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Introduction

Thank you for purchasing a SinterPro Sintering Furnace. We have designed and manufactured this furnace using the latest in microcomputer technology to give you many years of dependable service. To ensure that your SinterPro Sintering Furnace gives you the highest level of service, review and follow the guidelines outlined in this Operator’s Manual.

Warranty

This Whip Mix equipment is warranted to be free from defects in material and workmanship from the date of installation for a period of 2 years on the unit. 1 year on the muffle*, thermocouple and heating elements.

Any item returned to our factory through an authorized dealer, will be repaired or replaced at our option at no charge provided that our inspection shall indicate it to have been defective. Dealer, labor, shipping and handling charges are not covered by this warranty.

This warranty does not apply to damage due to shipping, misuse, careless handling or repairs by other than authorized service personnel. Whip Mix is not liable for indirect or consequential damage or loss of any nature in connection with this equipment.

This warranty is in lieu of all other warranties expressed or implied. No representative or person is authorized to assume for us any liability in connection with the sale of our equipment.

*Attention: Hairline cracks in the muffle insulation, sintering trays, and firing tray cap are normal, and to be expected. These components carry a 1 year warranty with the exception of hairline cracks in these components.

Specifications

Electrical Power Requirements:

- **#96553 16 Amp Model**: 208 – 240 VOLT 50/60Hz Single Phase, 16 Amps, 3680 Watts
- **#96550 20 Amp Model**: 200 – 240 VOLT 50/60 Hz Single Phase, 20 Amps, 4600 Watts

Maximum Heat Rate*: 1 – 54°F/min. (1 – 30°C/min.)

**Temperature**: Stage 1,2,3,4: 158°F – 2858°F (70°C – 1570°C*) 1-30˚C/minute*

* Programmable heat rates. Actual heat rate at high temperatures may be lower depending upon furnace load and electrical voltage.

Hold Time: 0 – 4 hours on each Stage

Environmental Conditions

- Indoor use
- Altitude up to 2000m
- Environmental Temperature 5°C to 35°C (41°F to 95°F)
- Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 35°C (95°F)
- Mains supply voltage fluctuations not to exceed +/- 5% of the nominal voltage
- Pollution Degree 2, Installation Category II
- Protection Degree IP20 – protected against objects greater than 12.5mm, no liquid protection

Overall Dimensions:

- 17” (43.2 cm) Wide × 25.5” (65cm) Deep × 33.24” (84.5 cm) High

Heating Chamber Dimensions:

- 3.5” (9 cm) Diameter × 6.5” (16.5 cm) High

Oven Weight: 132 Lbs. (60.0 kg)

Shipping Weight: 191 Lbs. (86.6 kg)

Maximum Temperature: 1570°C (2858°F)

Number of Programs: 30

- Programs 1-2 are pre-programmed with Vericore Zirconia fast and slow sintering cycles.

Number of Stages/Program: 1 – 4, User defined.

Delay Start: 0 – 8.0 hours

HVAC Load: 15,710 BTU/Hour (20 amp unit)

12,568 BTU/Hour (16 amp unit)

*Attention:

Hairline cracks in the muffle insulation, sintering trays, and firing tray cap are normal, and to be expected. These components carry a 1 year warranty with the exception of hairline cracks in these components.
ATTENTION USERS:
SAFETY INSTRUCTIONS
DO NOT ATTEMPT INTERNAL SERVICE

WARNING: THE INTERIOR OF THE MAIN ASSEMBLY IS ONLY ACCESSIBLE BY REMOVING HARDWARE WITH TOOLS AND SHOULD ONLY BE OPENED AND SERVICED BY QUALIFIED TECHNICIANS. SINCE THE INTERIOR OF THE UNIT MAY CONTAIN HIGH VOLTAGE AND DANGEROUS COMPONENTS, FAILURE TO HEED THIS WARNING MAY RESULT IN EQUIPMENT DAMAGE, PERSONAL INJURY AND/OR DEATH.

CAUTION: THE TEMPERATURE DISPLAYED IS ACCURATE ABOVE 70°C (158°F). NEVER INSERT OR RETRIEVE WORK WITH A BARE HAND. ALWAYS USE THE SINTERING TRAY PLACEMENT TOOL TO INSERT OR RETRIEVE SINTERING TRAYS OR BURNS MAY RESULT.

NOTE: CLEAR, THIN, GLASS “SOAP BUBBLES” WILL APPEAR ON THE HEATER ELEMENTS. THIS IS ENTIRELY NORMAL AND TO BE EXPECTED. THEY RESULT FROM THE SILICA IN THE ELEMENTS REACTING WITH AIR AND ARE CHEMICALLY INERT, AND WILL NOT REACT CHEMICALLY WITH YOUR WORK PRODUCT. THERE IS NO NEED TO “CLEAN” THE ELEMENTS. WE RECOMMEND THE USE OF A LID ON THE TOP OF YOUR SAGGER TRAY STACK TO PREVENT THE SILICA DEBRIS FROM LANDING INSIDE THE TOPMOST TRAY.

NOTE: THE USE OF ACID BASED STAINS CAN REACT WITH THE HEATER ELEMENTS AND SHORTEN THEIR LIFE.

NOTE: DO NOT TURN OFF THE OVEN POWER UNTIL AFTER THE MUFFLE TEMPERATURE HAS RETURNED TO ROOM TEMPERATURE TO PREVENT DAMAGE TO ELECTRONICS AS THE COOLING FANS ARE NEEDED.

Important Note:
The muffle insulation in your SinterPro is likely to accumulate moisture if the oven is not used regularly. It is strongly advised that before you put any work product in the oven for the first time or any time it has been unpowered for more than a weekend you run the following drying cycle; a Rate Rise of 10°C/minute to 500°C, Hold .5 hours. This procedure will bake out any retained moisture in the insulation. If the power is left on the unit will show “IDLE” in the display and keep the muffle warm.

Unpacking The Furnace

IMPORTANT: NEVER TIP OR TILT THE FURNACE ONTO ITS SIDE OR BACK. DOING SO MAY DAMAGE THE HEATING ELEMENTS OR THE THERMOCOUPLE. SAVE ALL PACKAGING MATERIALS TO SHIP THE FURNACE BACK FOR SERVICE IN THE FUTURE SHOULD THERE BE A NEED.

1. Inspect the carton for any signs of shipping damage. If anything looks suspicious call before unpacking the unit so that a freight claim inspector can validate.
2. Use a pallet jack to position the oven as near to the site of use as possible.
3. Remove the bands and shrink wrap securing the carton to the pallet.
4. Remove carton lid and locate “READ ME FIRST” document to review important instructions to familiarize unpacking of SinterPro furnace. Remove white metal lid and other documents; set aside until needed.

5. Remove black cut foam spacers, outer carton.

NOTE: DO NOT REMOVE THE OVEN FROM THE SHIPPING SKID UNTIL INSTRUCTED TO DO SO. THE FOLLOWING STEPS ARE MUCH EASIER TO PERFORM WHEN THE TOP OF THE MUFFLE IS AT WAIST HEIGHT WHILE ON THE SHIPPING PALLET.
6. Remove both the Accessory box (small) and the Heater Element box (large) from the unit.

7. Remove foam and wire ties (both long and short).

8. Open the Heater Element box from the end as noted on the box and remove the 4 heater rods by pulling up the cardboard insert.

9. Lower the heater rods into the wells with the two electrical plugs oriented towards the rear of the oven. Carefully remove the cardboard insert from the side.

10. Heating rod insertion after removing the cardboard.

11. Insert the two plugs into the receptacles.
12. Locate plastic bag containing 8 screws taped to the inside of the Accessory box lid.

