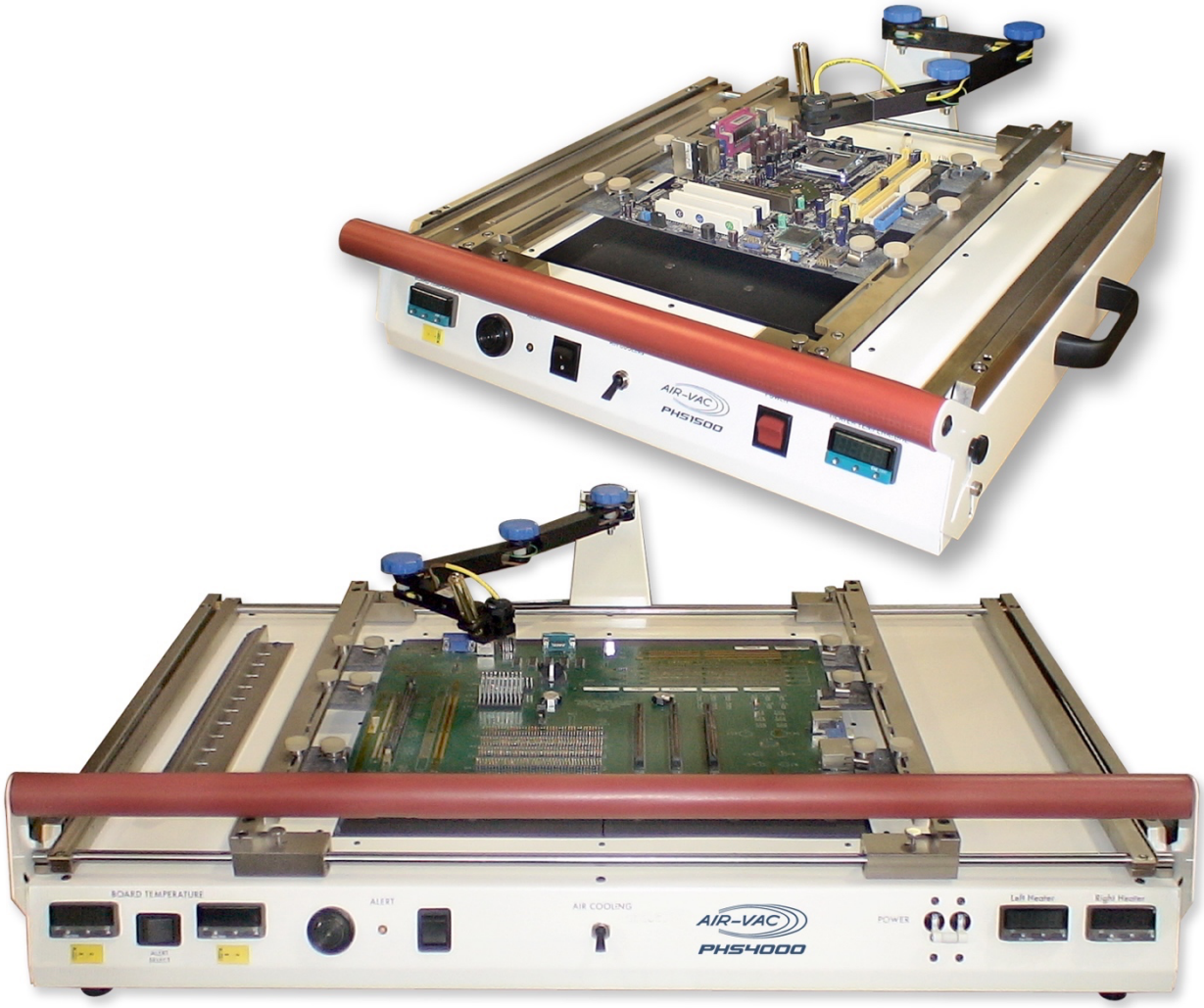
PHS1500/4000

Stand Alone Preheater

Users Guide 1029.00.902



Users Guide No. 1029.00.902 • Revision 4

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1 Introduction Overview

1.0 Contacts & Support

Air-Vac is always willing to assist our customers with any technical or operating questions. If you have any questions on machine parameters, options, procedures or maintenance, please do not hesitate to call.

Air-Vac Engineering Company, Inc.
30 Progress Avenue, Seymour, CT 06483
Tel: 203-888-9900 - Fax: 203-888-1145
http://www.air-vac-eng.com

Information: airvac@air-vac-eng.com

1.1 Warranty - General

Air-Vac Engineering Company warrants its equipment for a period of one (1) year from date of shipment on all parts and materials required to repair the system except for component parts that are considered "wear and tear" items that are warranted for ninety (90) days. These include, but are not limited to, heaters, belts, lights, vacuum cups and tubing.

Air-Vac agrees to repair or replace any or all such equipment that may prove to be defective within the warranty period, without expense, excluding shipping to the owner. This warranty shall not apply to any products that have been repaired or altered except by Air-Vac Engineering. Services under warranty shall not affect an extension of the warranty period, nor will a new warranty period be granted for the parts, which were replaced/repaired. The title of the replaced parts will automatically pass to Air-Vac.

Air-Vac reserves the right to reject replacement under this warranty where, in the sole opinion of Air-Vac, the defect is due to obvious misuse and/or improper maintenance of the module or any part thereof. The express and/or implied warranty of Air-Vac is limited to the replacement and/or repair of any item defective in material and/or workmanship. Other damages, if any, direct or consequential are expressly excluded from this warranty.

