INFINITY ZR SINTERING FURNACE

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INTRODUCTION

Thank you for purchasing an **Infinity ZR 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 Infinity ZR 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 floor section of the muffle are normal, and to be expected. They are a result of the hardening of the floor plate to stand up to the pressure of the sintering trays. Without this hardening the trays would dig into the buttery soft insulation and result in deep gouges and grooves, making it difficult to keep the trays level. The muffle has a multi-layer construction, and the layer underneath the floor plate is not hardened and will not crack. The hairline floor plate cracks will NOT affect the performance of the oven. The muffle carries a 1 year warranty with the exception of cracks in the floor plate.

ATTENTION USERS:
SAFETY INSTRUCTIONS
DO NOT ATTEMPT INTERNAL SERVICE

This symbol alerts the user that important Operating and Maintenance instructions have been included with the unit.
Read carefully to avoid any problems.
This symbol warns the user to use caution because the surface is hot.

Use of the Infinity ZR furnace not in conformance with the instructions specified in this manual may result in premature failure of the unit.

This symbol alerts the user that important Operating and Maintenance instructions have been included with the unit. Read carefully to avoid any problems.

WARNING: To prevent fire or electrical shock, do not expose this appliance to rain or moisture.

IMPORTANT NOTE:

The muffle insulation in your Infinity ZR 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 idle for more than a weekend you run the following drying cycle; a Rate Rise of 20 C/minute, Hold Temperature, 1550 C, Hold Time of 2 hours. This procedure will bake out any retained moisture in the insulation.

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.

WARNING: NEVER OPEN THE MUFFLE DOOR WHEN THE DISPLAYED TEMPERATURE IS ABOVE 200°C (394°F) OR SERIOUS BURNS OR INJURIES MAY RESULT. THE DOOR HAS AN ELECTRICAL INTERLOCK WHICH WILL PREVENT A SHOCK HAZARD BUT THE CONTENTS, THE HEATERS, AND THE INSULATION ALL RETAIN HEAT AFTER THE FIRING CYCLE HAS FINISHED.

CAUTION: THE TEMPERATURE DISPLAYED IS ACCURATE ABOVE 200°C (394°F). THE THERMOCOUPLE SIGNAL APPROACHES ZERO AT AROUND 200°C THEREFORE THE DISPLAYED TEMPERATURE IS UNRELIABLE *BELOW* 200° C (394°F). NEVER INSERT OR RETRIEVE WORK WITH A BARE HAND. ALWAYS USE THE SAGGER PLACEMENT TOOL TO INSERT OR RETRIEVE SAGGER WORK TRAYS OR BURNS MAY RESULT.

WARNING: WHENEVER THE MUFFLE DOOR IS OPEN, SWING IT ALL THE WAY OPEN TO THE LIMITS OF ITS TRAVEL TO PREVENT ACCIDENTAL CONTACT WITH THE INTERIOR WHITE DOOR INSULATION.

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.

(The bubbles may be removed easily with a 1" wide paint brush only when the oven elements are at room temperature. A gentle swipe using strokes parallel to the element is all that is needed to remove the bubbles. The glass debris may then be swept out with the brush or carefully vacuumed out with a portable vac.)

NOTE: The use of acid based stains can react with the heater elements and shorten their life.

SPECIFICATIONS

Electrical Power Requirements: 208-230V 50/60Hz Single Phase, 40 Amps, 9200W

Overall Dimensions
18" W x 16.5" D x 29" H
(73.7cm x 45.7cm x 42cm)

Heating Chamber Dimensions:
6.0" W x 8.36" D x 6.0" H
(15.24 cm x 21.25 cm x 15.24 cm) (4.93 Litre)

Oven Weight: 106 Lbs. 48.0 Kg

Shipping Weight: 145 Lbs. (65.8 kg)

Maximum Temperature: 1550°C (2822°F)

Number of Programs: 30

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

DELAY START: 0 – 4.0 hours

HVAC Load: 31,320 BTU/Hour

HEAT RATE*
1 – 104°F/min. (1 – 40°C/min.)

TEMPERATURE
Stage 1,2,3,4: 150°F – 2822°F (66°C – 1550°C*)

HOLD TIME: 0 – 4 hours on each Stage
* Programmable heat rates. Actual heat rate at high temperatures may be lower depending upon furnace load and electrical voltage.

ENVIRONMENTAL CONDITIONS
- Indoor use
- Altitude up to 2000m
- Environmental Temperature 5°C to 40°C (41°F to 104°F)

• Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°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

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. Use a pallet jack to position the oven as near to the site of use as possible.
2. Remove the upper carton from the pallet.
3. Remove the four (4) shipping bolts securing the furnace to the pallet with a 1/2" box end wrench or ratchet. The bolt locations are accessible through the gaps in the pallet slats, and/or from the openings at each end of the pallet. Save the shipping bolts. Install the four 5/16" by ½" long filler bolts into the holes where the shipping bolts were originally.

PLACING THE FURNACE

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

1. Use a person on either side of the oven to lift the oven onto the work surface site. Grasp the oven by the square tubing on the bottom edge of the cabinet, DO NOT USE THE DOOR TO LIFT!!!

2. Place the oven on the work surface.

3. Locate the door lock key in the accessory box and unlock the door. Open the door by rotating the handle clockwise from the horizontal closed position to the vertical position. The door will now be free to open.

4. You will see a scalloped piece of cut foam inside the muffle cavity. Rotate one side of the foam from horizontal to vertical to disengage it from the heater elements, then gently withdraw it from the muffle cavity. Next remove the two outside foam strips between the

heater elements and the cavity side walls.

5. Locate the stainless steel door interlock pin in the accessory box. One end is smooth, and the other end is threaded.

6. There is a threaded hole in the bottom/outside corner of the inside flange of the door. Thread the stainless steel pin into this hole and rotate it all the way until the pin threads bottom out and you can no longer rotate it by hand. (This pin extends into the chassis to close a switch which prevents power from going to the heater elements whenever the door is opened).

