

BioOven III
Instruction Manual
Catalog Nos. 30-202 and 30-204

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Quick Start

The temptation to run a new instrument or computer program before reading the manual is, we know, overwhelming. Fortunately, with the BioOven III and its user-friendly controller, it is entirely possible to do just that. Here is a quick procedure you can employ.

1. Follow the simple Installation instructions on Page 2, if this has not already been done.
2. Turn on the oven. The controller and internal circulating fan should come on at this time. A screen will indicate temperature and the status of the most recent run. See Display, Page 7 for more detail.
3. Press {MENU} for the screen: RUN, WRITE/EDIT, FORMAT. Use Up/Down Arrows { \blacklozenge } or { \blacklozenge } to make a selection and Press {ENTER}. Do not use the FORMAT Option without reading Page 18.
4. Choosing WRITE/EDIT or RUN will lead you to a choice of working with a "POINT" (a single temperature, ramp and soak), a "PROFILE" (*series* of temperatures, with ramp rates and soak times), or a "PROGRAM" (a series of PROFILES strung together). If you choose PROFILE or PROGRAM you will be asked to choose the one to be edited or run from a list of PROFILES and PROGRAMS. They appear in groups of four on the screen. The ones already loaded in memory are listed in the Appendices 4 and 5, Pages 28 and 31. Scroll through these lists using the Arrow Keys, selecting the blinking choice by pressing {ENTER}.
5. If you are in the RUN menu, just Pressing {ENTER} on the highlighted choice will lead you to run that PROFILE or PROGRAM. Press {STOP} to stop a running PROFILE or PROGRAM. See details on Page 21.

In the EDIT Menu you will be led through the PROGRAM or PROFILE which you can modify at will. In EDIT Mode, use the Arrow keys and the keypad to put in new entries. *As soon as a number is typed, it is stored in permanent memory. There is no other keystroke required to save an entry.* Pressing {ENTER} (or {BACKUP}, {MENU}, or {DISPLAY}) will take you out of EDIT Mode. All changes will have already been "saved". Because the editing function instantly writes to memory, there is a convenient COPY function allowing the original to be preserved while editing is being done. See page 9 for more editing details.

6. A running PROFILE or PROGRAM can be stopped at any point, from any screen, by pressing the {STOP} key. When you do this you will be taken to a display screen where the word STOPPED is on the bottom (status) line of the display screen.

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The BioOven III

Congratulations on your purchase of the BioOven III. Whether you plan to use this precision oven for the processing of samples in tubes, in 96- or 864-well plates, in capillaries, on microscope slides or in other experimental settings of your own design, the BioOven III should be ideal for your needs. We believe you will find the BioOven III to be the most versatile of ovens, user-friendly, yet powerful enough to be the ultimate in flexibility. We want you to be fully satisfied with your purchase. A good start in that respect is a complete review of this manual.

We welcome your inquiries concerning the operation of the BioOven III. We have the ability to build both probes and samples trays to your specification should special needs arise in your work, and we would welcome the opportunity to work with you. Your comments on the usefulness and accuracy of this manual will also be valuable to us.

Installation

The BioOven III should be installed on a level, hard top bench, with a completely flat, uncluttered surface under the unit for exit of the cooling air. The unit arrives completely assembled and only the following simple steps need be taken before operating the BioOven III.

1. Sample trays will be in the large carton with the BioOven, or if you ordered more than one, in separate smaller boxes.
2. Attached to the appropriate trays you will find probe(s) according to your order. Place the proper amount of liquid in the probe container provided, make sure the probe tip is in the liquid, but not touching the bottom, and place the container in the holder mounted on the left side of the oven. We strongly recommend that you fill your probes with glycerin to a level that matches your sample size. Glycerin will not evaporate and is less harmful to the probe than other liquids, including water. Mineral oil may also be used, but has the tendency to creep out of plastic-ware.

It is important that the probe match your sample as closely as possible. Please feel free to change the bottom of the tube probe if you think your samples are contained in a different gauge plastic than used in our probe. See the Appendix 1, Page 24 for recommendations.

Remove the sample tray by lifting it straight up and off of the spindle. Plug the appropriate probe into the top of the chamber. Probe type is determined by your sample container type. The plug is polarized and will go in only one way, mating the copper prong to the copper receptacle. Replace the sample tray. Please make certain that excess probe wire will not rub against or become entangled with the sample tray.

3. Connect the power cord to an outlet rated for at least 1200 watts, that is, at least 6 amps at 220 volts or 15 amps at 115 volts. Please use only the cord provided, which is appropriate for this power rating. The unit may now be switched on.

Warning!

Please be certain that the internal fan in the oven compartment comes on immediately when the BioOven III is switched ON. Running the heaters without the fan will result in very rapid burnout of the coils. Should this unlikely situation occur, turn off the oven and consult the factory.

Warnings

The unit contains an open heater element located behind a protective grid in the back to provide rapid response during heat up and when the heat is turned off. The element is electrically live and should not be touched with electrically conductive materials unless the power has been disconnected. Do not place easily combustible materials in the oven or lightweight materials that may be blown into the heating element by the forced-draft fan. In particular, do not place flammable solvents, laboratory tissues, loose foil, or similar materials in the oven.

Please note also that, in response to customer requests, the heat does not cut off automatically when the door is opened. This facilitates certain applications, but does allow the possibility that careless use could lead to burns and possibly electrical shock. Exercise exceptional caution when opening the door with the heater power ON.

The BioOven III was designed to be easily field-serviceable. However, service to any portion of the BioOven III that requires the removal of screws or other fasteners should be attempted only after consulting directly with factory personnel.

Damage in Shipment

If the unit is damaged in shipment, please inform both the shipper and St. John Associates immediately. In such a case, it is very important to preserve all of the shipping material for the shipper's inspection. With many shippers and in some locations, you only will be given 10 days from receipt of the product to file a report of damage.

The BioOven III Set Up

The front of the BioOven III contains a lighted ON/OFF rocker panel switch, an unlighted rocker switch for the turntable, the controller display and key panel, and the oven chamber. The controller is explained in greater detail in the following pages.

The rocker panel switch will light when the unit is ON. The internal circulating fan system in the oven compartment also comes on automatically, as does the controller. Depending on the unlighted rocker switch position, the turntable may also be active.

The controller will display the BioTherm brand name, the edition number of the controller, and will then revert to the status it was in when it was last turned off. The Display Screens are shown on Page 8.

The Turntable Switch is an unlighted, three-position On/Off/On Switch for the rotating sample platform, supporting rotation in either direction. The middle position is OFF.