Air-Vac shall be liable under this warranty only if 1) Air-Vac receives notice during the appropriate warranty period (90 days or 1 year as applicable); 2) The products are operated in accordance with the supplied documentation; and 3) Such products are, to Air-Vac's satisfaction, determined to be defective.

When contacting Air-Vac for warranty inquiries, please provide the *Order Number that the parts were shipped, Model and Serial Number of the product and the Reason for Warranty.* Products cannot be returned to Air-Vac without authorization – please call for an RMA #.

1.2 Heater Limited Life Warranty

Air-Vac Engineering Company warrants the heaters for a period of ninety (90) days from date of shipment.

Air-Vac agrees to repair or replace any or all such equipment that may prove to be defective within the warranty period, without expense, excluding shipping to the owner. This warranty shall not apply to any products that have been repaired or altered except by Air-Vac Engineering. Services under warranty shall not affect an extension of the warranty period, nor will a new warranty period be granted for the parts, which were replaced/repaired. The title of the replaced parts will automatically pass to Air-Vac.

Air-Vac reserves the right to reject replacement under this warranty where, in the sole opinion of Air-Vac, the defect is due to obvious misuse and/or improper maintenance of the module or any part thereof.

> Heating element life is affected by several factors, temperature, airflow, condition of incoming air (water and oil contamination) and overall process cycle. These products are considered a "consumable" item. The length of useful service will vary based on the conditions under which they are run. Higher temperatures and/or lower flows will cause shortened life.

The express and/or implied warranty of Air-Vac is limited to the replacement and/or repair of any item defective in material and/or workmanship. Other damages, if any, direct or consequential are expressly excluded from this warranty.

Air-Vac shall be liable under this warranty only if 1) Air-Vac receives notice during the warranty period; 2) The products are operated in accordance with the supplied documentation; and 3) Such products are, to Air-Vac's satisfaction, determined to be defective.

When contacting Air-Vac for warranty inquiries, please provide the *Order Number that the parts were shipped, Model and Serial Number of the product and the Reason for Warranty.* Products cannot be returned to Air-Vac without authorization – please call for an RMA #.

1.3 Safety

The PHS Preheater was designed with safety of the operator in mind. The operation and maintenance of the system must be performed cautiously due to the nature of the hot surfaces, flux and molten solder involved in the assembly and rework of printed circuit cards.

NOTE:

WHEN OPERATING THE AIR-VAC PHS PREHEATER, FOLLOW ALL LOCAL CODES FOR SAFE OPERATION OF THE MACHINE. DISPOSAL OF MATERIALS USED IN THE PROCESSING OF PRINTED CIRCUIT BOARDS MUST BE DONE IN COMPLIANCE WITH EACH MANUFACTURERS RECOMMENDATION IN ACCORDANCE WITH LOCAL CODES.

Other safety items include:

- Operator safety warning labels and markings are employed.

1.3.1 Safety Instructions & Recommendations

Machines and tools of Air-Vac can only be used with maximum efficiency and safety by properly trained personnel.

Machine Operation

- All heated areas can be programmed to reach high temperatures. Use caution near heated surfaces including the heater surface, carrier components and boards being held in the carrier.
- Observe the legal and specific national regulations concerning accident prevention and protection of the environment.
- Observe the general safety regulations concerning working with solder and flux. Fume extraction should considered if required.

Caution: Operation of this module involves hot surfaces. All normal safety practices must be observed.

Personnel

- Safety glasses should be worn at all times. Wear protective gloves when working with solder. Solder contains tin and lead, which are hazardous materials.
- Place any waste solder or dross in a heat resistant dross container.
- Always wash hands after working with solder.
- Use caution if wearing loose clothing while operating this machine as loose clothing can contact hot surfaces or become caught on something. Always secure loose clothing before operating this equipment.
- Never eat, drink, or smoke while working on or near the machine.
- Only trained operators and technicians should work on this equipment.
- Molten solder and hot surfaces will cause severe burns. Use extreme caution when operating this equipment. Heat resistant gloves are recommended particularly when placing and removing boards from the carrier.
- Report any problem to supervisor.

Equipment

- Flux vapors result from soldering or desoldering. Fresh air must be provided. A venting system or fume extraction system is recommended.
- Keep all covers on. Do not open machine covers unless you are a qualified technician performing troubleshooting or maintenance.
- In the event of an emergency, turn off the red power switch located on the front of the machine. Locate this switch before operating this machine.
- Shut off electrical power and unplug machine when servicing any area of the machine.
- Refer to material safety data sheet of solder, flux, or any other product used in conjunction with the machine. Follow all warning labels and instructions.

Maintenance

- Only qualified personnel are allowed to work on the machine.
- As a basic rule, disconnect the main power before servicing the machine or when the machine is taken off line.
- Only use the tools for their defined purpose.

- Never remove or disable any safety feature or software.
- Make sure that all electrical devices are leakage current protected and are stored and used in dry, dust-free surroundings.
- The machine contains static sensitive devices. Use caution to avoid static discharge when handling machine parts.
- Use original spare parts only.

1.3.2 Additional Safety Precautions

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- Preheater surfaces can be hot and are marked with hot labels.
- Flux vapors can be hazardous to operators - fume extraction should be employed.
- Flux liquid is flammable and hazardous to operator health and safety.