13. Mount white metal perforated lid with 8 screws provided.

14. **Save all packaging/shipping materials** in case of return/repair. The Customer is responsible for re-packaging the furnace like it was received. **The furnace must be returned in original carton** to prevent damage. Failure to retain packaging will incur a charge for a new carton plus shipping of empty carton.

15. Remove the oven from the shipping pallet following the procedure pictured below:

   **CAUTION: THE OVEN WEIGHS 132 LB/60 KG.**

   LIFTING AND PLACEMENT OF THE OVEN IS A SAFE PROCEDURE WHEN PERFORMED WITH FOUR (4) PERSONS. THE PROVIDED LIFT STRAPS (ORANGE) HAVE 3 LOOPS EACH. USE THE LOOP BEST SUITED FOR YOUR HEIGHT IN ORDER TO USE YOUR LEGS TO LIFT (NOT YOUR BACK). PLACE THE LOOP OVER YOUR FOREARM UP TO THE ELBOW, THEN USE THE SAME HAND PLACED ON THE OVEN TO STEADY THE LOAD.

   **FOUR persons required to lift the unit onto work surface. (60kg / 132 lb)**

   1. Fold out straps (4)
   2. Each person (4) place arm through loop up to elbow
   3. Place same hand on oven to steady
   4. After placement, tilt oven back to remove straps and save with the rest of material
   5. Placing the furnace

- Place the SinterPro on a **non-flammable**, level surface capable of supporting 200 lb. / 90 kg. The surface should be high enough to allow easy access to the muffle cavity for loading and unloading the muffle.
- Leave at least 12 in. / 31cm of **unobstructed air space** around all sides and the rear of the furnace for ventilation.
- Make sure that there is at least **36 in. / 92 cm of free air space** above the top of the SinterPro cabinet for ventilation.

- **The SinterPro Oven should not be placed in such a way as to obstruct access to the AC Mains disconnect to the oven in case of an emergency.**
Setting Up The Oven

Unpack contents of the accessory carton.

Contents:
• 1 ea. metal forceps for handling sintering trays
• 1 ea. shallow ceramic sintering tray
• 1 ea. deep ceramic sintering tray
• 1 ea. Sintering ceramic tray lid
• 1 ea. Jar ceramic beads
• Power Cord
• Firing Tray Crown
• Cooling Tray

• USB Flash Drive
• Locate the Power Cord and plug the appropriate end into the back of the oven (see picture below), and the other end into the wall power outlet. Electrical power requirements include US and CAN: 200/240 VAC, 20 A. and International: 230 VAC, 16 A.

Connecting Power to the Furnace

A dedicated mains power circuit is required. Make sure the wall supply wire size accounts for the distance from the power source to the oven outlet. The maximum impedance of the power supply to the furnace must be less than 0.032 ohms, as determined by licensed electrician.

Back Panel Component Familiarization

2. 3 AMP Control Logic Circuit Breakers (2).

Power: The On/Off power switch is also a circuit breaker. The switch will flip to a neutral position when triggered. To reset the circuit breaker press the switch to the Off position, then rock it towards the On position. You may have to wait a minute for the thermal breaker to cool off before it will latch in the ON position.

NOTE: The (2) 3 AMP circuit breakers must be set (pushed in) in order to apply power to the Muffle Heaters.

CAUTION: ALWAYS SWITCH OFF THE POWER SWITCH AND UNPLUG THE POWER CORD BEFORE SERVICING THE OVEN.
Controls & Indicator Familiarization

Controls Description (Left To Right)
1. **PROGRAM SELECT**: Press to select a program or to review the program currently running.
2. Press the **Up Arrow** key to increase a number. The longer the button is pressed, the faster the numbers increase.
3. Press the **Down Arrow** key to decrease a number. The longer the button is pressed, the faster the numbers decrease.
4. **ENTER / REVIEW**: When programming or reviewing a program in process, press to advance to the next parameter.
5. Press the **Table Up** button to raise the lift platform.
6. Press the **DELAY START** button to delay the start of a program. The number entered is the time delay required before the selected Program begins.
7. **START / STOP** button: Press to immediately start or stop a program.

**NOTE**: While a program is running, press delay start to display the time remaining to complete the program.

Indicators Description
8. **STAGE 1–2–3–4 indicator lights**: While programming, the number of active stages are illuminated.
9. **°F and °C** identifies the temperature scale.
10. **°/ MIN** identifies the heat rate.
11. **HH : MM** indicates time. Flashing indicates that a power failure has occurred. (Press the **Start/Stop** button to halt the blinking. **HH:MM** LED will remain off unless program is actually in a delay before Start time period.
12. **Main Display**
   A. The 4 digit display indicates the chamber temperature.
   B. When programming or reviewing, the main display indicates **PROGRAM NUMBER, DELAY START TIME, HEAT RATE, TEMP** and **HOLD TIME**.
   C. Displays special words and error codes.
13. **Program Status Graph** indicates the status of the sintering process.
Powering On The Furnace

• Make sure both 3 Amp button circuit breakers are fully pressed in.
• At the right rear corner of the chassis is the Power switch. Depress it fully towards the “1” position to turn on the power.
• The red numeric digital display should illuminate.
• The green “Heat” LED should light for one second, followed by the yellow “Alarm 1” LED, followed by the red “Alarm 2” LED. An audible “click” should be heard one second later; this is the muffle power safety contactor energizing. If the lift is in the full up position the display should stop on the word “IDLE”, and the green “Heat” LED should be flickering.


• Press the Down Arrow button to lower the lift. Note the indentation in the top surface of the firing platform. This indentation is to assist you in centering the sintering trays.

NOTE: If the Furnace is not running a program, the stage LED(s) on the left side of the temperature display will be lit all the time, when a program is running the current Stage LED will be BLINKING. To end a program, press the START/STOP button once.

To Set Temperature Scale
The furnace is pre-set in degrees Celsius.
1. Turn the power switch on. If the furnace is already on, be sure it is in the idle mode – (no program is running). The chamber temperature appears on the Main Display and the °C light goes on.
2. To change temperature scale: Press Up Arrow button and Down Arrow button at the same time. The degree light switches to the opposite temperature scale and the displayed value switches to those units.

To Turn The “Beep” On And Off
When a program is completed, 20 “beeps” sound every 15 minutes to inform the operator that the Sintering cycle is completed.
1. Be sure the oven is in the Standby MODE – (no program us running).
2. Press the Up Arrow key and PROGRAM SELECT simultaneously to display the status of the “beep.” “ON” indicates the beep is active. “OFF” indicates the beep is inactive.
3. Use either of the Up Arrow or Down Arrow keys to turn the “beeps” on or off.
4. To return to the Standby mode, wait 7 seconds or press STOP / START twice. (If STOP / START is pressed once, the current PROGRAM cycle starts.)

Muffle Standby Heat

The muffle insulation will readily take on moisture from the air unless the muffle temperature is elevated above room temperature. This moisture will rapidly turn to steam and expand quickly enough to crack the insulation - unless some standby heat is applied whenever a firing program is not running.

When the oven is not in use, always remove all firing trays and press the up arrow button to raise the lift platform to the top. When the lift platform reaches the top position (and the muffle temperature is below 70°C) the front panel display will read “IDLE”. Whenever you see the word “IDLE” a small amount of heat (27 Watts) is being applied to keep the muffle at or in the vicinity of 48°C (120°F). The green heater LED will blink to indicate Idle heating.

If the furnace has been sitting in Standby with no user interaction for an hour, the platform will automatically close by itself, and apply the IDLE power to the heaters.