   CAUTION: NEVER SLAM THE DOOR WHEN CLOSING IT. THE SUDDEN DECELERATION CAN CRACK THE CENTER SQUARE OF INSULATION ON THE DOOR AND EVENTUALLY CAUSE IT TO FALL OFF.

CONNECTING POWER TO THE FURNACE

1. The power plug furnished with your Infinity ZR may or may not match the receptacle you have in your facility/country. If it does not, have a licensed electrician replace it with a plug rated at 250 Volts AC and at least 40 AMPs. Also make sure that the plug bears an independent testing label (like UL) certification insignia. 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 0.027ohms, as determined by a licensed electrician.

2. Circuit Breakers protect circuitry from electrical overload.

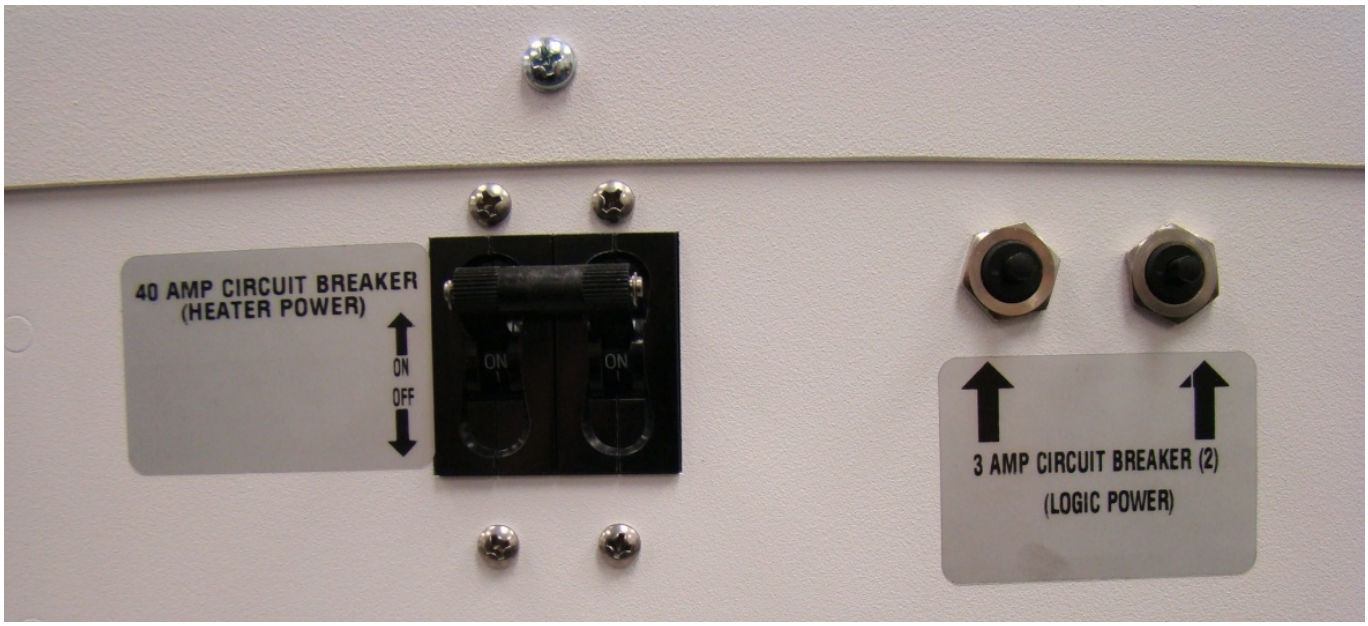
Logic Power (2ea): Black button will “pop out” if overload is present.
- To reset, wait one minute and push black button into body of circuit breaker.

Muffle Power (1ea): Dual Toggle Handle will point downward if overload is present.
- To reset, wait one minute and rotate handle upwards until the toggle latches in the up position.

BACK PANEL COMPONENT FAMILIARIZATION

1. 40 AMP Muffle Power Circuit Breaker.
2. 3 AMP Control Logic Circuit Breakers (2).
3. Mains Power Cord.

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



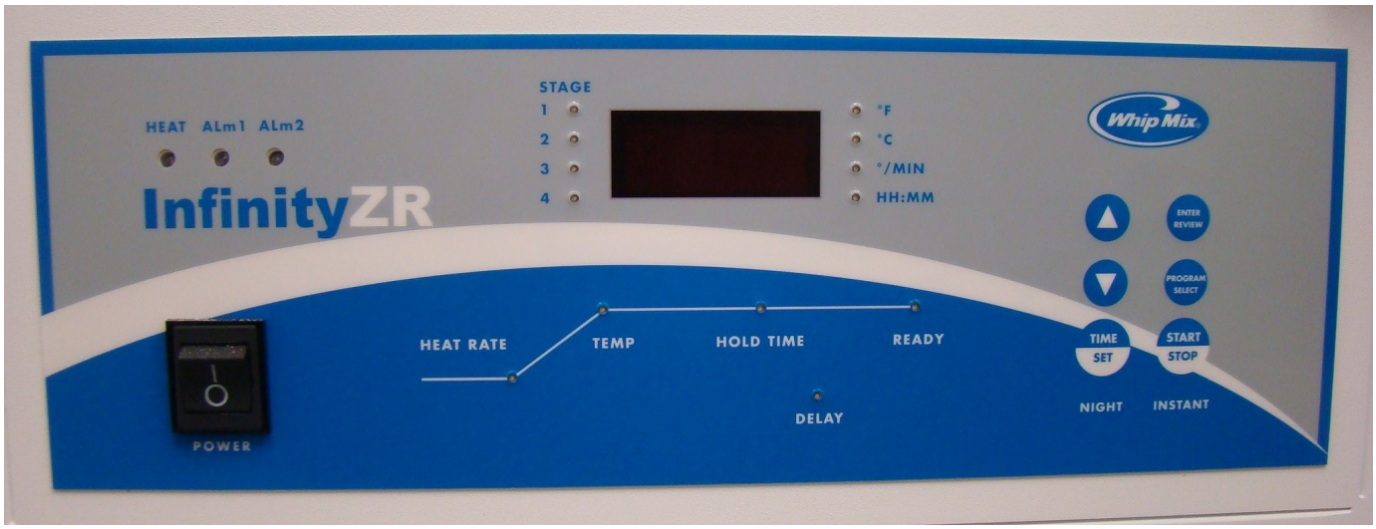
CAUTION:

ALWAYS DEACTIVATE ALL THREE CIRCUIT BREAKERS AND DISCONNECT THE MAINS CORD FROM THE POWER SOURCE BEFORE SERVICING THE OVEN.