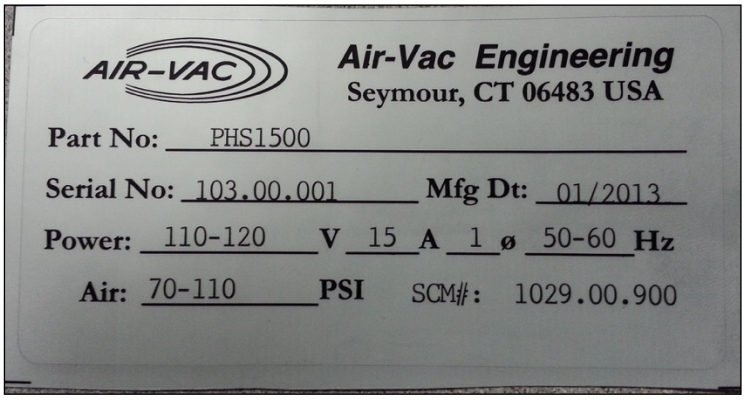
Handling of Hazardous Solder and Flux Products

AIR-VAC does not supply the solder or flux products with the PHS. The end user of the system should follow proper handling and disposal instructions for the materials as supplied by their vendors.

1.3.3 Label Description and Placement

The following placards are affixed to the PHS Preheater:

This label describes the electrical and air requirements for the system. The overall system requirements can be found in the facilities section of this manual. It is located in the rear of the machine.



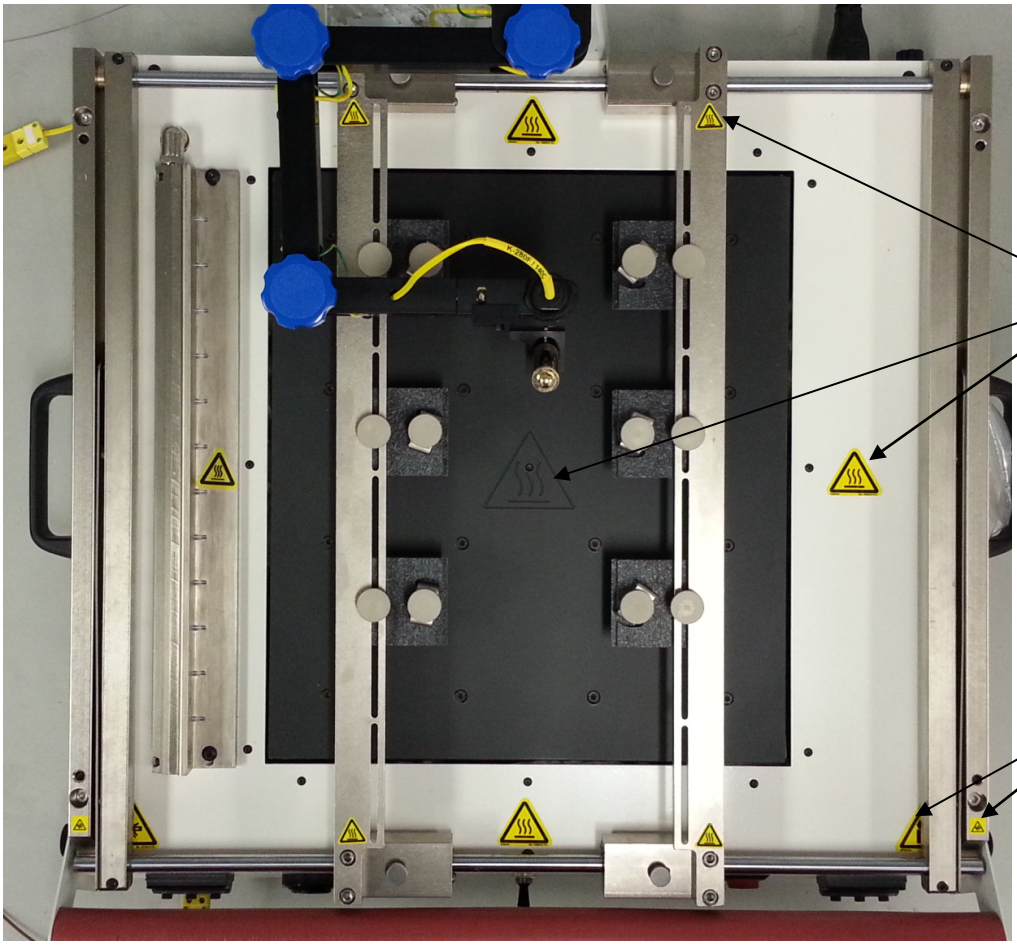
1.3.4 Machine warning labels

Label	*Indication*
	This label indicates hot surfaces well above 60 ^{0}C. The heater is required to reach temperatures well above 60 ^{0}C. Hot surface warning labels are found on the covers of each such heated surface as well as next to heated surfaces. Skin contact with these surfaces would result in a burn reaction and therefore presents an inherent potential thermal danger to the operators.
	This label indicates the presence of a Laser diode module with Laser class 2. Do not stare into the beam or reflections
	This label indicates the presence of an area that presents a pinch point hazard when motion occurs. Keep hands and all objects clear of this area.
CAUTION HIGH VOLTAGE **DISCONNECT POWER BEFORE OPENING**	High power warning labels advise personnel of potential shock issues when the machine covers are opened.