If the furnace power has been turned off on a weekend it is important to allow the furnace muffle be warmed up in the IDLE Mode with the platform up for at least a couple of hours to bake out any moisture before running a sintering program. Rate Rise of 10˚C/minute to 500˚C, Hold .5 hours.
If the lift platform is not fully up, and the muffle is cooler than 70°C, the display will read “LO”, and no power will be applied to the heaters.
**Lift Operation**

The lift platform may be operated manually when there is no program running.

To raise the lift platform, depress the button with the symbol which looks like the sintering tray and has an upward pointing arrow. To lower the lift platform, depress the button with the symbol which looks like the sintering tray and has a downward pointing arrow.

**IMPORTANT:** IF THE MUFFLE TEMPERATURE IS ABOVE 300°C, THE RED LED ABOVE THE TABLE DOWN BUTTON AT THE FAR RIGHT WILL BE LIT, INDICATING THAT IT IS NOT SAFE TO LOWER THE LIFT PLATFORM.

AS SOON AS THE MUFFLE COOLS BELOW 300°C, THE LED LIGHT WILL GO OUT AND THE TABLE DOWN BUTTON IS ENABLED TO LOWER THE LIFT.

---

**Loading The Sintering Trays**

Press the Down Arrow button to lower the lift firing platform. One shallow sintering tray, one deep sintering tray, one lid, and a zirconia tray liner bead sample jar are included with your SinterPro oven. The sintering tray is indented at the bottom to allow the tray to index into the firing tray to hold the sintering tray concentric with the firing tray.

The maximum sintering tray capacity should not exceed 5.6" tall. Below are four legitimate combinations of Whip Mix shallow and deep trays. If you use any other brand of trays, the diameter of the tray cannot exceed 90mm (3.5") and the stack cannot exceed 142mm (5.6") or damage to the lift or muffle insulation will result.

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**Cooling Modes Available (3)**

There are three cooling modes available with the SinterPro oven.

1. Fast Cool
2. Controlled Cool
3. Natural Cool

**Fast Cool**

If you desire to recover your work product in an hour from maximum temperature, you can select the Fast Cool cooling mode by arrowing to “FCL” and the lift table will descend slowly, maintaining a 22°C per minute cooling rate.

**Controlled Cool**

If you desire to recover your work product in 2.5 hours from maximum temperature, you can select the Controlled Cool cooling mode by arrowing to “CCL” and the lift table will remain closed until the cooling rate of the muffle drops below 10°C/minute, then descend slowly.

**Natural Cool (Select “NO”)**

The table remains closed throughout the natural cooling time of approximately 5 hours and 15 minutes from maximum temperature.
To Program And Operate – One Stage Program

Note: Always use the START/STOP button to halt a running program before turning the oven power off. If you turn the oven off without stopping the program in progress the power-fail memory feature will automatically restart the program at the point where the power either failed or the oven was turned off.

P1 and P2 have been pre-programmed with the sintering parameters for Vericore Zirconia ZR HT, ZR HTX and ZR Pro. P1 = a Fast Sinter Cycle and P2 = a Slow Sinter Cycle. The specific parameters are as follows.

**P1: Fast Sinter Cycle**
Stage 1: 10°C/min. to 1000°C; No Hold
Stage 2: 5°C/min. to 1500°C; Hold for 2 hours
Stage 3: Fast Cool

**P2: Slow Sintering Cycle**
Stage 1: 6°C/min. to 900°C; No Hold
Stage 2: 3°C/min. to 1500°C; Hold for 2 hours
Stage 3: Controlled Cool

1. Turn the power switch on.
2. Press PROGRAM SELECT. Use to display the desired program number (P1 – P30).
3. Press ENTER / REVIEW to display the selected program. STAGE 1 and DELAYED (START) lights turn on. If DELAY mode is desired, use the arrow keys to set the delay time before the program starts (only if the Delay button is pressed instead of the normal Start button).
4. Press ENTER / REVIEW. STAGE 1 light remains on, DELAY (START) light turns off and HEAT RATE light turns on. Use the arrow keys to scroll for the heat rate required from 1°F – 54°F/min (1°C – 30°C/min).
5. Press ENTER / REVIEW. STAGE 1 light remains on, HEAT RATE light turns off and TEMP light turns on. Use the arrow keys to scroll to select the temperature required up to the maximum of 1570°C / 2858°F.
6. Press ENTER / REVIEW. STAGE 1 light remains on, TEMP light turns off and HOLD TIME light turns on. Use the arrow keys to scroll to the time needed to hold at above temperature (0 – 4hrs.).

7. To use a one stage sintering cycle, the furnace must be programmed not to use STAGE 2, 3 or 4. Follow these steps:
   A. After completing step 6 above, press ENTER / REVIEW. STAGE 1 light turns off, STAGE 2 and HEAT RATE lights turn on.
   B. Press either Arrow key, Main Display shows “.....5, 4, 3, 2, 1, COOL, NO.” Select “NO” to program the furnace for a one-stage cycle. (NO = Natural Cooling)

C. If Fast Cooling is desired, scroll to “FCL” or if Controlled Cooling is desired, scroll to “CCL” instead of “NO”. This will allow natural cooling down to around 900°C, then progressively lower the lift platform automatically to allow cooling air into the muffle at approximately 15°-20°C/minute rate. Your work will be retrievable sooner. (FCL or CCL can only be the last stage of a program, so the NO entry is not required in this case).

   **CAUTION: THE TABLE WILL AUTOMATICALLY LOWER VERY SLOWLY. BE ADVISED THAT THE MATERIAL TRAYS AND THE LIFT PLATFORM INSULATION ARE TOO HOT TO SAFELY TOUCH WITH YOUR HAND. USE FORCEPS AND INSULATED GLOVES WHEN HANDLING THE SINTERING TRAYS.**

8. All necessary information for this program is now entered.
9. To run the program immediately, press START / STOP.
10. To delay the start of the program press the DELAY START key.

**NOTE:** If DELAY START key is pressed while a program is running, the time remaining for completion of the program will appear on the Main Display for 5 seconds.

**NOTE:** It is recommended to wait for muffle to cool below 300°C / 572°F before initiating a new firing cycle to avoid thermal shock to your work.

### Sample One Stage Program
(with delayed start)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Delay Start</th>
<th>Heat Rate</th>
<th>Temp</th>
<th>Hold Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>3:00</td>
<td>30°C (54°F)</td>
<td>1530°C (2786°F)</td>
<td>1:00</td>
</tr>
<tr>
<td>Stage 2</td>
<td>NO (n/a)</td>
<td>(n/a)</td>
<td>(n/a)</td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td>NO (n/a)</td>
<td>(n/a)</td>
<td>(n/a)</td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td>NO (n/a)</td>
<td>(n/a)</td>
<td>(n/a)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** To turn off STAGE 2, 3 and 4, select “NO” for the HEAT RATE in STAGE 2.

### Running A Program

**NOTE:** Press the START/STOP button to initiate the program. If the Lift platform is in the down position pressing the Start/Stop button will cause it to begin rising to the closed position. Make sure your sintering trays are in position in the center of the firing platform before initiating the firing cycle.

**NOTE:** At the end of the firing cycle the appropriate number of Stage LEDs will be ON, and the Green “Ready” LED will be lit to signify the firing cycle is complete. Technically the firing cycle is still active until you press the START/STOP button.
To Program And Operate – Two Stage Program

1. Follow One Stage Program, Steps 1 – 6.
2. Press ENTER / REVIEW. STAGE 1 light turns off, STAGE 2 and HEAT RATE lights turn on. Main Display shows three heat rate choices. Choose one:
   A. Select heat rate between 1°F – 54°F / min (1°C – 30°C / min).
   B. Select "FCL" or "CCL" to program the cooling mode.
   C. Select "NO" to turn off STAGE 2, 3 and 4. This will result in a One Stage program.