IMPORTANT NOTE ON KILN FURNITURE PLACEMENT

A sintering tray, and lid, and tray liner bead sample are included with your Infinity ZR oven. There is an extra lid included as well. The purpose of the extra lid is to prevent the sintering tray(s) weight from sinking into the relatively soft muffle floor. Place the lid with the raised nibs facing the floor of the muffle. Locate it in the center so that there is equal spacing between the heater rods from side to side, and equal space to the heaters front to back. This lid is designed to be permanently left in the muffle and the indented circles in the top side of the lid will make placement of the work tray easy to be consistently placed every time you load the oven.

CONTROLS & INDICATOR FAMILIARIZATION



DISPLAY DESCRIPTION

1. 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.

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

2. **Start / Stop button:** Press to immediately start or stop a program.

3. Press the **Up Arrow** key to increase a number. The longer the button is pressed, the faster the numbers increase.

4. Press the **Down Arrow** key to decrease a number. The longer the button is pressed, the faster the numbers decrease.

5. **Enter / Review:** When programming or reviewing a program in process, press to advance to the next parameter.

6. **Program select:** Press to select a program or to review the program currently running.

7. **STAGE 1–2–3–4 indicator lights:** While programming, the number of active stages are illuminated.

8. **°F and °C** identifies the temperature scale.

9. **°/ MIN** identifies the heat rate.

10. **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.

11. **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.

12. **Program Status Graph** indicates status of the sintering process.

13. **Door Interlock Safety Switch** shuts off electrical power to the heating rod elements when the furnace door is opened.

POWERING ON THE FURNACE

Make sure the 40 Amp muffle power circuit breaker is in the upmost position. Make sure both 3 Amp button circuit breakers are fully pressed in.

Make sure the muffle door is closed and latched, and that the door handle is in the horizontal position. Depress the upper half of the rocker power switch with the "1" symbol on it.

The red numeric digital display should illuminate.

The green "Heater" LED should light for one second, followed by the yellow "Alarm 1" LED, followed by the red "Alarm 2" LED. A strong "thump" should be heard one second later; this is the muffle power safety contactor energizing.

IMPORTANT: YOU SHOULD HEAR THE COOLING FAN RUNNING WHENEVER THE OVEN IS POWERED ON. IF YOU DO NOT HEAR THE FAN (LOCATED BELOW THE MUFFLE HOUSING), CALL FOR SERVICE. DO NOT OPERATE THE OVEN UNLESS THE FAN IS RUNNING.

NOTE:
If the Furnace is in Idle Mode, 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 (Figure 1)
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. 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 Infinity is in the IDLE MODE – (no program us running).

2. Press the Up Arrow key and (while holding) press PROGRAM SELECT 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 idle mode, wait 7 seconds or press STOP / START twice.
(If STOP / START is pressed once, the current PROGRAM cycle starts.)

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.

1. Turn the power switch on.

2. Press PROGRAM SELECT. Use to display the desired program number (P1 – P30).

3. Press ENTER / REVIEW to select the displayed PROGRAM SELECT. STAGE 1 and DELAYED (START) lights turn on. Use the arrow keys to scroll 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 – 104°F / min (1°C – 40°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 2912°F (1600°C).

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. For one stage, the furnace must be programmed ***not*** to use STAGE 2, 3 or 4. Follow these steps
   A. After completing step 6, press ENTER / REVIEW.
   STAGE 1 light turns off, STAGE 2 and HEAT RATE lights turn on.

   B. Press Main Display shows ".....5, 4, 3, 2, 1, COOL, NO. " **Select "NO"** to program the furnace not to use STAGE 2, 3 or 4.

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.

SAMPLE ONE STAGE PROGRAM
(With Delayed Start)

	DELAY START	HEAT RATE	TEMP	HOLD TIME
STAGE 1	3:00	25°C (70°F)	1530°C (2786°F)	1:00
STAGE 2		**NO**	(n/a)	(n/a)
STAGE 3		**NO**	(n/a)	(n/a)
STAGE 4		**NO**	(n/a)	(n/a)

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

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 – 104°F / min (1°C – 40°C / min)**.
B. Select "COOL" to program the furnace to cool to a selected temperature.
C. Select "NO" to turn of 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. If you want the furnace to cool all the way back to ambient naturally and as rapidly as possible do not enter a COOL Stage.

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 maximum of 2822°F (1550°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. Main Display shows "....5,4,3,2,1, COOL, NO." **Select "NO" to program the furnace not to use STAGE 3 or 4.**

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.

SAMPLE TWO STAGE PROGRAM
(To start immediately)

	HEAT RATE	TEMP	HOLD TIME
STAGE 1	60°C (180°F)	1000°C (1832°F)	:10
STAGE 2	40°C (104°F)	1500°C (2732°F)	1:00
STAGE 3	**NO**	(n/a)	(n/a)
STAGE 4	**NO**	(n/a)	(n/a)

*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.

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 four heat rate choices. Choose one:

   A. Select heat rate between **1°F – 104°F /min (1°C – 40°C /min)**.

   B. Select "COOL" to program the furnace to cool to a selected temperature.

   C. Select "NO" to turn of 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 to the temperature required: heating temperature up to a maximum of 2822°F (1550°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 – 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 Main Display shows "....5,4,3,2,1, COOL, NO." **Select "NO" to program the furnace not to use STAGE 4.**

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, press DELAY button.

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.