The oven compartment is accessed through the door with a magnetic latch. The sample tray slides straight up off of the turntable spindle and stands on the bench top for easy loading. When replacing the tray be certain to line up the right-angle spindle pin with the cutout on the tray bottom. Plastic index pins are provided with each plate tray. These pins may be pressed into two or more of the holes located at the corners of the plate cutouts. The purpose of these pins is to prevent the plates from sliding off of the tray when the turntable is rotating. If the pins need to be moved to accommodate a different size plate, press them out from the underside, using a coin or other hard flat surface. Spring-loaded plastic clips are located at the sides of each plate cutout. These prevent lightweight plates from blowing off of the tray. Note that each clip has two different heights to accommodate variations in plate height.

The BioOven III Controller Keypad

The BioOven III controller is menu driven. The control panel consists of a keypad with twenty-four keys and a four-line, twenty-character/line screen. The keypad layout is shown below.

STOP	DISPLAY	MENU	1 ABC	2 DEF	3 GHI
DELETE	INSERT	BACKUP	4 JKL	5 MNO	6 PQR
←	↑	⇒	7 STU	8 VWX	9 YZ*
PAUSE RESUME	↓	ENTER	SPACE	0 + . &	NUMBER ALPHA

A brief explanation of the keys is given here. More information will be provided in the context of programming or operating the unit.

- {STOP} At any time, and from any screen, {STOP} will terminate a run in progress. If you then restart the same PROGRAM or PROFILE you will start at the beginning.
- {DISPLAY} From any screen, {DISPLAY} takes you to the Display Screens where operating information such as SAMPLE and TARGET Temperature, CYCLE Count, PROFILE/PROGRAM Names and running status is given. See page 7 for details.
- [MENU] From any screen, {MENU} takes you to the beginning of the Operating Menu and gives you the choice of RUN, WRITE/EDIT or FORMAT.
- {DELETE} {DELETE} removes the current STEP in a PROGRAM or POINT in a PROFILE. See detail on page 13.
- {INSERT} {INSERT} adds a STEP before the current STEP in a PROGRAM or POINT in a PROFILE. See detail on page 13.

{BACKUP} {BACKUP} moves you back one STEP, to the previous screen.

⇒ ⇐ ↑ ↓ ARROW KEYS move you in the indicated direction on screens with multiple inputs, for example, a screen asking you for a TARGET, RAMP RATE and SOAK TIME.

{PAUSE}
{RESUME} During the Running of a PROGRAM or PROFILE, {PAUSE} will suspend timing at the current or next scheduled soak point and will hold the soak point temperature until the

{RESUME} key is Pressed. If you press the {PAUSE} Key during a Ramp, the Pause indicator will come on but the temperature will continue to ramp until the next soak point is reached.

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{ENTER} {ENTER} allows you to accept all of the choices on a screen and then takes you to the next logical choice in the Menu. Particularly in PROFILE and PROGRAM writing modes the {ENTER} key means "I'm finished writing and wish to move to the next topic". You never need to press {ENTER} to save a piece of data. Data points are saved as soon as they are keyed in.

From a Display screen, {ENTER} will take you back to the last screen in use in the RUN, WRITE/EDIT, FORMAT Menu.

{SPACE} After writing a PROGRAM, you are given the opportunity to give it a unique name. To assist in readability, it is useful for placing a blank space in your PROFILE or PROGRAM name. The {SPACE} key will perform exactly like the space bar on a typewriter.

The {SPACE} key also has a separate function on the special CHANGE PER CYCLE screen. See page 14 for additional detail. {SPACE} will toggle the sign from + to -, and allow both increases and decreases in the parameters to be made.

{NUMBER}
{ALPHA} The keypad is always set by default to write numbers. On screens where you are asked to name PROFILES or PROGRAMS, pressing the {Number}/{Alpha} will toggle you from numbers to letters and back. In the Alpha mode the middle letter or symbol in the sets of three will appear when pressed (for example, the B in the ABC combination). The other two choices (the A & C in our ABC example) can be reached by using the UP/Down arrows.

* + . & These four additional symbols can be used in writing names for your PROGRAMS or for PROFILES.

The Display Screens

Turning the instrument ON or pressing the {DISPLAY} Key from any screen will take you to one of three types of display screens. The Default Display will be the most commonly used and shows all of the information a typical user would need in quickly checking the status of a run. Display 2, on the next page, gives details about the PROGRAM or PROFILE segment currently being run, and Display 3 gives information about the heating and cooling power levels. The Display Screen that is called up by turning the BioOven III on, or by pressing the {DISPLAY} Key, is the one that was last in use.

The Default Display in the Four Run Conditions:

RUN IS OVER

SAMPLE TEMP	25.0 C
TARGET TEMP	92.5 C
PROFILE NM CYC	22/25
PROGRAM NM	FINISHED

“FINISHED” indicates that a run is complete.

RUN IS IN PROGRESS

SAMPLE TEMP	25.0 C
TARGET TEMP	92.5 C
PROFILE NM CYC	11/25
PROGRAM NM	00:45:27

Elapsed time clock display “00:45:27” indicates that a run is in progress.

RUN STOPPED BY USER

SAMPLE TEMP	25.0 C
TARGET TEMP	92.5 C
PROFILE NM CYC	11/25

“STOPPED” indicates that the run has been stopped by the user.

PROGRAM NM STOPPED

RUN IS IN PAUSE MODE

SAMPLE TEMP	25.0 C
TARGET TEMP	92.5 C
PROFILE NM CYC	11/25
PROGRAM NM	PAUSE

“PAUSE” indicates that the run is in the pause mode with the temperature held constant (soak) until {RESUME} is pressed.

In these illustrations we use the phrases “PROFILE NM” and “PROGRAM NM”. In an actual run the names that you have given to your PROFILES and PROGRAMS would appear in these ten spaces.

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Additional Displays Available During a Run Only

DISPLAY 2

SAMPLE TEMP	92.1 C
TARGET TEMP	92.5 C
RAMP RATE	2.0 C/S
SOAK TIME	99:59:59

Display 2 showing the RAMP RATE and the SOAK TIME *countdown* for the current segment.

DISPLAY 3

SAMPLE TEMP	92.1 C
TARGET TEMP	92.5 C
HEATER POWER	39 %
COOLING PWR	0 %

Display 3 shows the % of maximum power applied to the heater or the cooling fans.

Repeated pressing of the {DISPLAY} Key shifts the Display from one of the Default Displays to Display 2 then to Display 3 and then back to the Default. Displays 2 and 3 are only available when a POINT, PROFILE or PROGRAM is running since data on these screens is only relevant to a run.