1.3.5 Warning Label Placement

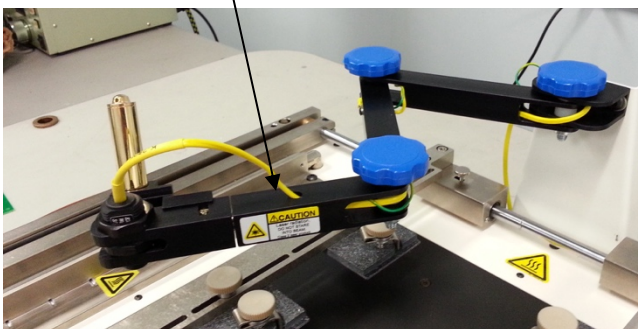
NOTE: PHS1500 shown (PHS4000 similar)

Hot surface and pinch point



High Voltage Warning

Laser Warning



2 Operation

2.0 Setup

2.0.1 Basic Setup

Remove any remaining packing material from the preheater. Insert the power cord into the receptacle in the rear panel (PHS1500 only).

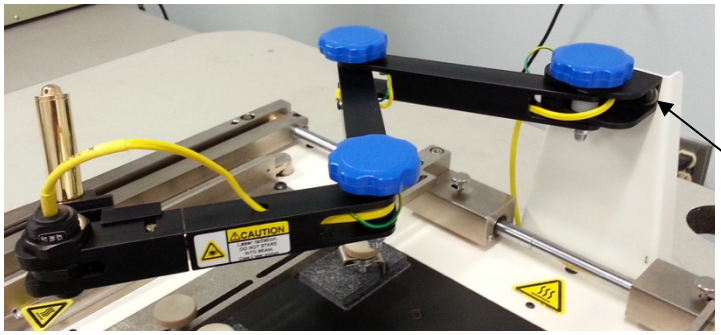
2.0.2 Cooling Option

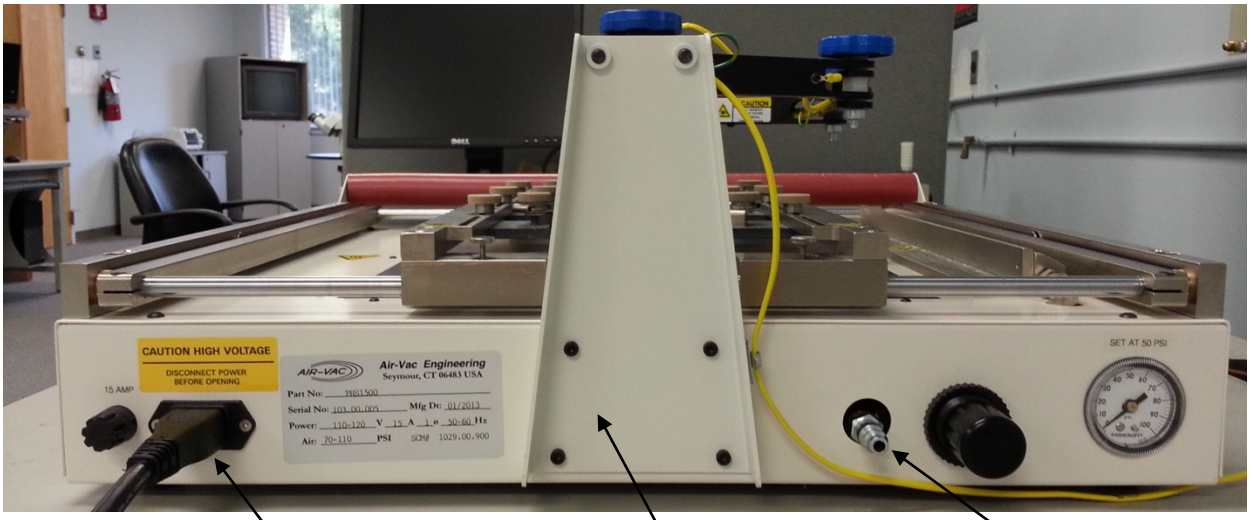
If the preheater is equipped with the optional cooling option, connect an air line to the fitting on the rear panel. This is a standard disconnect fitting. This should be supplied with 70-110 psi clean, dry air. Note the regulator will be set to a lower pressure and this is what you will see on the pressure gauge. The air cooling system typically runs at 50 psi.

2.0.3 IR Probe Option

After unpacking the preheater, if equipped with the IR Probe option, attach the mounting bracket to the rear of the preheater using the 4 screws provided. The IR Probe arm assembly attaches to the bracket with 2 screws. Connect the Thermocouple Extension Cable to the IR Probe cable and plug into the front panel jack

If supplied from the factory with this option an offset is programmed into the Board Temperature controller already. If not, see the Maintenance section for this.