SAMPLE THREE STAGE PROGRAM

(Program With Cooling)

	HEAT RATE	TEMP	HOLD TIME
STAGE 1	25°C (77°F)	1530°C (2786°F)	1:00
STAGE 2	25°C (77°F)*	1000°C (1832°F)	0:30
STAGE 3	NO	(n/a)	(n/a)
STAGE 4	NO	(n/a)	(n/a)

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.

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 four heat rate choices. Choose one:

   A. Select heat rate **between 1°F – 104°F/min (1°C – 40°C/min)**.
   B. Select “COOL” to program the furnace to cool to a selected temperature.
   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 maximum of 2822°F (1550°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 NIGHT / 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.

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 next to the Main Display.

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, if no other button is pressed, the DELAY START light turns off and the actual furnace temperature appears on the Main Display.

NOTE: STAGE 1 light is now on.

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 1appears 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 <u>program number</u> 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 individual parameter can be increased or decreased during the actual running of all 30 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 Infinity 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.

TROUBLESHOOTING

IMPORTANT: YOU SHOULD HEAR THE COOLING FAN RUNNING WHENEVER THE OVEN IS POWERED ON. IF YOU DO NOT HEAR THE FAN (LOCATED BELOW THE MUFFLE HOUSING) CALL FOR SERVICE. DO NOT OPERATE THE OVEN UNLESS THE FAN IS RUNNING.

Problem	Check	Try
Green Heater LED does not come on and blink every second when program launched.	If the Green Heater LED does not come on during the power on self-test call for service. If, after the power is turned on again you do not hear the thump of the muffle safety backup contactor check that the 40 amp muffle power circuit breaker on the back of the oven has not tripped.	Turn oven power switch off, then on again. If the 40 amp muffle power circuit breaker is tripped reset it. If it trips again, call for service.
Yellow Alarm 1 LED lit constantly	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.	Turn oven power switch off, then on again.
Red Alarm 2 LED lit constantly	If the Alarm 2 comes on again and stays on, call for service.	Turn oven power switch off, then on again.
Red Alarm 2 LED BLINKING (This occurs ANYTIME an Er _ code is displayed on the temperature display. See Er_ codes table		

below.)		
No Numeric Display when power turned on.	If the Heater, Alarm 1 & Alarm 2 LEDs do not come on, then go off, call for service.	Turn oven power switch off, then on again.
No Numeric Display and no other LEDs lit when power turned on.	Button circuit breakers on back panel are pushed in. Check the building power source for tripped circuit breaker (40 amp).	Turn oven power switch off, then on again.
"ER-X" Codes display in the digital numeric display.	Refer to the Error Code list below.	

NOTE: ANY TIME Er2 – Er7 CODES ARE DISPLAYED THE RED ALARM 2 LED SHOULD BE BLINKING SIGNIFYING THE MUFFLE POWER CONTACTOR HAS REMOVED THE POWER TO THE HEATERS. THE POWER WILL NOT BE RESTORED UNTIL THE ROOT CAUSE OF THE Er_ CODE HAS BEEN RESOLVED.

ERROR CODE	DESCRIPTION	PROBABLE CAUSE
Er1 (Soft Error)	INVALID ENTRY ERROR: STAGE, HEAT RATE and TEMP lights flash	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.
Er2	CALIBRATION ERROR	Only applies to Factory Calibration.
Er3	RESERVED	Reserved for future use.
Er4	OPEN THERMOCOUPLE	Occurs if the thermocouple is open or the connecting wire(s) are broken or disconnected from the terminal board.
Er5	MUFFLE CIRCUITE BREAKER OFF OR TRIPPED. OR REVERSED THERMOCOUPLE OR NO HEAT	Occurs if 40 AMP Muffle Power circuit breaker is OFF or TRIPPED. Occurs if the thermocouple extension wires have been connected backwards to the terminals on the printed circuit board. 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.
Er6	RESERVED	Reserved for future use.

Er7	THERMAL RUNAWAY	Occurs when the temperature has exceeded 1600 C (2912°F) instantly or exceeded 1585°C (2885°F) for 1 minute .

NOTE: Continuous "Beeps" occur when the Error Code appears on the Main Display until the START/STOP button is depressed.

ROUTINE MAINTENANCE

CLEANING INSTRUCTIONS
Clean exterior of oven only by wiping the unit with a damp cloth coated with a mild, non-abrasive cleaner.

DOOR ADJUSTMENT
The Muffle Door hinge friction can be adjusted to insure that the door does not swing closed on its own.

Make sure the oven has not been used in several hours and that the displayed temperature is "LO". Open the Muffle Door fully and locate the brass hex screw on the upper and lower hinge assembly pivot pins. If the door is swinging too freely, turn the hex screws clockwise a few degrees and test the tension on the door movement between each adjustment. This procedure may need to be repeated periodically as repeated door openings/closures may eventually wear down the brass hex screw.

POWER FAILURE

1. If a power failure occurs, the Infinity ZR memorizes the conditions prior to the loss of power. When the power returns, the Infinity ZR returns to the proper 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

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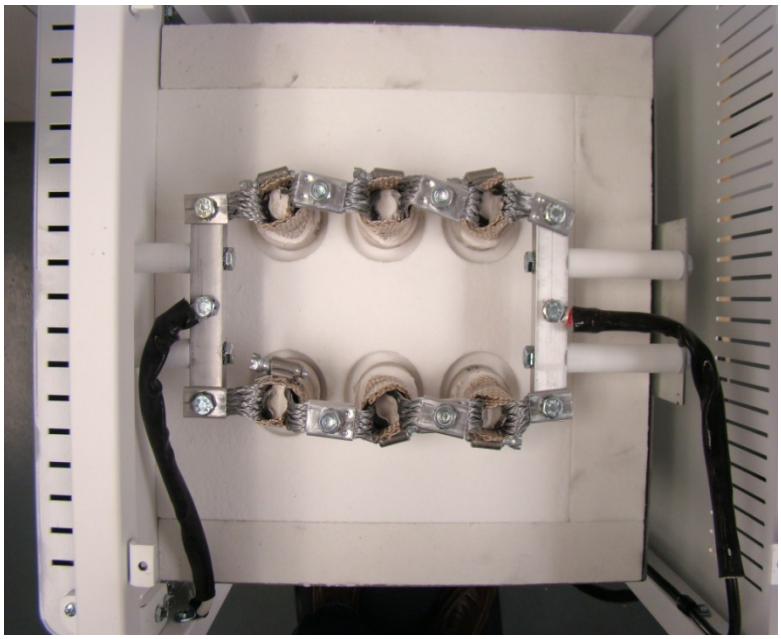
Toll Free 1–800–626–5651
Local 1–502–637–1451
FAX 1–502–634–4512

REPLACEMENT OF HEATING ELEMENTS

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



1. Remove all Mains Power from the oven, and manually trip the 40 AMP Muffle Power circuit breaker on the back of the oven for additional safety.