Writing or Editing PROGRAMS and PROFILES: General Principles

With the BioOven III, you have the choice of charting time and temperature in three different ways, as a POINT, a PROFILE or as a PROGRAM. These are defined below with examples.

POINT A POINT is a single temperature, reached at a defined RAMP RATE and held for a given period of time. For example, if you wish to hold the BioOven III at 37 C for 4 hours, and reach that temperature as rapidly as possible, you would define a POINT from the RUN Mode (that is, using the RUN choice from RUN, WRITE/EDIT, FORMAT) as shown in the screen below:

ONE POINT ENTER=RUN	
TARGET	37.0 C
RAMP RATE	2.0 C/S
SOAK TIME	04:00:00

After using the Arrow Keys and the numerical keypad to define the TARGET temperature, RAMP RATE and SOAK TIME desired, Pressing {ENTER} from any position starts the run. Because POINTS are so rapidly written, they are not stored in permanent memory, but are constructed as you need them from the RUN Menu.

PROFILE A PROFILE is a series of POINTS. In the BioOven III, a PROFILE can have up to 20 POINTS, with each POINT consisting of a TARGET temperature, a RAMP RATE to

achieve that temperature, and a SOAK TIME at that temperature.

Up to 99 PROFILES can be stored in permanent memory. For each PROFILE you will be given a chance to provide a name, which can be up to ten characters in length. You may, of course, accept the default names PRF 01, PRF 02 etc., if you wish. A PROFILE with two POINTS, named SAMPLE PRF, is shown below.

POINT 1

SAMPLE PRF	POINT 01
TARGET TEMP	92.0 C
RAMP RATE	2.0 C/S
SOAK TIME	00:00:20

POINT 2

SAMPLE PRF	POINT 02
TARGET TEMP	60.0 C
RAMP RATE	2.0 C/S
SOAK TIME	00:00:30

When running a PROFILE, you may wish to repeat the sequence of POINTS a number of times. The desired number of repeats is asked for as part of the RUN instructions and is not a part of the stored PROFILE, and thus is not part of the WRITE / EDIT Menu.

PROGRAM A PROGRAM is a user-defined sequence of PROFILES and associated repeat counts. For example you might run a PROFILE named "92 2 MIN" one time, followed by PROFILE "92 55 72LG" three times, PROFILE "92 55 72SH" twenty five times, ending with PROFILE "72 4 MIN" run once. This would be written as a PROGRAM, named PRG SAMPLE, with four parts called STEPS. Each STEP gives the PROFILE to be run and the numbers of times it is to be repeated.

STEP 1

PRG SAMPLE	STEP 01
PROFILE	92 2 MIN
CYCLES	01

STEP 2

PRG SAMPLE	STEP 02
PROFILE	92 55 72LG
CYCLES	03

STEP 3

PRG SAMPLE	STEP 03
PROFILE	92 55 72SH
CYCLES	25

STEP 4

PRG SAMPLE	STEP 04
PROFILE	72 4 MIN
CYCLES	01

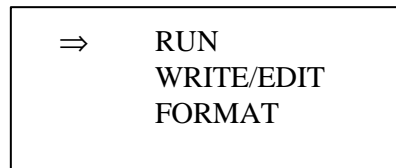
Up to 99 PROGRAMS can also be stored in permanent memory with each PROGRAM holding up to 20 STEPS.

In the illustration above, we use the phrase "PRG SAMPLE" to name our PROGRAM. You can use your own unique name as part of the PROGRAM writing or editing process. We say more about this on page 23 as part of the section on writing easy-to-remember names for PROFILES and PROGRAMS.

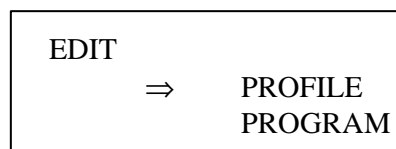
The important principle to remember about the logic of the BioOven III system is that PROFILES are a series of times and temperatures. Repeating a single PROFILE a number of times ("cycling the PROFILE") is probably most easily accomplished with a RUN instruction. To link a number of PROFILES, perhaps repeating some and not others, one would write a PROGRAM. A good start with the BioOven III, then is first to create a documented library of PROFILES. Then PROGRAM writing becomes very quick and easy. Detailed directions for Editing and Writing PROFILES and PROGRAMS are given on the following pages.

Editing or Writing PROFILES: Detail

From any point Press (MENU) and the following screen will appear. This is the beginning of the RUN, WRITE/EDIT, FORMAT set of choices ("menu".) Use the Down Arrow to point the cursor to WRITE/EDIT and Press {ENTER}.



Point to WRITE/EDIT ↓ Press {ENTER}



To EDIT or WRITE a PROFILE ↓ Press {ENTER}

```

SELECT PROFILE Ü ↑ ↓ P
92 2 MIN          72 2 MIN
92 55 72LG      92 55 72SH
ENTER=OK BACKUP=QUIT

```

Use Arrow Keys to highlight desired choice, press {ENTER} on the blinking choice to begin the WRITE/EDIT process.

If you choose a PROFILE for which data is written, you are given the screen below.

↓

More choices are available via the Up/Down arrows. Press {BACKUP} if you wish to get out without making a choice.

↓

If you choose a blank PROFILE, with no previous data written, only the choice below is given.

↓

```

PROFILE 92 55 72SH
⇒ EDIT
COPY
DELETE

```

Highlight EDIT

```

PROFILE PRF 39
⇒ EDIT

```

Press {ENTER}

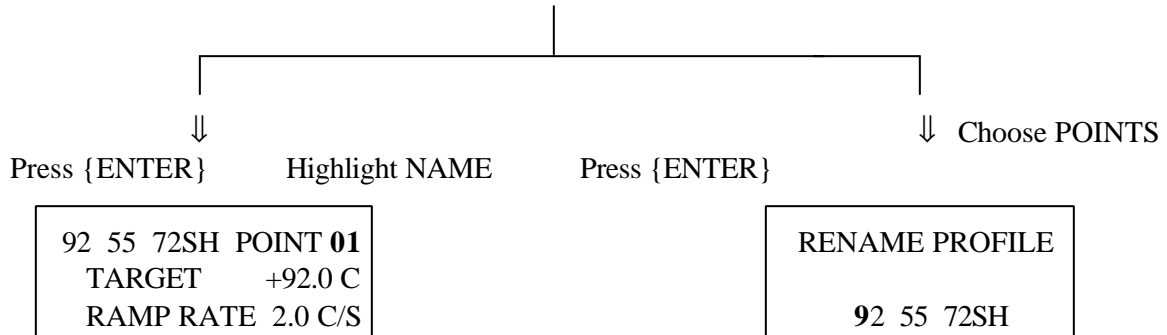
↓

11

```

PROFILE 92 55 72SH
⇒ CHANGE POINTS
CHANGE NAME

```



Use the Arrow Keys to Highlight the numbers to be modified. The number keys will enter the data. You may proceed to the next POINT by pressing the down arrow when at the time setting or ♦ / ◆ when on the POINT #. Press {ENTER} when finished.