   NOTE: The HEAT RATE cannot be programmed to “COOL” in STAGE 1 – only in STAGE 2, 3 or 4.
3. Press ENTER / REVIEW. HEAT RATE light turns off and TEMP light turns on. Use the arrow keys to scroll for the temperature required: heating temperature up to a max. of 2858°F (1570°C) or cooling temperature down to a minimum of 137°F (58°C).
4. Press ENTER / REVIEW. TEMP light turns off and HOLD TIME light turns on. Use the arrow keys to program the time needed to hold at the above temperature (0 – 4hrs.).
5. For two stages, the furnace must be programmed not to use STAGE 3 or 4. Follow these steps:
   A. After completing Step 4, press ENTER / REVIEW. STAGE 2 light turns off, STAGE 3 and HEAT RATE lights turn on.
   B. Press either Arrow key, Main Display shows “....5,4,3,2,1, FCL, CCL, NO.” Select “NO” to program the furnace not to use STAGE 3 or 4. (Natural Cooling).
   C. If Fast Cooling is desired, scroll to “FCL” or if Controlled Cooling is desired, scroll to “CCL” instead of “NO”. This will allow natural cooling down to around 900°C, then progressively lower the lift platform automatically to allow cooling air into the muffle at approximately 15°-20°C/minute rate. Your work will be retrievable sooner. (FCL or CCL can only be the last stage of a program, so the NO entry is not required in this case).

   CAUTION: THE TABLE WILL AUTOMATICALLY LOWER VERY SLOWLY. BE ADVISED THAT THE MATERIAL TRAYS AND THE LIFT PLATFORM INSULATION ARE TOO HOT TO SAFELY TOUCH WITH YOUR HAND. USE FORCEPS AND INSULATED GLOVES WHEN HANDLING THE SINTERING TRAYS.
6. All necessary information for this program is now entered.
7. To run the program immediately, press START / STOP.
8. To delay the start of the program (see One Stage Program, Step 3), press DELAY START.

   NOTE: If DELAY (START) is pressed while a program is running, the time remaining for completion of the program will appear on the Main Display for 5 seconds.
   NOTE: It is recommended to wait for muffle to cool below 300°C / 572°F before initiating a new firing cycle to avoid thermal shock to your work.

Sample Two Stage Program
(to start immediately)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Heat Rate</th>
<th>Temp</th>
<th>Hold Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>30°C (54°F)</td>
<td>1000°C (1832°F)</td>
<td>:10</td>
</tr>
<tr>
<td>Stage 2</td>
<td>5°C (9°F)</td>
<td>1500°C (2732°F)</td>
<td>1:00</td>
</tr>
<tr>
<td>Stage 3</td>
<td>NO</td>
<td>(n/a)</td>
<td>(n/a)</td>
</tr>
<tr>
<td>Stage 4</td>
<td>NO</td>
<td>(n/a)</td>
<td>(n/a)</td>
</tr>
</tbody>
</table>

Though any number may appear, the unit is deactivated when “NO” is selected for the HEAT RATE.

   NOTE: To turn off STAGE 3 & 4, select “NO” for the HEAT RATE in STAGE 3.

To start immediately, press START / STOP.
Follow the same programming procedures if a three or four stage program is desired.

Running A Program

   NOTE: Press the START/STOP button to initiate the program. If the Lift platform is in the down position pressing the Start/Stop button will cause it to begin rising to the closed position. Make sure your sintering trays are in position in the center of the firing platform before initiating the firing cycle.

   NOTE: At the end of the firing cycle the appropriate number of Stage LEDs will be ON, and the Green “Ready” LED will be lit to signify the firing cycle is complete. Technically the firing cycle is still active until you press the Start/Stop button to extinguish the Ready LED and halt the periodic beeping. This is useful if you have an overnight run so that you have confirmation that the cycle completed normally, even if it is hours later.
To Program And Operate – Three Stage Program

1. Follow Two Stage Program, Steps 1 – 4.

2. Press ENTER / REVIEW. STAGE 2 light turns off, STAGE 3 and HEAT RATE lights turn on. Main Display shows three heat rate choices. Choose one:
   A. Select heat rate between 1°F – 54°F / min (1°C – 30°C / min).
   B. Select “FCL” or “CCL” to program the cooling mode.
   C. Select “NO” to turn off STAGE 3 and 4. This will result in a Two Stage program.

NOTE: The HEAT RATE cannot be programmed to “COOL” in STAGE 1 – only in STAGE 2, 3 or 4.

3. Press ENTER / REVIEW. HEAT RATE light turns off and TEMP light turns on. Use the arrow keys to scroll for the temperature required: heating temperature up to a max. of 1570°C / 2858°F or cooling temperature down to a minimum of 137°F (58°C).

4. Press ENTER / REVIEW. TEMP light turns off and HOLD TIME light turns on. Use the arrow keys to program the time needed to hold at the above temperature (0 – 4hrs.).

5. For three stages, the furnace must be programmed not to use STAGE 4. Follow these steps:
   A. After completing Step 4, press ENTER / REVIEW. STAGE 3 light turns off, STAGE 4 and HEAT RATE lights turn on.
   B. Press either Arrow key, Main Display shows “....5, 4, 3, 2, 1, COOL, NO.” Select “NO” to program the furnace not to use STAGE 3 or 4.
   C. If Fast Cooling is desired, scroll to “FCL” or if Controlled Cooling is desired, scroll to “CCL” instead of “NO”. This will allow natural cooling down to around 900°C, then progressively lower the lift platform automatically to allow cooling air into the muffle at approximately 15°-20°C/minute rate. Your work will be retrievable sooner. (FCL or CCL can only be the last stage of a program, so the NO entry is not required in this case).

CAUTION: THE TABLE WILL AUTOMATICALLY LOWER VERY SLOWLY. BE ADVISED THAT THE MATERIAL TRAYS AND THE LIFT PLATFORM INSULATION ARE TOO HOT TO SAFELY TOUCH WITH YOUR HAND. USE FORCEPS AND INSULATED GLOVES WHEN HANDLING THE SINTERING TRAYS.

6. All necessary information for this program is now entered.

7. To run the program immediately, press START / STOP.

8. To delay the start of the program (see One Stage Program, Step 3), press DELAY START.

NOTE: If DELAY START key is pressed while a program is running, the time remaining for completion of the program will appear on the Main Display for 5 seconds.

NOTE: It is recommended to wait for muffle to cool below 300˚C / 572˚F before initiating a new firing cycle to avoid thermal shock to your work.

Sample Three Stage Program
(program with cooling)

<table>
<thead>
<tr>
<th></th>
<th>Heat Rate</th>
<th>Temp</th>
<th>Hold Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>30°C (54°F)</td>
<td>1000°C (1832°F)</td>
<td>:10</td>
</tr>
<tr>
<td>Stage 2</td>
<td>10°C (18°F)</td>
<td>1530°C (2786°F)</td>
<td>2:00</td>
</tr>
<tr>
<td>Stage 3</td>
<td>5°C (9°F)*</td>
<td>250°C (482°F)</td>
<td>(n/a)</td>
</tr>
<tr>
<td>Stage 4</td>
<td>NO</td>
<td>(n/a)</td>
<td>(n/a)</td>
</tr>
</tbody>
</table>

To start immediately, press START / STOP.