2. Remove the top panel with a Philips head screwdriver.

3. Two 7/16” box end wrenches are required to remove the bolts fastening the Heater Element electrical straps.

4. Rotate the oven on the counter or table so that the current bank being worked on is more accessible.

5. Remove all six (6) bolts on the current side. The far ends only require one wrench to remove the bolts from the aluminum buss bars. The bolts adjacent to the middle element in the bank require a second 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.

6. 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.

7. Withdraw all three (3) elements on the current side and set them aside.

8. Unwrap all the replacement elements and note the inked numeric marking on the side of the ceramic insulator. If all the elements have the same numeric value, then proceed to the next step. If the values are different, group them into banks of three (3) such that the numeric sum of the values of the elements is the same on both banks.

   EXAMPLE:
   The (6) elements have the following numeric markings; 28, 28, 28, 28, 32, 32.
   You would want to group them into groups of 3 as follows; 28, 28, 32 and 28, 28, 32. Put one grouping on one side, and the other grouping on the other side. You may have slightly different values than in the example, but just remember the point is to keep the sum of the values balanced if possible.

9. CAREFULLY lower each element into the hole in the roof of the Muffle. You may encounter a hard stop about 1-2 cm before the bottom of the white insulator is up against the top of the recess in the Muffle insulation. Gently tilt the element from side to side until the element tip finds the recessed well in the floor of the Muffle cavity. You may need to open the door of the Muffle and visually guide the tip into the well.

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

10. After the 3 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 to the aluminum buss bar.

11. **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.**

12. Rotate the oven 180 degrees and repeat steps 5 through 10 for the other bank of Heater Elements.

13. Re-mount the top cover, and reset the 40 AMP Muffle Power circuit breaker.

14. Rotate the oven to its normal working position and 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 a slight 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.

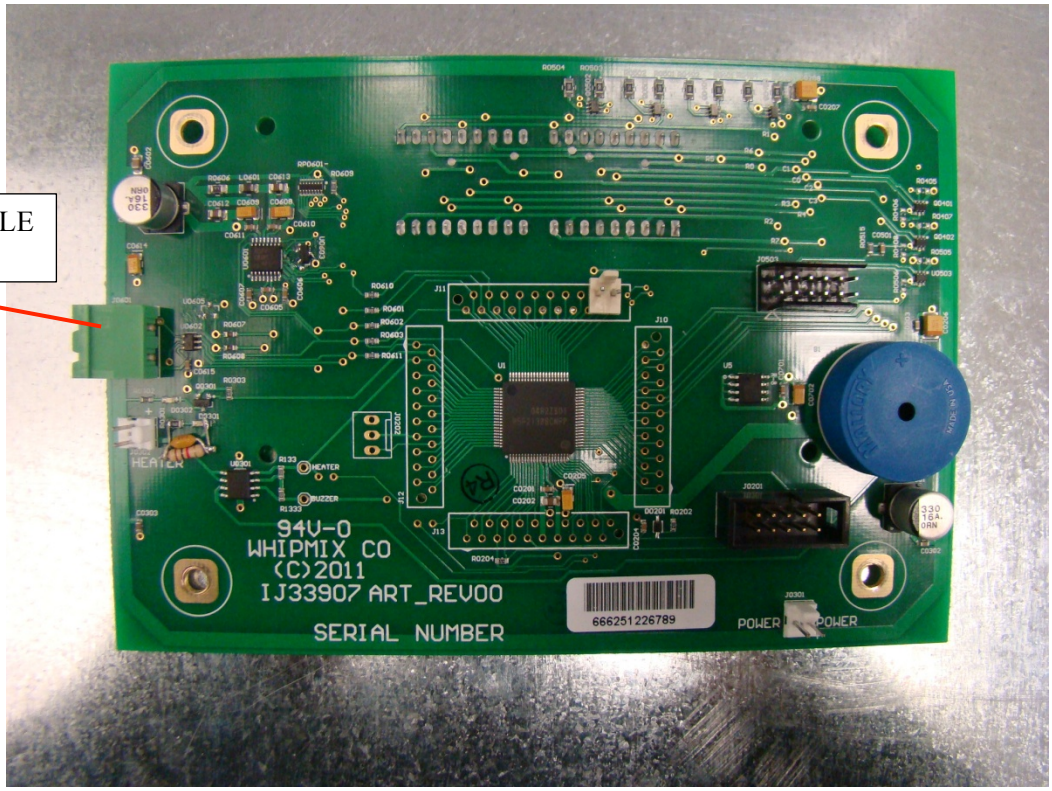
NOTE: CLEAR, THIN, GLASS "SOAP BUBBLES" MAY APPEAR ON THE HEATING ELEMENTS FOR THE FIRST FEW WEEKS OF OPERATION. THIS IS AN ENTIRELY NORMAL AND EXPECTED PHENOMENON RESULTING FROM OXIDATION OF THE SILICON CARBIDE ELEMENTS. THE BUBBLES RESULT FROM SMALL QUANTITIES OF CARBON DIOXIDE GAS WHICH IS NON-TOXIC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

(The bubbles may be removed easily with a 1" wide paint brush only when the oven elements are at room temperature. A gentle swipe using strokes parallel to the element is all that is needed to remove the bubbles. The glass debris may then be swept out with the brush or carefully vacuumed out with a portable vac.)