Use the keypad to write new numbers and letters, using the Number/Alpha toggle key as needed. Press {ENTER} to accept. If the letter on the screen is not the one desired, Scroll to it with the Up/Down keys.
(See also Page 23)

If you scroll past the POINTS that have already been written you will encounter the END OF PROFILE statement screen shown below. This allows you three choices, Go Back to the Last Screen (Resume Edit via {BACKUP}), Quit Writing/Editing and move on (Edit Done) via {ENTER}, or Add a POINT to the PROFILE via {INSERT}.

END OF PROFILE ENTER = EDIT DONE BACKUP = RESUME EDIT INSERT = ADD A POINT

You may be tempted in your first few WRITE / EDIT sessions to use the {ENTER} key in desktop computer fashion to “Confirm a choice” or “Move to the next screen”. *Don't Do It!* The {ENTER} key from any position means that editing or writing is done and you wish to move on. The arrow keys will move you to any location you wish, including scrolling off of the bottom of the screen to the next point or to the end of the program statement. Use {ENTER} only to quit and move on to the next topic, such as NAME or RUN.

Adding and Deleting POINTS (STEPS) in a PROFILE (PROGRAM)

In writing or editing a PROFILE, you may discover that you have omitted a POINT or perhaps have a POINT that you wish to remove. Similarly you may wish to add or delete STEPS in a PROGRAM that you have written. It is easy to correct these problems without going back to the beginning and rewriting everything.

To add another POINT in your PROFILE:

Go to the POINT that is immediately after the position where a new POINT should be added. Press {INSERT} on the key pad and a new POINT will be inserted at that position. The numbering for the next POINT and all subsequent POINTS will be increased by 1. Write in the time and temperature data on the new POINT just as you would in a normal WRITE / EDIT process.

To delete a POINT in your PROFILE:

An unneeded POINT in your PROFILE can be Deleted by going to that POINT and Pressing the {DELETE} Key. The POINT is immediately removed and all subsequent POINTS are renumbered accordingly.

To add another STEP in your PROGRAM:

Go to the STEP that is immediately after the position where a new STEP should be added. Press {INSERT} on the keypad and a new STEP will be inserted at that position. The numbering for the next STEP and all subsequent STEPS will be increased by 1. Write in new parameters for the new STEP just as you would in a normal WRITE / EDIT process.

To delete a STEP in your PROGRAM:

An unneeded STEP in your PROGRAM can be Deleted by going to that STEP and Pressing the {DELETE} Key. The STEP is immediately removed and all subsequent STEPS are renumbered accordingly.

Choosing a Ramp Rate

The default ramp rate that appears on the profile writing and editing screens is 2.0 degrees C/S. If you wish to achieve the fastest ramp rates possible, then leave the rate at this setting. For applications in thin-walled plastic sample containers the maximum rate actually achieved will be between 0.5 and 1.0 C/S, but the controller will not be confused if a higher rate is asked for in the procedure. With the probe exposed directly to the air, rates at or near this maximum of 2.0 C/S can be realized.

Automatic Increases / Decreases in Soak Times and Temperatures

A unique feature of the BioOven III allows you to increase or decrease any SOAK TIME or TARGET temperature by a fixed amount per cycle. For example, you may have a DNA denaturation step at 94.0 C in a PROFILE set to run for 30 cycles. As the number of cycles increase, you may find it desirable to lower the time or temperature of this POINT. The BioOven III offers you this opportunity with a programming feature that allows you to increase or decrease the SOAK TIME or the TARGET Temperature by a set amount *per cycle*.

SOAK TIMES can be incremented or decremented from 1 sec to nearly 1 hour (59:59) per cycle. For example, you could have an initial (cycle 1) SOAK TIME, at say 92 C, of 1:00 minute and decrease that by 1.0 sec per cycle. Thus, the second cycle would soak at 92 C for 59 sec and the 30th cycle would soak for 30 secs. Temperatures can be similarly increased or decreased by amounts from 0.10 C to 9.90 C. For


```
SELECT PROGRAM ← ↑ ↓ ⇒  
92CYCSHT72 92CYCLNG72  
LNG SHT 72PRG 04  
ENTER = OK  BACKUP = QUIT
```

Use the Arrow Keys to highlight the desired PROGRAM and press {ENTER}. More choices are available via the



up/down arrows. If a PROFILE has already been written for your choice, you will see the screen below. If you are writing a new profile, only one option is presented and you will see the screen to the right.

```
PROGRAM PRG 01  
      > EDIT  
      COPY  
      DELETE
```



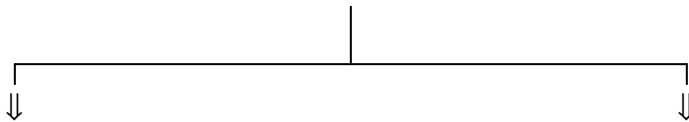
```
PROGRAM PRG 39  
      > EDIT
```

Highlight EDIT and then press {ENTER}



```
PROFILE PRG 01  
      > CHANGE STEPS  
      CHANGE NAME
```