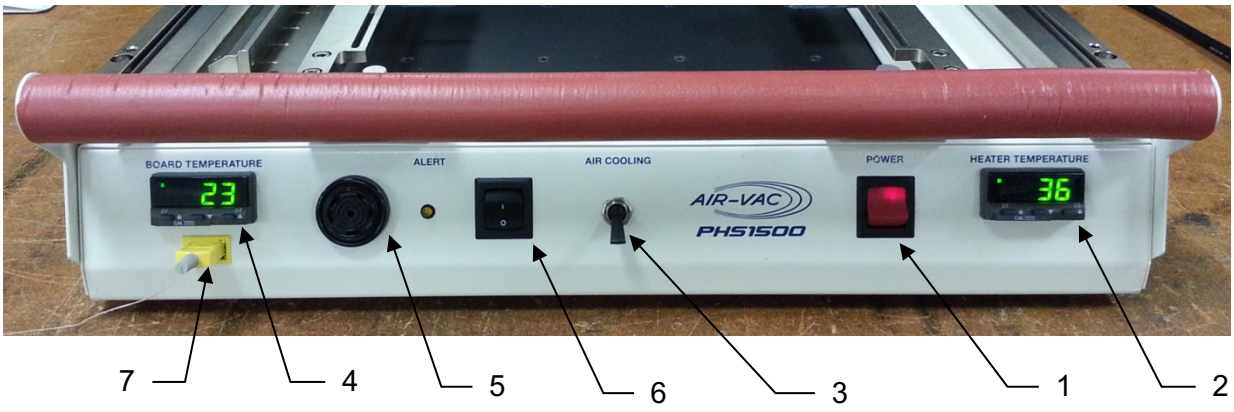
2.1 Operation

Warning: Hot surfaces are present during and after operation. Areas are marked by appropriate labels as noted above. Do not touch them or serious burns may result.

Caution: The preheater will heat up to and maintain the set temperature as long as the power switch is in the on position.

2.1.1 Controls

PHS1500



1 Power Switch / Indicator

2 Heater Temperature Controller

3 Air Cooling Switch

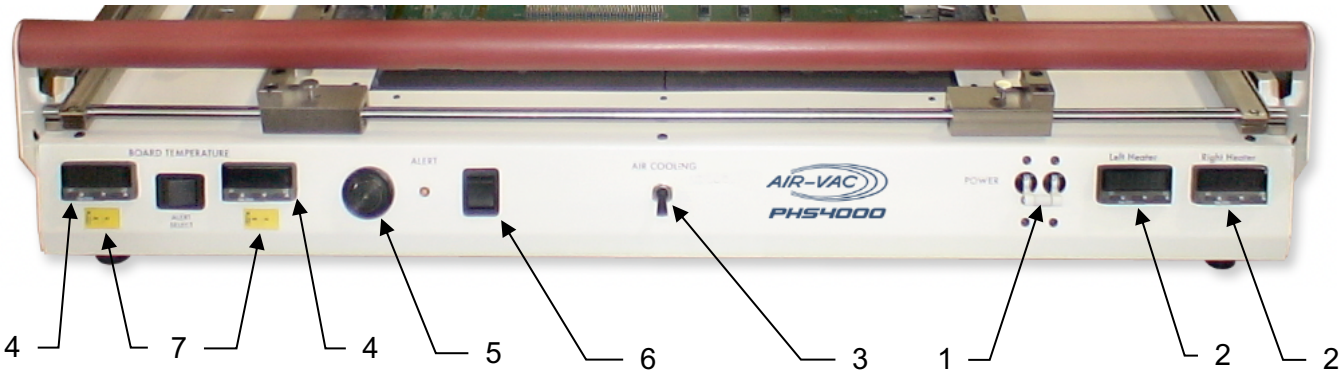
4 Board Temperature Display / Alert Controller

5 Temperature Alert Speaker / Indicator

6 Alert Speaker On-Off Switch

7 Board Temperature Thermocouple Jack (K type, mini plug)

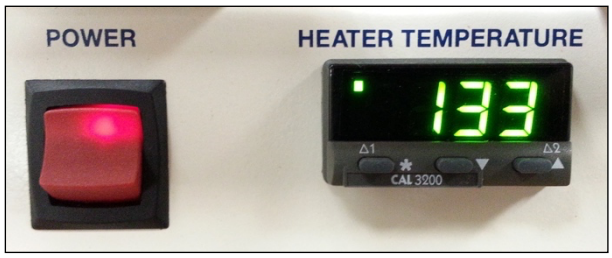
PHS4000

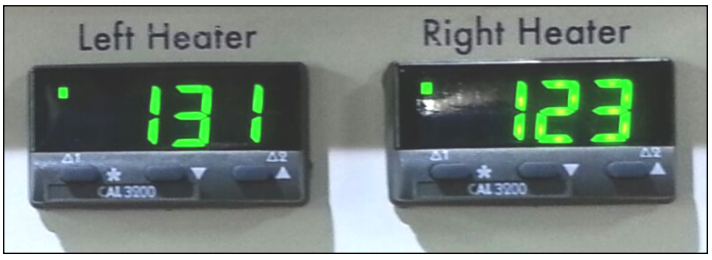


1 Power Switch
2 Heater Temperature Controllers
3 Air Cooling Switch
4 Board Temperature Display / Alert Controllers
5 Temperature Alert Speaker / Indicator
6 Alert Speaker On-Off Switch
7 Board Temperature Thermocouple Jacks (K type, mini plug)

2.1.2 Setting the Heater Setpoint

The temperature control displays and controls the temperature of the heater. The temperature displayed is the current temperature of the heater plate. Press and hold the star button to see the set point. While holding the star button, use the up and down arrows to set the desired set point temperature. Release the star button to return to normal operation and current temperature. The PHS1500 has a single heater temperature control. The PHS4000 has 2 heater temperature controls (for left and right heater plates).





2.1.3 Alert Operation

The Board Temperature Monitor has an alert function to advise the operator that the board has reached a desired temperature. The temperature is measured by either a K type thermocouple taped to the board or the optional IR Probe positioned over an appropriate area of the board.

The PHS1500 has a single Board Temperature Monitor.