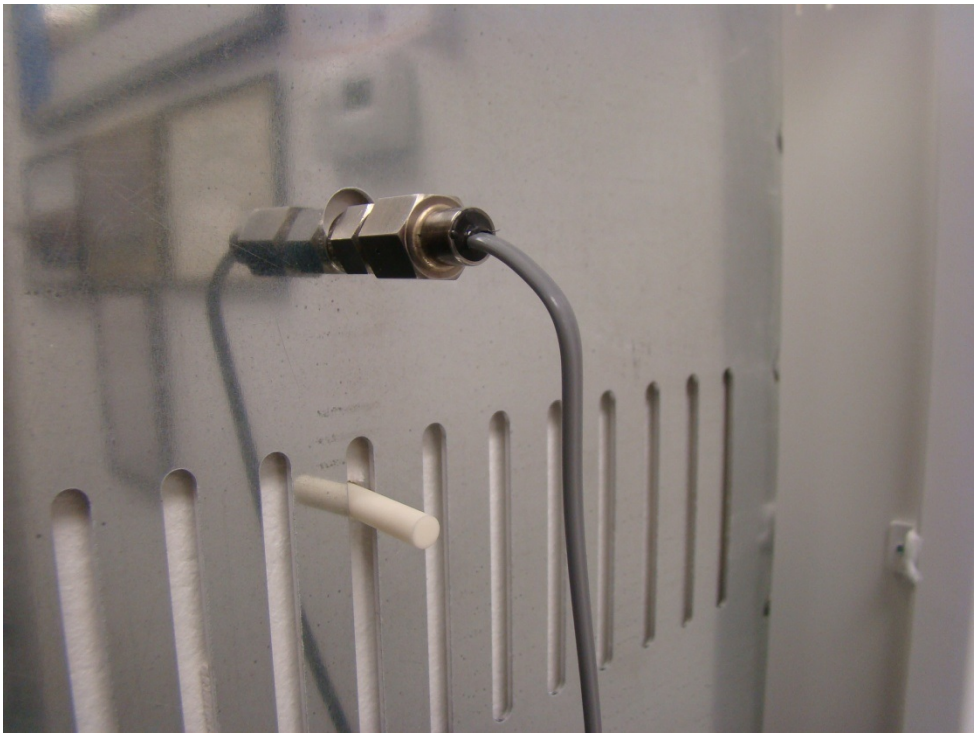
REPLACEMENT OF THERMOCOUPLE

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

1. Remove all Mains Power from the oven.
2. Remove the left side and back panels with a Philips head screwdriver.
3. Disconnect the Thermocouple cable from the green connector on the Logic pcb.



4. Remove the old Thermocouple from the rear of the muffle by gently sliding it out.



5. Insert the new Thermocouple into the rear of the muffle by gently sliding it in until you reach the tubing on the lead wire.