Choose STEPS and press {ENTER}

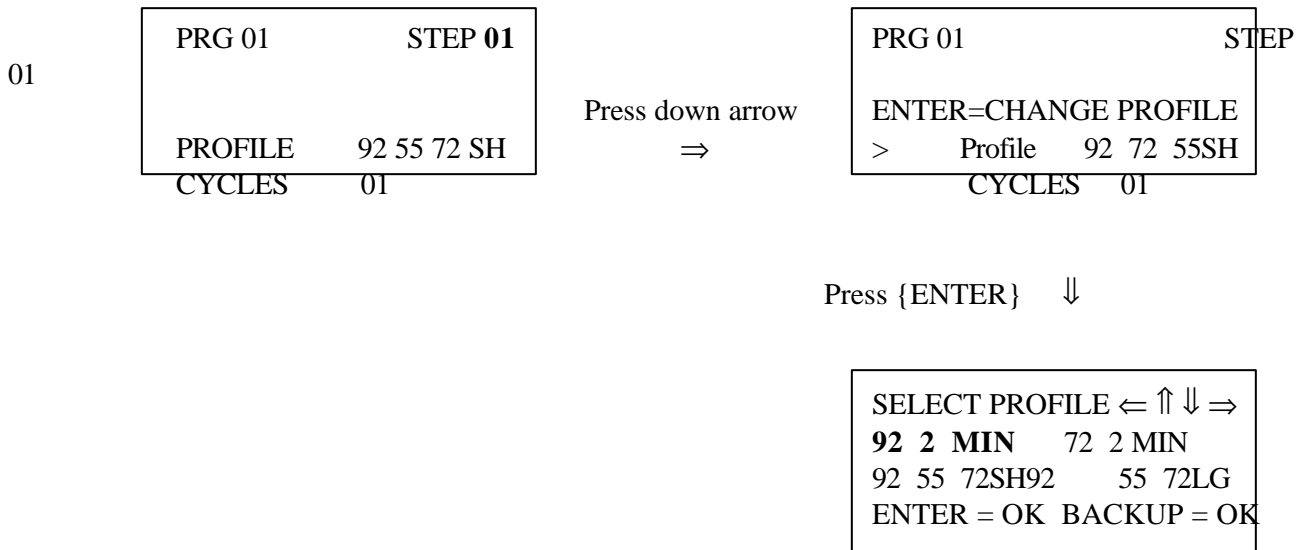
PRG 01	STEP 01
PROFILE	92 55 72SH
CYCLES	01

Choose NAME and press {ENTER}

RENAME PROGRAM
PRG 01

Renaming a PROGRAM is exactly the same as renaming the PROFILES, see page 12.

In creating STEPS for your PROGRAM, keep in mind that each STEP consists only of a PROFILE and a repeat count (CYCLES) for that profile (this implies, of course, that the PROFILES have already been written.) With the screen above you can scroll through the STEPS by pressing the right or left arrows, or move down to make your choices by pressing the down arrow. When you move from STEP to PROFILE, the following screen changes occur:



The SELECT PROFILE screen allows you to pick the PROFILE that you wish to run at the Step in your PROGRAM. Pressing {ENTER} on the blinking PROFILE name will place that choice in the correct slot on the previous screen. Pressing the down arrow then allows you to choose how many times you want this PROFILE to run in your PROGRAM.

As with the PROFILE writing routine, the arrow keys allow you to scroll off the STEP and reveal the next STEP or an END OF PROGRAM statement. The choices then presented are the same as on page 12 in the PROFILE writing routine.

Deleting and Copying PROFILES and PROGRAMS

At the bottom of page 11 we arrived at the point where we had chosen a PROFILE to be Edited. A similar position with respect to PROGRAMS had been reached in the middle of page 15. At that point we chose the EDIT function. This page explains the functions of "Delete" and "Copy".

```
PRF or PRG NAME
>  EDIT
   COPY
   DELETE
```

DELETE When Delete is chosen, the PROFILE or PROGRAM is mark for deletion, and the screen will subsequently appear as shown below. Undelete allows you to change your mind.

```
PRF or PRG NAME
>  EDIT

UNDELETE
```

The PROFILE or PROGRAM marked for deletion is not actually erased. It can always be called for editing and undeleted as the screen above suggests. However, PROFILES and PROGRAMS marked for deletion are viewed as "empty slots" into which other PROFILES and PROGRAMS can be copied, and in such cases, the former PROFILES or PROGRAMS are completely overwritten.

PROGRAMS and PROFILES marked for deletion will not be found in the list of PROGRAMS and PROFILES that can be run, and PROFILES marked for deletion will not be available as components of a PROGRAM. A PROFILE incorporated into a PROGRAM and subsequently deleted will result in an error message when the PROGRAM is run. ("Error: That PROGRAM calls an undefined PROFILE. Press {ENTER} to continue")

COPY When Copy is chosen, the PROFILE or PROGRAM is immediately copied and placed in the first available empty slot (which could be one marked for deletion). You are asked to rename the copied PROFILE in its new slot or change the POINTS. The original is If you are editing a PROFILE and you are not certain in which PROGRAMS it is being used, it is better to Copy the PROFILE and create a new file.

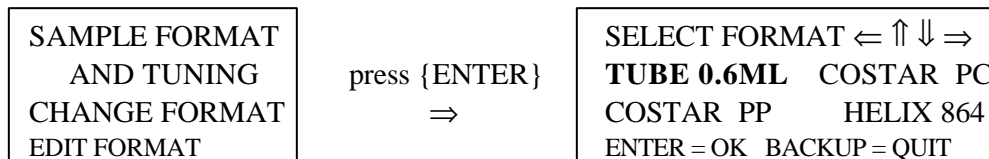
Selecting and Editing Formats and Tuning Parameters

Your BioOven III can be used in applications that employ plastic tubes, multi-well plates, microscope slides and other unusual environments for samples. Each of these environments will require different instrument set-up parameters to run in the best possible way. With the BioOven III, we define "best possible way" to mean reaching set points as quickly as possible without overshooting the set point more than a few tenths of a degree. Operationally, this means selecting a set of tuning parameters that allow the heating or cooling power to be optimally controlled as the set point is approached.

When you select the FORMAT choice on the RUN, WRITE / EDIT, FORMAT screen, we ask you to choose an experimental format from a list that includes:

TUBES 0.7ML	This is the standard microcentrifuge type. See page 24.
PC PLATE	This is the thin 96-well polycarbonate plate, Costar. Part # 6510 See page 25.
HELIX 864	This is a 24X36 = 864 well plate from Helix. It is ideal for low volume (< 20 ul), high throughput applications. See page 25.
SLIDES	This is for work on standard glass microscope slides. See page 27.
SPECIAL	If you have ordered a special application, this format will be factory written and given a descriptive name.