Follow the same programming procedures if a three or four stage program is desired.

NOTE: When the temperature is set to a lower temperature than in the previous stage, the furnace ignores the programmed HEAT RATE (except for “NO”) and automatically cools to the pre-set temperature. The time required for the cooling stage is determined by the pre-set temperature. The lower the temperature, the more time needed to cool down.

NOTE: Press DELAY button to start after a pre-set delay time elapses. (See SAMPLE ONE STAGE PROGRAM to program DELAY START time.

Running A Program

NOTE: Press the START/STOP button to initiate the program. If the Lift platform is in the down position pressing the Start/Stop button will cause it to begin rising to the closed position. Make sure your sintering trays are in position in the center of the firing platform before initiating the firing cycle.

NOTE: At the end of the firing cycle the appropriate number of Stage LEDs will be ON, and the Green “Ready” LED will be lit to signify the firing cycle is complete. Technically the firing cycle is still active until you press the Start/Stop button to extinguish the Ready LED and halt the periodic beeping. This is useful if you have an overnight run so that you have confirmation that the cycle completed normally, even if it is hours later.
To Program And Operate – Four Stage Program

1. Follow Three Stage Program, Steps 1 – 4.

2. Press ENTER / REVIEW. STAGE 3 light turns off, STAGE 4 and HEAT RATE lights turn on. Main Display shows three heat rate choices. Choose one:
   A. Select heat rate between 1°F – 54°F/min (1°C – 30°C/min).
   B. Select “FCL” or “CCL” to program the cooling mode.
   C. Select “NO” to turn off Stage 4. This will result in a Three Stage Program.

   NOTE: The HEAT RATE cannot be programmed to “COOL” in STAGE 1 – (only in STAGE 2, 3 or 4).

3. Press ENTER / REVIEW. HEAT RATE light turns off and TEMP light turns on. Use the arrow keys to scroll to the temperature required: heating temperature up to a max. of 2858°F (1570°C) or cooling temperature down to a minimum of 137°F (58°C).

4. Press ENTER / REVIEW. TEMP light turns off and HOLD TIME light turns on. Use the arrow keys to scroll to the time needed to hold at the above temperature (0 – 4 hrs.).

5. All necessary information for this program is now entered.

6. To run the program immediately, press START / STOP.

7. To delay the start of the program to be ready to cast at the pre-set time (see One Stage Program, Step 3), press TIME SET (DELAY START).

   NOTE: If DELAY (START) is pressed while a program is running, the time remaining for completion of the program will appear on the Main Display for 5 seconds.

   NOTE: It is recommended to wait for muffle to cool below 300˚C / 572˚F before initiating a new firing cycle to avoid thermal shock to your work.

   NOTE: If all 4 stages are used to control temp., there are no remaining Stages left to use the FCL (Fast Cool) feature. There is no need for a “NO” to signal the end of the cycle.

Running A Program

   NOTE: Press the START/STOP button to initiate the program. If the Lift platform is in the down position pressing the Start/Stop button will cause it to begin rising to the closed position. Make sure your sintering trays are in position in the center of the firing platform before initiating the firing cycle.

   NOTE: At the end of the firing cycle the appropriate number of Stage LEDs will be ON, and the Green “Ready” LED will be lit to signify the firing cycle is complete. Technically the firing cycle is still active until you press the Start/Stop button to extinguish the Ready LED and halt the periodic beeping. This is useful if you have an overnight run so that you have confirmation that the cycle completed normally, even if it is hours later.

To Review A Program

1. Turn the power switch on.

2. Press PROGRAM SELECT.

3. Use arrow keys to select the program number to be reviewed. The program number (P1 – P30) will appear on the Main Display.

4. The number of stages in the program are indicated by the STAGE lights.

5. Press ENTER / REVIEW.
   The DELAY (START) light turns on. The number of hours/seconds until the Program Starts appears on the Main Display. After 7 seconds, the DELAY START light turns off and the actual furnace temperature appears on the Main Display.

   NOTE: STAGE 1 light is now on.

   NOTE: DELAY (START) appears only at the very beginning of STAGE 1.

6. Press ENTER / REVIEW and TEMP light turns on. The programmed temperature (TEMP) for STAGE 1 appears on the Main Display.

7. Press ENTER / REVIEW and HOLD TIME light turns on. The programmed HOLD TIME for STAGE 1 appears on the Main Display in HR:MIN.

8. All of the information in STAGE 1 has now been entered. If ENTER / REVIEW is pressed again, STAGE 2 light turns on. Review STAGE 2 following the same procedure as above. Continue pressing ENTER / REVIEW to review all of the individual parameters in STAGE 2, 3, or 4.

   NOTE: DELAY (START) appears only at the very beginning of STAGE 1.
Edit A Program While The Program Is Running

1. To identify which program is running, press PROGRAM SELECT.  
   **NOTE:** The program number cannot be changed while the program is running.

2. To determine the time remaining for the completion of the program, press the DELAY START button. The time remaining appears on the Main Display for 5 seconds.

3. Any parameter can be increased or decreased during the running of any programs.  
   **NOTE:** HEAT RATE cannot be changed to “NO” in the stage currently running or in the stages already completed.

4. To change a parameter while a program is running, press ENTER / REVIEW to advance to the desired STAGE and parameter (i.e. HEAT RATE, TEMP or HOLD TIME). Initially, STAGE 1 will appear. Any parameter can be increased or decreased by pressing the UP ARROW button or the DOWN ARROW button.

5. Any program can be stopped or started by pressing the START / STOP button.

6. If a program is edited while running and the HEAT RATE in STAGE 2, 3 or 4 is set to “COOL” but the corresponding TEMP programmed is entered to heat to a higher temperature than the previous stage, the SinterPro will try to heat with a 0°F / Min (0°C / Min) HEAT RATE. In this case, when DELAY START button is pressed, 99:99 (Hr:Min) flashes on the Main Display, indicating that the program cannot be completed.

Purging The Oven

The recommended program to purge the oven of impurities is:

   Stage 1: 20°C per minute to 1550°C with a 1 hour Hold Time.
   Stage 2: “NO”
Troubleshooting

Internal Fuse List:
1. Inline Fuses (2) on DC power supply output are:
   Bel Fuse, Inc. Part NO. 5ST-4-R, Glass 4Amp, 250 Volt, 5 x 20 mm.
2. Voltage Monitor PCB fuses (2) are:
   Bel Fuse, Inc. Part NO. 5ST-125-R, Fuse, Glass 125mA, 250VAC 5x20mm

