elements stay on after you press STOP?
If so, the electrical contacts inside a relay are stuck in the closed position. This will also cause elements to turn on as soon as you plug in the burnout oven. Replace the relay.