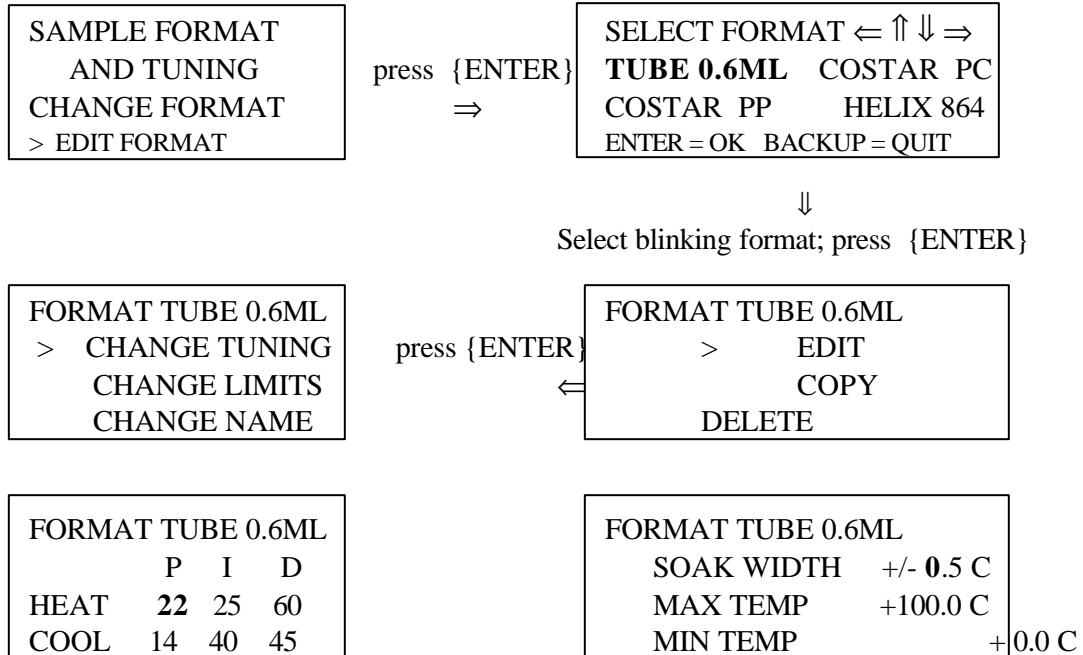
When you choose a format, you are automatically placing an appropriate set of tuning parameters into memory.



When you select the blinking format you will be asked to confirm your choice. This is normally all you will need to do with the software when you change sample formats. You will, of course, also have to change the sample tray and probe, if you have not previously done so.

Tuning Parameter Changes

In the normal course of events, you should never need to use the EDIT FORMAT option from the previous page. However, should you find that, in your particular application, you are not hitting set points as accurately as you would prefer, or should you add an unusual sample format, it may be necessary to change the settings or create a new set. As with PROFILES and PROGRAMS this will require that you choose a format to be written or edited from the usual list (Up to 20 may be stored in memory)



The screen on the left is the Change Tuning screen. There are separate tuning parameters for Heating and Cooling modes. The three tuning parameters P, I, and D range in arbitrary units from 00 to 99 and are described below:

- P = Proportioning** This parameter responds to the difference between the set point and the actual temperature. The higher the number, the more aggressive the response, but you may get some overshoot. Use lower numbers to cure overshoot of the set points.
- I = Integral** This parameter integrates over a number of recent temperature readings to decide if progress toward the set point is being made. The higher the number, the more aggressive the response. Use lower numbers to cure overshoot of the set points.
- D = Derivative** This parameter is sensitive to the temperature/time slope. In this case the lower the number, the more aggressive the response, but you may get some overshoot. Use higher numbers to cure overshoot of the set points.

Where adjusting tuning parameters remember that you can adjust these while a PROFILE or PROGRAM is running. Thus efficient adjustments are made by running a few cycles and recording the response, changing the parameters and observing the response. There is no need to stop the run during this process. Adjust a single parameter at a time in units of 5 or 10. A strip chart recording of oven temperature is very helpful in observing the results of tuning changes.

The factory-set Tuning Parameters are:

Tubes, 0.7ml	P	I	D	PP Plates	P	I	D
Heat:	35	30	45	Heat:			
Cool:	20	50	40	Cool:			
PC Plates	P	I	D	Helix 864	P	I	D
Heat:	40	30	45	Heat:	20	25	30
Cool:	20	50	40	Cool:	14	40	30
Slides	P	I	D	User Defined	P	I	D
Heat:	20	25	30	Heat:			
Cool:	14	40	30	Cool:			

SOAK WIDTH, MIN and MAX TEMPERATURES

The lower right hand screen on the previous page allows you to adjust the soak width and maximum and minimum temperatures allowed. The SOAK WIDTH is the temperature tolerance allowed around the TARGET Temperature. Thus with a SOAK WIDTH of +/-0.5 C and a TARGET Temperature of 92.0 C, the controller will start the soak timer if the actual temperature lies anywhere between 91.5 and 92.5 C. You may set the Soak Tolerance as low as 0.1 C, but at such a setting you may find the system takes excessive time to get within the narrow range. Since the SOAK TIME count down will not begin until you are within the soak tolerance, a narrow soak tolerance could result in spending excessive time near the set point.

The Max and Min Temperatures are there to make it difficult to program in low temperatures that the BioOven III cannot reach, even in a cold room, or high temperatures that might put at risk some of the plastic-ware in the oven interior (not to say your samples as well). These are both user-adjustable, but particularly on the high end we recommend that you study the temperature characteristics of your materials before raising this limit above 100 C.

Running POINTS, PROFILES, and PROGRAMS

This is perhaps the simplest menu option of all. Press the {MENU} Key and you will have the RUN, WRITE / EDIT, FORMAT Screen. If you have never done so, please be sure that the sample format that you are going to use and the format set for the BioOven III match. This is explained in detail on page 18.

Now you are ready to RUN. Move the cursor to RUN and Press {ENTER}. This gives you the screen below.

```

RUN
  > PROFILE
    PROGRAM
    POINT
  
```

The simplest procedure to run is the POINT, so move to that first and press {ENTER}.

Running a POINT:

```

ONE POINT ENTER=RUN
TARGET          37.0 C
RAMP RATE      2.0 C/S
SOAK TIME      INFINITE
  
```

Choosing POINT gives you just one screen of choices. You can set the TARGET temp., the RAMP RATE to reach the POINT and the time to soak (hold at temp.)

The screen shows the default values of 37.0 C, 2.0 C/S and INFINITE time at the TARGET. Change any you wish and as soon as you press {ENTER} the POINT will start running. You will automatically be taken to a Display screen where run information will be available.

Moving the cursor, using the down arrows, to the Time INFINITE, will reveal that it is actually written as 00:00:00. Any time entered as 00:00:00 is interpreted as INFINITE.

Running a PROFILE

Choosing to RUN a PROFILE will first reveal the familiar SELECT PROFILE screen.

```

SELECT PROFILE  <=> ↑ ↓ =>
92 2 MIN      72 2 MIN
92 55 72LG    92 55 72SH
ENTER = OK   BACKUP = QUIT
  
```

Use the arrow keys to move to the desired choice, press {ENTER} and fill in the desired response to the number of cycles that you wish to run. See next page for this screen.

```

RUN PROFILE
92 2 MIN
CYCLES = 01
ENTER = OK  BACKUP = QUIT

```

Use the arrow keys to move to the cycle number and fill in the desired choice. Press {ENTER} to begin the Run.

Press (ENTER) and the PROFILE will begin to run. You will automatically be taken to Display screen where run information will be available.