<table>
<thead>
<tr>
<th>Problem</th>
<th>Check</th>
<th>Try</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Heater LED does not come on and blink every second when program launched.</td>
<td>If the Green Heater LED does not come on during the power on self-test call for service.</td>
<td>Turn oven power switch off, then on again. If the 16 amp Mains Power circuit breaker is tripped reset it. If it trips again, call for service.</td>
</tr>
<tr>
<td>Yellow Alarm 1 LED lit constantly</td>
<td>Verify that the yellow Alarm 1 does not remain lit constantly after the power on self-test is completed. If it does, call for service.</td>
<td>Turn oven power switch off, then on again.</td>
</tr>
<tr>
<td>Red Alarm 2 LED lit constantly</td>
<td>If the Alarm 2 comes on again and stays on, call for service.</td>
<td>Turn oven power switch off, then on again.</td>
</tr>
<tr>
<td>Red Alarm 2 LED BLINKING (This occurs ANYTIME an Er 7 code is displayed on the temperature display. See Er_ codes table below.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Numeric Display when power turned on.</td>
<td>If the Heater, Alarm 1 &amp; Alarm 2 LEDs do not come on, then go off, call for service.</td>
<td>Turn oven power switch off, then on again.</td>
</tr>
<tr>
<td>No Numeric Display and no other LEDs lit when power turned on.</td>
<td>Button circuit breakers on back panel are pushed in. Check the building power source for tripped circuit breaker.</td>
<td>Turn oven power switch off, then on again.</td>
</tr>
<tr>
<td>Main Circuit Breaker Trips when program running</td>
<td>Fan filter clogged, fan not running. (fan in base of column)</td>
<td>Clean fan filter &amp; insure fan running.</td>
</tr>
<tr>
<td>Hood Temperature uncomfortably hot to the touch.</td>
<td>Upper fans (2) one or both not turning</td>
<td>Call for service.</td>
</tr>
<tr>
<td>“ER-X” Codes display in the digital numeric display.</td>
<td>Refer to the Error Code list below.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1 (Soft Error)</td>
<td>INVALID ENTRY ERROR: STAGE, HEAT RATE and TEMP lights flash</td>
<td>Occurs when the HEAT RATE is set to COOL but the TEMP of that stage is higher than the TEMP of the prior stage (should be heating). This will occur when a program is already running and a parameter was edited in process.</td>
</tr>
<tr>
<td>Er2</td>
<td>CALIBRATION ERROR</td>
<td>Only applies to Factory Calibration.</td>
</tr>
<tr>
<td>Er3</td>
<td>RESERVED</td>
<td>Reserved for future use.</td>
</tr>
<tr>
<td>Er4 (at Idle temp) OR Er8 (at High Temps)</td>
<td>OPEN THERMOCOUPL</td>
<td>Occurs if the thermocouple is open or the connecting wire(s) are broken or disconnected from the terminal board. If wiring is good, replace thermocouple. OR The thermocouple output signal becomes intermittent at elevated temperatures.</td>
</tr>
<tr>
<td>Er5</td>
<td>NO HEAT DETECTED/ POSSIBLE</td>
<td>The error will be detected 5 minutes after heating program started. This error will also occur if the program is started and the chamber door is kept open for 5 minutes or the Solid State Relay (SSR) is defective, the heater rods are defective or there is a problem with the main PC board.</td>
</tr>
<tr>
<td>Er6</td>
<td>REVERSED THERMOCOUPLE CONNECTION</td>
<td>Occurs if the thermocouple extension wires have been connected backwards to the terminals on the printed circuit board.</td>
</tr>
<tr>
<td>Er7</td>
<td>THERMAL RUNAWAY</td>
<td>Occurs when the temperature has exceeded 1600°C (2912°F) instantly or exceeded 1585°C (2885°F) for 1 minute.</td>
</tr>
<tr>
<td>Er8</td>
<td>High Temperature Thermocouple failure</td>
<td>Replace Thermocouple</td>
</tr>
<tr>
<td>Er9</td>
<td>Cavity Temperature Stall</td>
<td>Heaters have reached end of useful life, replace all 4 heater rods.</td>
</tr>
<tr>
<td>Er10</td>
<td>Check/Clean Cooling Fan Reminder</td>
<td>A slower than normal fan speed is detected indicating the fan filter may be blocked. It is still able to run a program, but the filter should be cleaned to restore optimum cooling. This error will display any time a program is started with a partially clogged filter. Pressing the Start/Stop button again will launch the program but the error will persist until the fan is no longer bogged down by a clogged filter.</td>
</tr>
<tr>
<td>Er11</td>
<td>Cooling Fan Lockout</td>
<td>A failed cooling fan or a serious filter blockage. Program running is prevented to prevent further damage to electronics.</td>
</tr>
<tr>
<td>Er12</td>
<td>Lift Error</td>
<td>Lift is either obstructed or did not reach travel limit sensor and lift motor timeout was reached Check for jammed table or sagger tray obstruction.</td>
</tr>
<tr>
<td>Er13</td>
<td>Temperature Calcuation Error</td>
<td>Possible power surge. Cycle power OFF/ON. If error returns contact Service.</td>
</tr>
</tbody>
</table>

**NOTE:** Continuous “Beeps” occur when the Error Code appears on the Main Display until the START/STOP button is depressed.
Routine Maintenance

Cleaning Instructions
It is the user’s responsibility not to use decontamination or cleaning agents that could cause a hazard as a result of a reaction with parts of the equipment or with material contained in it. In order to be sure that such a reaction will not occur, we recommend using only a damp cloth moistened with water to clean the furnace. Never clean the display window with a dry cloth or tissue. Always moisten the cleaning cloth with water before wiping the screen. Note: If hazardous material is spilled on or inside the furnace, contact Whip Mix Technical Support if there is any doubt how to safely remove the material.

Fan Filter Cleaning (Weekly)

Carefully remove the filter guard by unsnapping the guard to gain access to the cellular foam filter. Rinse the filter clean and dry it by blotting it on a paper towel. Slip the filter foam back inside the guard and press the guard back in place. An alternative method is to vacuum the filter in place with the nozzle of a hand vacuum or shop vac.

An Er10 error code indicates the fan filter is clogged and the fan has slowed measurably. This error is a reminder to clean the filter and will not preclude operation but it will not stop showing up until full fan speed is restored. An Er11 error code indicates the fan has stopped turning. This error will inhibit further use of the oven until the cause is remedied.

CAUTION: DO NOT ALLOW THE FILTER TO BECOME CLOGGED WITH DUST OR THE CIRCUIT BREAKER CAN TRIP DUE TO THERMAL OVERLOAD. DO NOT DISCARD THE FILTER OR DUST CAN ENTER THE ELECTRONICS AND DAMAGE THEM.

Power Failure

1. If a power failure occurs, the SinterPro memorizes the conditions prior to the loss of power. When power returns, the SinterPro returns to the same point in the program.
2. When power is returned, the HR:MIN light flashes indicating that a power failure has occurred. It continues to flash until START / STOP is pressed.

NOTE: The HR:MIN light flashes if the power switch is turned off and on while a program is running and START / STOP was not pressed. It will not flash if the power switch was turned off or a power failure occurred when the PROGRAM READY light was on.

Service

CAUTION: The SinterPro Sintering Furnace should be serviced only by qualified service technicians. Be sure to unplug the power cord and wait for the furnace to cool before performing any service operation. For help with operating or servicing your Whip Mix equipment, please call Whip Mix any time between 8:00 a.m. and 5:00 p.m. Eastern time.

Toll Free 1–800–626–5651
Local 1–502–637–1451
FAX 1–502–634–4512
Lift Preventative Maintenance

As part of the preventative maintenance, it is recommended to lubricate the lift mechanism every six months or as necessary for smooth functioning of the lift. Use of Lubriplate "FGL-2 "grade lubricant or equivalent is highly recommended in servicing the lift. Following are the steps to service the lift.

1. Raise or lower the lift platform to the fully up or down position respectively via the front panel buttons before turning off the oven. Remove all mains power from the oven, and unplug the mains power cord for safety.

2. Rotate the furnace so that the back of the chassis is facing you and leave sufficient space for the bottom rear panel to lay flat.

3. Remove the rear top cover panel with a phillips screwdriver leaving the third row of screws (one on each side) from the top, intact. The third row of screws need not be removed to remove the top cover panel.

4. Then remove the rear bottom cover panel with phillips screw driver and lay the panel carefully on the surface without disturbing the electrical wire connections.

5. Using an 11/32" nut driver, remove six nuts in the locations as shown in the above figure.

6. While applying downwards pressure on the EMI shield, pull it out slowly without catching any electrical wires. It is recommended to turn the shield sideways as shown in the above figure for easy removal.