6. Re-connect the Thermocouple cable to the green connector on the Logic pcb.

7. Power on the oven.

8. The Temperature Display should read “LO” (<200°C / <392°F)

9. Start a cycle and verify that the Temperature display begins to climb within 1 minute of start.

10. Refer to the Temperature Calibration section to verify Temperature Calibration.

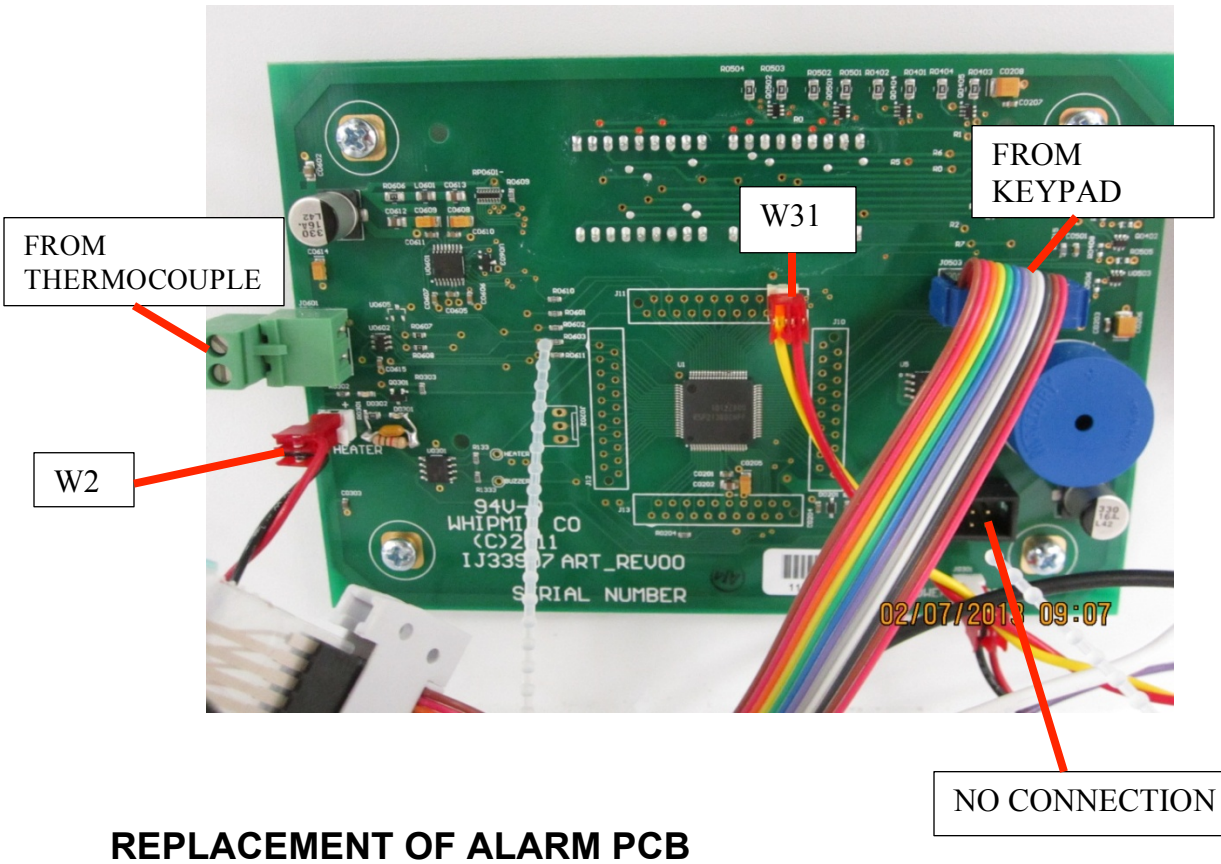
REPLACEMENT OF LOGIC PCB

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

Logic PCB Replacement

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

1. Remove all Mains Power from the oven.
2. Remove the right side panel with a Philips head screwdriver.
3. Tag all the electrical wiring to match the photograph above so that you know where to replace the cables.
4. Remove the four hex nuts affixing the logic pcb to the inside of the chassis.
5. Gently remove the pcb from the studs, and set aside.
6. Place the new logic board back onto the same studs, and replace the hex nuts, and tighten.
7. Re-install the cables.
8. 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.



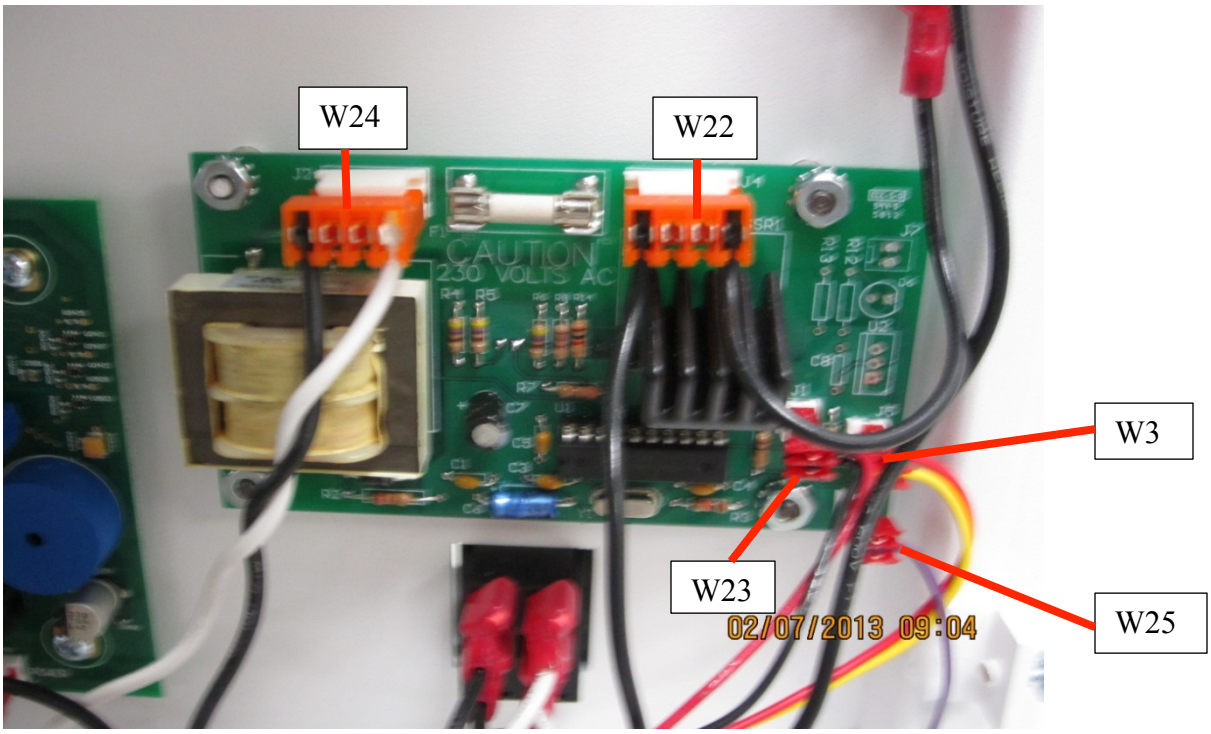
REPLACEMENT OF ALARM PCB

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

Alarm PCB Replacement

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

1. Remove all Mains Power from the oven.
2. Remove the left side panel with a Philips head screwdriver.
3. Remove the four hex nuts affixing the logic 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.

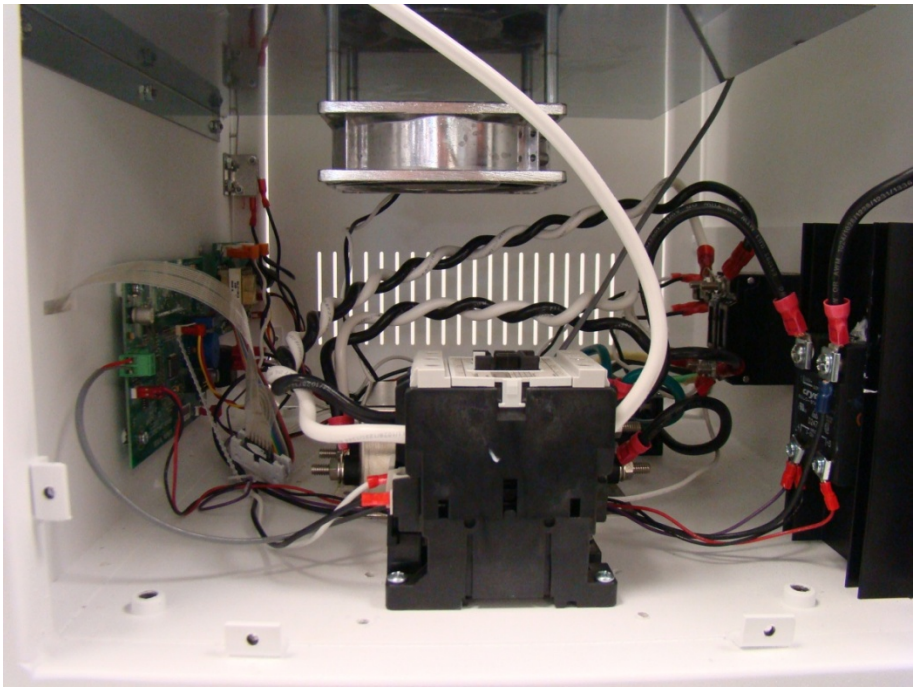


REPLACEMENT OF SOLID STATE RELAY

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

1. Rotate the oven 180 degrees so that the back of the oven is facing you.
2. Remove the back 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, and make sure the 1- 40 AMP circuit breaker is in the upwards, active position.