The PHS4000 has two Board Temperature Monitors.

The temperature controller displays the temperature of the thermocouple input and controls the alert indicator / speaker. The temperature displayed is the current temperature of the monitoring thermocouple. The amber alert indicator will illuminate when the temperature of the sensor (thermocouple or IR probe) reaches or exceeds the set temperature. If the Alert Speaker switch is in the on position an audible tone will be sounded when the temperature is at or above the setting. This may be turned on or off at any time but the alert indicator will always be on when the temperature is at or above the set point.

On the PHS4000 an Alert Select switch allows the operator to select which of the 2 controllers drives the alert/safety feature.

To adjust the temperature for the alert tone / indication, press and hold the star button to see the set point. While holding the star button, use the up and down arrows to set the desired set point temperature. Release the star button to return to normal operation and current temperature.

When using the IR Probe option, an offset is required in the Board Temperature controller. See the maintenance section for more information on setting this. Do not switch between a regular thermocouple and the IR probe without setting the offset to the appropriate value.

2.1.4 PCB Temperature Safety Feature

If the IR probe or a taped on thermocouple is used to monitor the PCB temperature, the Board Temperature controller has a feature that shuts off the heater power once the thermocouple gets to the board temperature set point. While some oscillation of the board temp will occur, the feature is intended as a safety to prevent an unattended PCB from overheating significantly.

- The actual tone (if used) or the Alert LED are intended to tell the operator when to remove the PCB from the preheater once the programmed temperature has been reached.

- The preheater will not heat unless either a thermocouple or the optional IR Probe is plugged into the thermocouple port and the displayed temperature is below the board temperature setpoint.

Caution: Never leave a PCB in the preheater unattended as over heating and possible damage / fire could result.

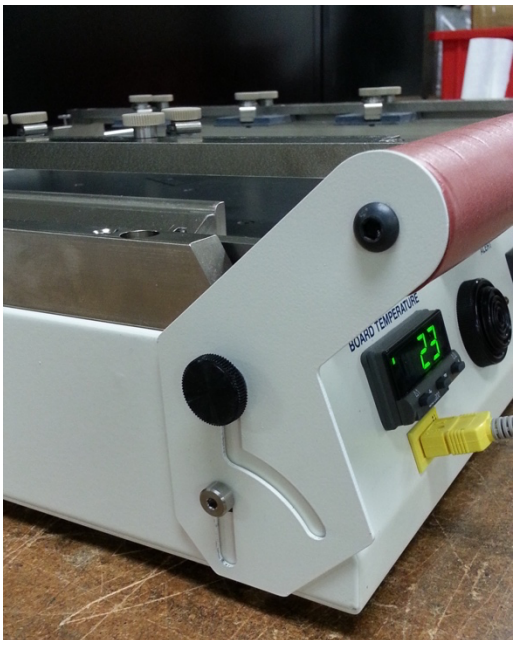
2.1.5 Cooling Operation

The Cooling option is an air knife that provides a blanket of cool air between the heater plate and the board being heated. To activate the cooling air, use the toggle switch on the front panel as required. The pressure to the air knife can be adjusted by the regulator on the rear of the preheater. It is initially set at the factory to 50 psi.

2.1.6 Use of the Arm Guard

The front arm guard is provided to help prevent operator's arms from contacting hot surfaces of the heater, enclosure or board being worked on. The arm has 2 positions. The forward most position is suitable when working an area close to the front of the preheater. This is also the lowest position. The rear position is a higher position and further rearward for when it is necessary to work on an area that is in the back of the board.

Front Position



Rear Position

To switch positions loosen the locking Knobs on both sides of the preheater. Once loose the Arm Guard assembly can be raised then rotated rearward. After positioning, tighten the locking knobs to prevent movement.

Caution: The arm guard should not be leaned on excessively. Its primary function is to help prevent accidental contact with hot surfaces if it is necessary to reach over the preheater. The operator is still responsible for being aware of risks of working with hot items and should behave accordingly.

2.1.7 Tip up Carrier

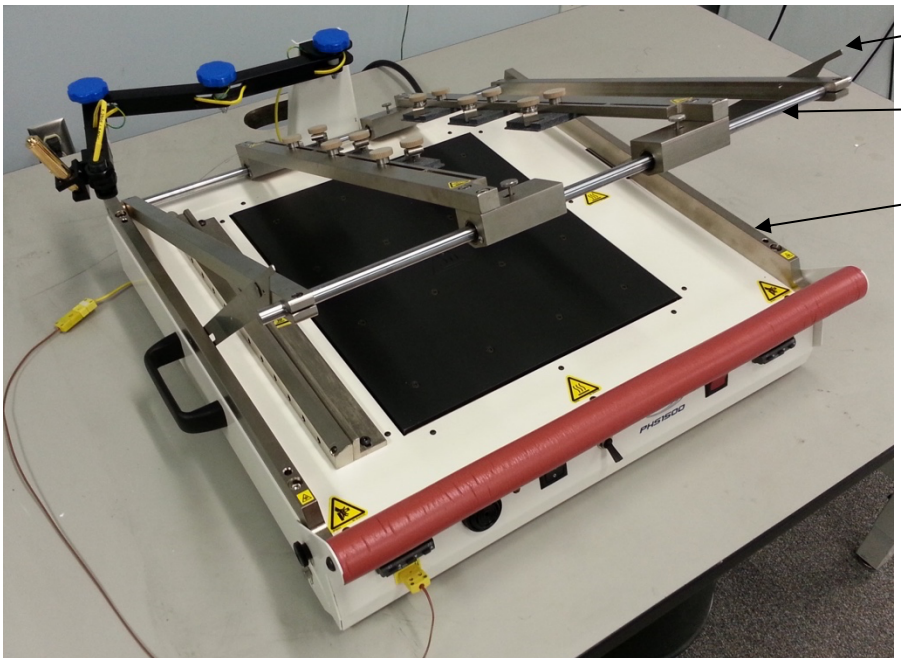
The Carrier is hinged in the back to allow the user to lift the front for placing the under board support on the preheater surface. If the carrier is lifted far enough, a set of locking arms engage to hold the carrier up.