7. Clean the lead screw where ever needed, with lint free rag to remove any dust.
8. Apply recommended lubricant as necessary to the rail guides and the lead screw along its length as shown in below figure.

9. Turn the coupler manually to move the lift up and down to spread the lubricant, repeat step 8 if necessary.

10. Replace the EMI shield back to its position. First, locate the bottom left hole of the shield on to the mating stud, ensuring the edge of the shield sits on the wire loop. Then locate the remaining holes of the shield to the corresponding studs with downward pressure on the shield for ease of assembly. Ensure the electrical wire connections are not disturbed.

11. Secure the shield with nuts using the nut driver.

12. Replace the rear bottom cover panel first ensuring all the wires are inside the unit without any risk of pinching the wires while securing the panel with screws.

13. Replace the rear top cover panel and secure it with screws.

14. Power on the unit and move the lift up and down few times to spread the lubricant and verify lift functionality.
Replacement Of Heating Elements

**WARNING:** BEFORE ATTEMPTING ANY OF THE SERVICE PROCEDURES IN THIS SECTION, BE SURE TO TURN OFF THE OVEN POWER SWITCH AND DISCONNECT THE OVEN FROM THE WALL POWER, OR LOCKOUT AND TAG THE WALL CIRCUIT BREAKER SO THE OVEN CANNOT BE POWERED DURING THE SERVICING.

1. Lower the lift platform to the fully down position.
2. Remove all Mains Power from the oven, and unplug the Mains Power cord for safety.
3. Remove the top panel with a Philips head screwdriver.
4. Two 7/16” box end wrenches are required to remove the bolts fastening the Heater Element electrical straps.
5. Unplug the two leads connecting the heater wires to the square white panel on the chassis by grasping them and gently pulling towards the front of the oven. They will slide about an inch before disengaging.
6. Remove all six (6) 7/16” bolts interconnecting the four heater elements. This will require a second 7/16” wrench on the underside to provide resistance against the wrench on the upper side.

**CAUTION:** Do not allow the wrenches to rotate such that undue strain is placed on the Heating Element, especially when installing the new Heating Elements.

7. Once the bolts have been removed, and each individual element is free, grasp the white ceramic insulator and begin raising the Heating Element vertically out of the roof of the Muffle. Take care not to tilt the element off of vertical or the insulation may chip away.
8. Withdraw all four elements and set them aside.
9. Unwrap all four of the replacement elements.
10. CAREFULLY lower each element into the hole in the roof of the Muffle.

**CAUTION:** UNDER NO CIRCUMSTANCES ATTEMPT TO ENERGIZE THE MUFFLE WITH ANY OF THE ELEMENTS NOT INSERTED FULLY!

11. After the four elements have been inserted and seated fully, replace the electrical hardware you removed in step number 5. Make sure there is a **LOCK WASHER BETWEEN THE STRAPS**, then place a lock-washer on the bolt, then the nut, and tighten securely, taking care not to twist the elements by tugging on the electrical straps. Make the connections between the middle element and the end elements first, then finish with attaching the end element straps. **Plug the two electrical pins back into the jacks on the chassis and push them all the way in.**

12. Form the loops of the straps with your fingers away from the center of the ends so that there is maximum clearance between the straps. Check to make sure there are no loose strands bridging the two straps.
13. Re-mount the top cover.
14. Power the Oven on.
15. Verify that the Power On Self-Test sequence executed correctly.
   a. The green Heater LED comes on for 1 second, then goes off.
   b. The yellow Alarm1 LED comes on for 1 second, then goes off.
   c. The red Alarm2 LED come on for 1 second, then goes off.
   d. The distinctive “thump” of the Muffle Safety contactor is heard 1 second after the red LED goes off.

16. Run a test cycle without anything in the Muffle to verify normal operation. You may detect an odor during the first cycle which is due to the new Heater Elements “breaking-in”. The odor should be gone by the second or third cycle, and will not return.

**NOTE:** CLEAR, THIN, GLASS “SOAP BUBBLES” MAY APPEAR ON THE HEATING ELEMENTS FOR THE FIRST FEW WEEKS OF OPERATION. THIS IS AN ENTIRELY NORMAL AND EXPECTED PHENOMENON RESULTING FROM OXIDATION OF THE SILICON CARBIDE ELEMENTS. THE BUBBLES RESULT FROM SMALL QUANTITIES OF CARBON DIOXIDE GAS WHICH IS NON-TOXIC AND NON-REACTIVE WITH ZIRCONIA.

**NOTE:** You may get a “rotten egg” smell and even notice a slight bit of grey smoke the first time the heaters are fired. This is NORMAL, and will disappear after the first firing. It is recommended that you run a complete sintering cycle with nothing in the muffle to allow the heater rods to outgas fully.
Replacement Of Thermocouple

**WARNING:** BEFORE ATTEMPTING ANY OF THE SERVICE PROCEDURES IN THIS SECTION, BE SURE TO TURN OFF THE FURNACE POWER VIA THE POWER SWITCH AND DISCONNECT THE FURNACE FROM THE WALL POWER. ENSURE THE FURNACE IS COOL ENOUGH FOR SAFE HANDLING.

1. Rotate the furnace so that the back of the chassis is facing you.
2. Remove the top rear cover plate and bottom rear cover plate with a Phillips screwdriver.
3. Follow the grey cable attached to the thermocouple downward until you reach a green connector on the logic circuit board. Gently pull on the connector away from the circuit card until it disconnects.

4. The thermocouple is recessed inside a 1.6” (4 cm) hole at about eye height. (see photo)

5. Remove the retainer nut at the 12 o’clock position with a nut driver.
6. With the clip held in place using a small screw driver through the clip hole, remove the thermocouple from the muffle towards you. **It is extremely important to hold the clip through the clip hole with a small screw driver at all times during removal or installation of thermocouple. If it is not held at all times during removal or installation of thermocouple, it will drop down to the bottom between the furnace walls.**

7. With the clip held in place using a small screw driver through the clip hole, insert the new thermocouple into the muffle by gently sliding it until the ceramic ring is down in contact with the muffle containment metal sleeve.
8. Replace the retaining nut at the 12 o’clock position. This nut does not have to be tightened more than just enough to retain the brown ring. Overtightening can cause the brown ring to crack when the muffle gets hot and expands.
9. Re-connect the green Thermocouple connector to the green female connector on the logic circuit board.
10. Replace all the back panels with the Phillips screws. Ensure no wires get pinched when re-attaching the lower back panel.
11. Power on the furnace.
12. The Temperature Display should read either “IDLE” or “LO” (<70°C / <158°F).
13. Start a cycle and verify that the Temperature display begins to climb within 3 – 4 minutes of start.
Replacement Of Logic PCB

WARNING: BEFORE ATTEMPTING ANY OF THE SERVICE PROCEDURES IN THIS SECTION BE SURE TO TURN OFF THE OVEN POWER VIA THE POWER SWITCH AND DISCONNECT THE OVEN FROM THE WALL POWER.

Logic PCB Replacement
Refer back to the System Wiring Diagram on page 25 for wiring cable references. The “W” number of the cable shows where both ends connect.