12. Rotate the oven 180 degrees to its operational position. Make sure the Muffle door is closed and latched.

13. Remove the Lockout and Tag from the wall Mains circuit breaker or reconnect the Mains Power Cord to the wall plug.

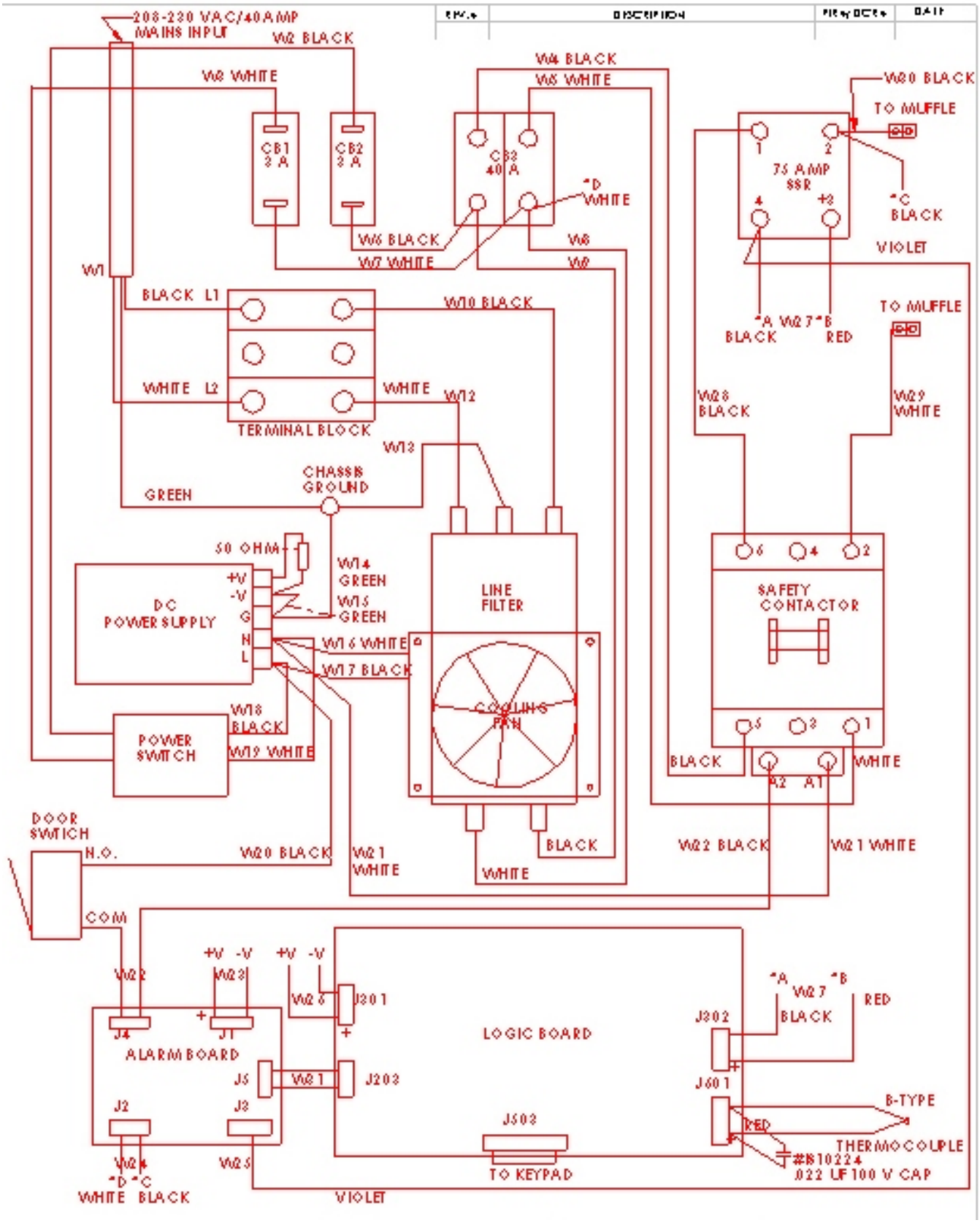
14. Apply power to the oven via the front panel rocker switch, and verify that the Power On Self-Test does the following:
    a. The green Heater LED comes on for 1 second, then goes off.
    b. The yellow Alarm1 LED comes on for 1 second, then goes off.
    c. The red Alarm2 LED come on for 1 second, then goes off.
    d. The distinctive “thump” of the Muffle Safety contactor is heard 1 second after the red LED goes off.

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 “thump” 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.

    For any additional help you may need with the Infinity ZR Furnace, contact Whip Mix Technical Support at the number below:

    (800) 626-5651

INFINITY ZR WIRING DIAGRAM



SPARE PARTS LIST

96501 - SINTERING BEADS 8OZ JAR
96502 - SINTERING TRAY W/LID
96503 - SINTERING TRAY SPATULA
96504 - #33907-U LOGIC BOARD
96505 - #10002 ALARM PCB
96506 - #10003 MUFFLE SOLID STATE RELAY
96507 - #116580 DOOR MICROSWITCH
96509 - #10060 OVERLAY
96510 - #10001 HEATING ELEMENTS PKG 6
96511 - #10013 THERMOCOUPLE - TYPE B

SERVICE

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NOTES:

1-800-626-5651
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