Caution: Preheater surfaces and board supports can be extremely hot. Avoid contact and use appropriate tools to handle board supports. A board support handling stick is provided.

To lower the carrier, lift it slightly and press down on the lock arm tabs to disengage the locks.

Caution: When lowering the carrier grasp the inside of the front rail to remain clear of the carrier frame to avoid any potential pinch areas along the carrier frame.

Carrier in Up and Locked Position (PHS1500 shown)



Support Handling Stick

3 Maintenance

3.0 General

Warning: Hot surfaces are present during and after operation. Areas are marked by appropriate labels as noted above. Do not touch them or serious burns may result.

Caution: The preheater will heat up to and maintain the set temperature as long as the power switch is in the on position.

Warning: Electrical shock hazards exist inside the Preheater. Access this area only by an experienced technician and only after removing power and air connections.

Keep the equipment clean of debris and flux deposits with appropriate cleaners. Do not allow liquid to flow into the interior of the electrical enclosure thru and of the openings.

Do not scrub the heater plate with any abrasive material or device. Damage to the surface can result.

Clean the bearing rails and oil with a light machine oil as required to prevent sticking of the rail movement and rusting of the rails.

3.1 Setting the IR Probe Offset

Setting the offset for the IR Probe requires going into the programing of the CAL3200 controller. This should only have to be done during setting up the IR Probe initially and should be done only by appropriate personnel.

The manual for the CAL3200 is the source for the following notes and is the controlling document for the entire procedure. The notes below are for guidance in the procedure. The function that is being adjusted is a level 3 function called ZEro.

- To enter the programing mode, press and hold the up and down arrow keys for 3 seconds. The display will change to "tunE". To exit at any time press and hold the up/down keys for 3 seconds.
- Press and hold the down arrow to get to "LEVL"
- Release the key to display 1
- Press and hold * and use up arrow to advance to 3
- Release the * key
- Use the up (or down) key to move thru the functions on this level. Stop at "ZEro".
- Press and hold the * key and using the up/down keys set the number to 0 if using regular thermocouples and -70 if using the IR probe.
- Release the * key
- Press the up and down keys together and hold for 3 seconds to return to the operation mode.