1. Remove all Power from the oven.
2. Rotate the oven so that you have access to the lower rear chassis panel.
3. Remove the lower rear panel with a Philips head screwdriver.
4. Tag all the electrical wiring to match the photograph above so that you know where to replace the cables.
5. Remove the four hex nuts affixing the logic PCB to the inside of the chassis.
6. Gently remove the PCB from the studs and set aside.
7. Place the new logic board back onto the same studs, replace the hex nuts, and tighten.
8. Re-install the cables.
9. Power up the oven and verify the Power On Self-Test executes properly as below;
   a. The green Heater LED comes on for 1 second, then goes off.
   b. The yellow Alarm1 LED comes on for 1 second, then goes off.
   c. The red Alarm2 LED come on for 1 second, then goes off.
   d. The distinctive “click” of the Muffle Safety contactor is heard 1 second after the red LED goes off.

Replacement Of Alarm PCB

WARNING: BEFORE ATTEMPTING ANY OF THE SERVICE PROCEDURES IN THIS SECTION BE SURE TO TURN OFF THE OVEN POWER VIA THE POWER SWITCH AND DISCONNECT THE OVEN FROM THE WALL POWER.

Alarm PCB Replacement
Refer back to the System Wiring Diagram on the page 25 for wiring cable references. The “W” number of the cable shows where both ends connect.

1. Remove all Power from the oven.
2. Remove the lower rear panel with a Philips head screwdriver.
3. Remove the four hex nuts affixing the alarm PCB to the inside of the chassis.
4. Gently remove the PCB from the studs, and set aside.
5. Place the new Alarm board back onto the same studs, replace the hex nuts, tighten.
6. Re-install the cables.
7. Power up the oven and verify the Power On Self-Test executes properly as below;
   a. The green Heater LED comes on for 1 second, then goes off.
   b. The yellow Alarm1 LED comes on for 1 second, then goes off.
   c. The red Alarm2 LED come on for 1 second, then goes off.
   d. The distinctive “thump” of the Muffle Safety contactor is heard 1 second after the red LED goes off.
Replacement Of Solid State Relay

1. Rotate the oven 180 degrees so that the back of the oven is facing you.
2. Remove the lower rear panel with a Philips head screwdriver.
3. Locate the Solid State Relay assembly as pictured below.
4. Label all of the wires with the numbers marked on the face of the black Solid State Relay BEFORE DISCONNECTING!
5. Remove the two mounting screws at the top and bottom of the Solid State Relay which fasten it to the black, finned, aluminum heat sink.
6. Insert a small straight-bladed screwdriver between the Solid State Relay and the black aluminum heat sink and gently pry the Solid State Relay loose from the heat sink.
   **HINT:** Use a paper towel or cloth in the hand supporting the Solid State Relay during the process to prevent getting any of the white thermally conductive coating on your hands or your clothes.
7. Once the old Solid State Relay is free in your hand, use a knife to scrape as much of the white thermally conductive coating off of the old Solid State Relay as possible, and transfer it to the new relay. Spread the white coating around evenly on the new Solid State Relay, then place it onto the heat sink and smear it around gently to force out air bubbles and insure good contact with the heat sink.
   **HINT:** You can let go of the Solid State Relay and the white coating will hold it in place.
8. Before re-installing the mounting screws, make sure the Solid State Relay is oriented exactly the way it was in the photo above.
9. Re-install the two Solid State Relay mounting screws and tighten securely.
10. Re-connect all the wires by matching up the tags on the wires with the marking numbers on the face of the Solid State Relay.
11. Replace the Back Panel on the oven. Make sure the 2 – 3 AMP button circuit breakers are depressed, in the active position. Rotate the oven 180 degrees to its operational position.
12. Reconnect the Power Cord to the wall plug.
13. Apply power to the oven via the Mains Power rocker switch, and verify that the Power On Self-Test does the following:
   a. The green Heater LED comes on for 1 second, then goes off.
   b. The yellow Alarm1 LED comes on for 1 second, then goes off.
   c. The red Alarm2 LED come on for 1 second, then goes off.
   d. The distinctive “click” of the Muffle Safety contactor is heard 1 second after the red LED goes off.
14. Make sure the Muffle lift platform is raised.
15. If the red Alarm2 LED does NOT go OFF after several seconds there is a problem with the wiring associated with the Solid State Relay. A few seconds afterwards you will hear a second “click” of the Muffle Safety contactor dropping back out to prevent un-commanded power from reaching the Muffle Heaters. Remove power from the unit, disconnect it from the wall, and repeat steps 1-3 above to re-inspect the wiring. If the wiring is as shown in the photo above, and all the connections are tight, there may be a secondary problem with the Alarm PCB attached to the front panel, or the new Solid State Relay may be defective.
Replacement Of Voltage Monitor PCB

WARNING: BEFORE ATTEMPTING ANY OF THE SERVICE PROCEDURES IN THIS SECTION BE SURE TO TURN OFF THE OVEN POWER VIA THE POWER SWITCH AND DISCONNECT THE OVEN FROM THE WALL POWER.

1. Remove both the top rear panel and the bottom rear panel to gain access to the chassis.
2. Disconnect all the connectors along the edge of the circuit board as shown in the photo below.
3. Remove the 2 screws.
4. Remove the circuit board and reverse the order of operations to re-assemble.
## Spare Parts List

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>96549</td>
<td>8oz Jar of 2mm sized Zirconia Sintering Beads</td>
</tr>
<tr>
<td>96531</td>
<td>Shallow Sintering Tray</td>
</tr>
<tr>
<td>96535</td>
<td>Deep Sintering Tray</td>
</tr>
<tr>
<td>96537</td>
<td>Sintering Tray Lid</td>
</tr>
<tr>
<td>96539</td>
<td>Sintering Tray Forceps</td>
</tr>
<tr>
<td>96555</td>
<td>Logic Board</td>
</tr>
<tr>
<td>96558</td>
<td>Alarm PCB</td>
</tr>
<tr>
<td>96560</td>
<td>Overlay</td>
</tr>
<tr>
<td>96562</td>
<td>Heating Elements Pkg 4</td>
</tr>
<tr>
<td>96563</td>
<td>Thermocouple - Type B</td>
</tr>
<tr>
<td>96565</td>
<td>Display PCB</td>
</tr>
<tr>
<td>96566</td>
<td>Power Supply</td>
</tr>
<tr>
<td>96567</td>
<td>Contactor</td>
</tr>
<tr>
<td>96568</td>
<td>Lower Column Fan Assy(4 Wires)</td>
</tr>
<tr>
<td>96564</td>
<td>Upper Column Fan Assy (2 Wires)</td>
</tr>
<tr>
<td>96569</td>
<td>Lift Motor</td>
</tr>
<tr>
<td>96570</td>
<td>Solid State Relay</td>
</tr>
<tr>
<td>96571</td>
<td>Fan Filter</td>
</tr>
<tr>
<td>96572</td>
<td>Firing Tray Insulation</td>
</tr>
<tr>
<td>96573</td>
<td>Firing Tray Refractory Cap</td>
</tr>
<tr>
<td>96540</td>
<td>Fuse, 4Amp, 250 Volt, Glass, 5 X 20 mm for DC Power Supply</td>
</tr>
<tr>
<td>96541</td>
<td>Fuse, 125 MA, 250 Volt, Glass, 5 X 20 mm for Volt Mon. PCB</td>
</tr>
<tr>
<td>96542</td>
<td>Fuse, 50 MA, 250 Volt, Ceramic, 5 X 20 mm for Alarm PCB</td>
</tr>
</tbody>
</table>

## Service

**CAUTION:** The SinterPro Sintering Furnace should be serviced only by qualified service technicians. Be sure to unplug the power cord and wait for the furnace to cool before performing any service operation. For help with operating or servicing your Whip Mix equipment, please call Whip Mix between 8:00 am and 5:00 pm Eastern time.

Toll Free (800) 626–5651  
Local (502) 637–1451  
FAX (502) 634–4512