Running a PROGRAM

Choosing to Run a PROGRAM is almost identical to running a PROFILE. The SELECT PROGRAM screen will show all of the PROGRAMS which have been written in groups or four. Scroll through these and press {ENTER} when the cursor is on the blinking entry. No further decisions need to be made and the PROGRAM will immediately start to run. The controller automatically switches you to a Display screen where run information is available.

```

SELECT PROGRAM  <=> Use the arrow keys to move to the desired choice.
92CYCSHT72    92CYCLNG72
LNG SHT 72
ENTER = OK  BACKUP = QUIT

```

Press {ENTER} and the PROFILE will begin to run. You will automatically be taken to a display screen where run information is available.

Naming PROFILES and PROGRAMS: Record Keeping

The most efficient use of the BioOven III will occur in those cases where a well-maintained library of PROFILES and PROGRAMS is readily available. We believe this is most effective if PROFILES and PROGRAMS are given names that will be easy to remember, and if records are kept of which PROFILES are employed in which PROGRAMS. Several sheets are available at the end of this Manual where this information can be documented. The PROFILES and PROGRAMS that are already in the memory are written out there.

NAMES Names of either PROFILES or PROGRAMS can be up to 10 characters in length. Any number and all characters on the keypad can be used, including a blank space. We think that descriptive names like "92 2 MIN" are better than code names like "Toms Cycle".

RECORDS Even if only one person uses the BioOven III, a good record of PROFILES and PROGRAMS is helpful. In multi-user situations it is essential. We suggest the following model for recording PROFILES and PROGRAMS. The section "Programs using the Profile" on page 31 will save considerable time if kept up to date.

Typical Profile and Program Records:

Profile Name: 92 55 72SH

Point	Temp	Ramp	Soak
01	92.0	2.0	0:15
02	55.0	2.0	0:15
03	72.0	2.0	0:15

Programs using this Profile:

PRG 01 PRG 02 PRG03

Program Name: PRG 01

Step	Profile	Cycles
01	92 2 min	01

02	92 55 72LG	03
03	92 55 72SH	25
04	72 4 MIN	01

Appendix I - Running Tube Samples

The standard operating configuration for the BioOven III is with 0.6 ml plastic tubes. We recommend the thin-walled tubes available from Robbins Scientific. Robbins Scientific tubes all have a positive locking cap and in our experience, have never popped open during a run.

Use of the Tray

The tray can be loaded most easily by removing it to the bench-top and taking the top plate off by loosening the thumbscrew. The system will run quite well with the top plate off which may be more convenient on those runs where only a few samples are processed. In our experience, there is no difference between inner and outer rows, top or bottom plates.

Matching the Probe to your Sample

The probe for tube samples that comes with your BioOven is of the thin-walled variety. Should you use sample tubes that are very different from that supplied as a probe tube, we recommend that you change the bottom of the probe so that your samples and the probe tube exactly match each other. The wall thickness of the tubes will have a great influence on cycle times and heating rates. The ability of the probe to exactly emulate your samples is dependent on the degree to which there is a good match between the probe and your typical sample.

Filling the Probe Tube

The probe should be filled with the same level of liquid that you use in your samples. The liquid filling level will also influence the rate of heating. We strongly recommend that you employ a non-volatile liquid in the probe tube. Good choices are glycerin or mineral oil. With such liquids you do not have to be concerned about evaporation of the probe liquid, which could lead to erratic temperature control.

Options

Should you wish to run larger or smaller size tubes please call us. Custom trays and probes to fit any situation can be quickly provided.

Ordering Tubes

Appendix 2 - Running Plate Samples

With a simple change of the sample tray and probe and a FORMAT Change in the software (see page 18) the BioOven will run samples in multi-well plates. We make two recommendations: (1) The thin walled V-shaped polycarbonate 96-well plate from Costar, or (2) for high volume applications, the 864-well polycarbonate plate available from Helix.

Probes

With your order, we asked you to specify which type of plate you plan to employ. The probe is a small section of the plate itself, with the probe tip immersed in a central well. For 96-well plates, the probe is a 3X3-well section, for the Helix plate about a 9X9-well section. As with the tube probes, we recommend using a non-volatile liquid in the wells, filled to the same level as employed in your samples.

Use of the Sample Tray for Plates

The standard tray is two layered, each level holding two trays. As with the tube probe, the top layer can be removed, and the system can be run with only one tray if you wish.

With heavy plates, only the pegs are needed to secure the plate on the rack. Generally, two pegs per plate are all that is required. With light plates, it will be necessary to use a small amount of lab tape to keep the plates from lifting off of the pegs in the high airflow in the BioOven.

Plate Selection - Warning

Plates must be constructed of materials that will not melt or deform at the temperature employed in your experiments. For this purpose, polycarbonate or polypropylene plates are common and very satisfactory. (Any plate that can be autoclaved is fine.) Glass plates are also acceptable, but most of these have a flat optical grade bottom and will cycle more slowly than the thin polycarbonate now available.

Polystyrene plates, for example, the very popular Falcon plates, have been used successfully in the BioOven, but exceptional care must be exercised. Polystyrene will melt at temperatures in the 90's. Just how high depends on the level of crosslinker in the polymer mix. You would do well to test each batch of plates with a dummy, non-hazardous solution, before committing precious samples to runs in polystyrene plates.

Options

By special request, we can provide a three layered tray so that 6 plates can be run. This system has been thoroughly tested with the 864-well plate, allowing exceptionally high throughput, over 5000 samples/run.

25

Helix Div. Of Vorhies Technologies
1672 Main Street, Ste E-106
Ramona, California 92065
Tel: 619-455-4522
Fax: 619-455-2778
800-424-3549

Polycarbonate catalog # HD-864-PC (864 well plates)

USA/Scientific Plastics
P.O. Box 3565
Ocala, Florida 34478

(384 well plates)

Tel: 904-237-6288
Fax: 904-351-2057
800-522-8477

Corning Inc.
Science Products Division
45 Nagog Park
Acton, MA 01720

Tel: 978-635-2200
Fax: 978-635-22476
800-492-1110

Appendix 3: Microscope Slide Samples

There are no generally established protocols for processing samples on microscope slides. The significant problem in slide use is evaporation of the liquids used to deliver reagents and biologicals to the tissue or cell samples you are examining. Several systems that you might wish to explore are given below.

1. Samples may be placed inside a wall of silicone putty that has been formed in a small circle on the slide surface. A cover slip is placed over the ring and pressed down to obtain a good seal.
2. A cover slip placed over sample and reagents can be "glued" to the slide using fingernail polish. We recommend a colored polish so you can easily see where you have placed material. While surveys are not exhaustive, L'Oreal brand polish appears to hold up well to the temperatures and aggressive media common to such experiments.
3. Slides with wells are easier to handle in both cases noted above.

Probes

The probe that is supplied with the microscope slide tray is a bare probe. You will achieve best success if you construct a probe that resembles your sample as closely as possible. If you provide us with details about the sample handling system you plan to employ, we will construct a probe for you. The probe should be mounted on the left standoff similar to the mounting system used with tubes and plates.

Rotation

If you are running only one or two samples, the probe can be placed near the slides and the turntable switched off. However, if many samples are to be run, the rotation of the turntable will insure that they all will be treated identically. Provided the samples are well sealed, the centrifugal effects of the rotation will not be a problem. Poor sealing techniques can result in the sample running off of the slide. Experiments with slide orientation should be conducted with the turntable off. Only when a reliable sealing method has been developed should multiple slides and turntable rotation be attempted.

**Appendix 4
List of Profiles**

Profile: 92 2 MIN

Point	Temp	Ramp	Soak
01	<u>92.0</u>	<u>2.0</u>	<u>2:00</u>
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

92CYCSHT72 92CYCLNG72 _____
LNG SHT 72

Profile: 72 2 MIN

Point	Temp	Ramp	Soak
01	<u>72.0</u>	<u>2.0</u>	<u>2:00</u>
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

92CYCSHT72 92CYCLNG72

Profile: 92 55 72LG

Point	Temp	Ramp	Soak
01	<u>92.0</u>	<u>2.0</u>	<u>1:00</u>
02	<u>55.0</u>	<u>2.0</u>	<u>0:30</u>

Profile: 92 55 72SH

Point	Temp	Ramp	Soak
01	<u>92.0</u>	<u>2.0</u>	<u>0:15</u>
02	<u>55.0</u>	<u>2.0</u>	<u>0:15</u>

03 72.0 2.0 0:30
 04 _____
 05 _____

Programs using this Profile:
92CYCLNG72 LNG SHT 72 _____

Profile: COOL TO 30
 Point Temp Ramp Soak

01 30.0 2.0 30:00
 02 _____
 03 _____
 04 _____
 05 _____

Programs using this Profile:

03 72.0 2.0 0:15
 04 _____
 05 _____

Programs using this Profile:
92CYCSHT72 LNG SHT 72 _____

Profile: 95 45 SLOW
 Point Temp Ramp Soak

01 95.0 2.0 0:10
 02 45.0 0.1 30:00
 03 _____
 04 _____
 05 _____

Programs using this Profile:

Appendix 4
List of Profiles, (Cont.)

Profile: 37 ISOTHERM

Point Temp Ramp Soak
 01 037. 0.2 Infinite
 02 _____
 03 _____
 04 _____
 05 _____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak
 01 _____
 02 _____
 03 _____
 04 _____
 05 _____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak

01	_____	_____	_____
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak

01	_____	_____	_____
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak

01	_____	_____	_____
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak

01	_____	_____	_____
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

**Appendix 4
List of Profiles, (Cont.)**

Profile: _____

Point Temp Ramp Soak

01	_____	_____	_____
02	_____	_____	_____
03	_____	_____	_____
04	_____	_____	_____
05	_____	_____	_____

Programs using this Profile:

Profile: _____

Point Temp Ramp Soak

	01	_____	_____	_____
02		_____	_____	_____
03		_____	_____	_____
04		_____	_____	_____
05		_____	_____	_____

Programs using this Profile:

Profile: _____

Profile: _____

Point Temp Ramp Soak

Point Temp Ramp Soak

01 _____
02 _____
03 _____
04 _____
05 _____

01 _____
02 _____
03 _____
04 _____
05 _____

Programs using this Profile:

Programs using this Profile:

Profile: _____

Profile: _____

Point Temp Ramp Soak

Point Temp Ramp Soak

01 _____
02 _____
03 _____
04 _____
05 _____

01 _____
02 _____
03 _____
04 _____
05 _____

Programs using this Profile:

Programs using this Profile:

**Appendix 5
List of Programs**

Program 92CYCSHT72

Program 92CYCLNG72

Step	Profile	Cycles
01	<u>92 2 MIN</u>	<u>01</u>
02	<u>92 55 72LG</u>	<u>03</u>

Step	Profile	Cycles
01	<u>92 2 MIN</u>	<u>01</u>
02	<u>92 55 72LG</u>	<u>25</u>

03	<u>92 55 72SH</u>	<u>25</u>
04	<u>72 2 MIN</u>	<u>01</u>

05	_____	_____

03	<u>72 2 MIN</u>	<u>01</u>
04	_____	_____

05	_____	_____

Program LNG SHT 72

Step	Profile	Cycles
01	<u>92 55 72LG</u>	<u>03</u>
02	<u>92 55 72SH</u>	<u>25</u>

03	<u>72 2 MIN</u>	<u>01</u>

04	_____	_____

05	_____	_____

Program 37 ISOTHM

Step	Profile	Cycles
01	<u>37ISOTHERM</u>	<u>01</u>
02	_____	_____

03	_____	_____

04	_____	_____

05	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____

02	_____	_____

03	_____	_____

04	_____	_____

05	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____

02	_____	_____

03	_____	_____

04	_____	_____

05	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____

02	_____	_____

03	_____	_____

04	_____	_____

05	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____

02	_____	_____

03	_____	_____

04	_____	_____

05	_____	_____

Appendix 5
List of Programs, (Cont.)

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____
03	_____	_____
_____	_____	_____
04	_____	_____
_____	_____	_____
05	_____	_____
_____	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____
03	_____	_____
_____	_____	_____
04	_____	_____
_____	_____	_____
05	_____	_____
_____	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____
03	_____	_____
_____	_____	_____
04	_____	_____
_____	_____	_____
05	_____	_____
_____	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____
03	_____	_____
_____	_____	_____
04	_____	_____
_____	_____	_____
05	_____	_____
_____	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____

Program _____

Step	Profile	Cycles
01	_____	_____
_____	_____	_____
02	_____	_____
_____	_____	_____

03 _____

04 _____

05 _____

03 _____

04 _____

05 _____

Program _____

Step Profile Cycles

01 _____

02 _____

03 _____

04 _____

05 _____

Program _____

Step Profile Cycles

01 _____

02 _____

03 _____

04 _____

05 _____

For Assistance Please Call or Write to

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BioTherm™ Products
4805 Prince George's Ave.
Beltsville, MD 20705

Tele: 301-595-5605
Fax: 301-595-2738
Sales: 800-837-2023

e-mail: info@stjohnassociates.com