4 Specifications - Schematics

4.0 Specifications

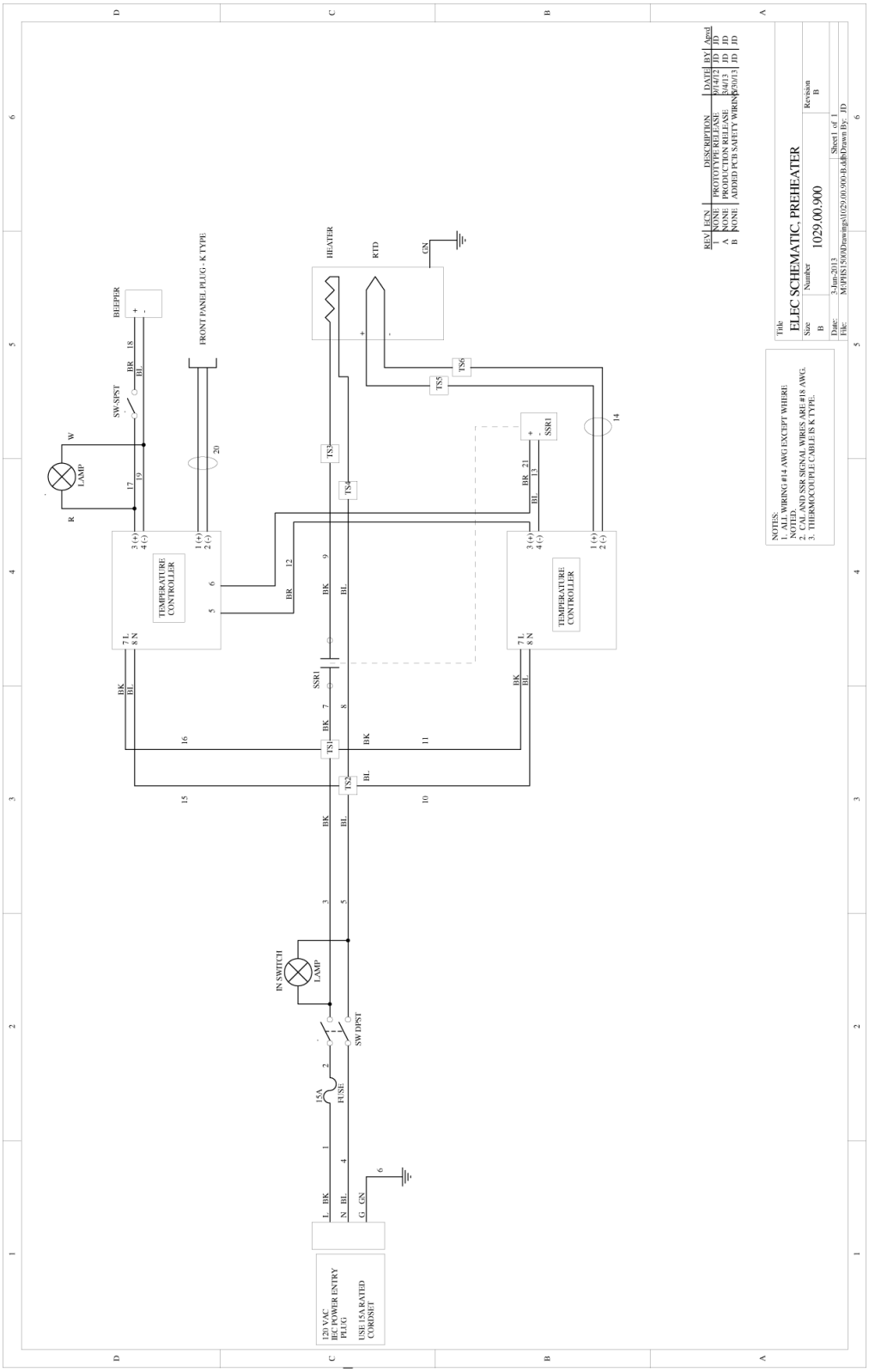
Model PHS1500

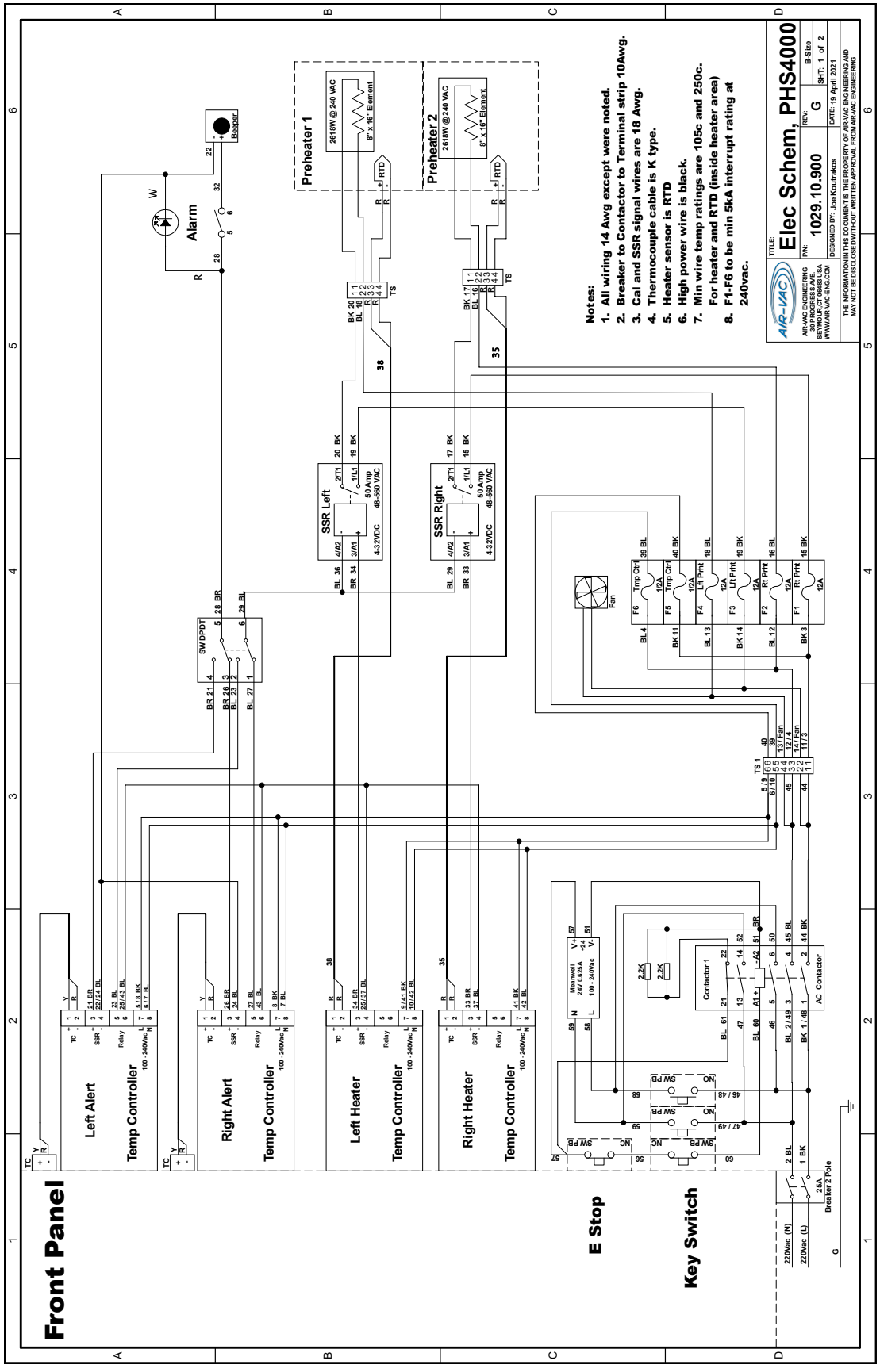
- **Dimensions:** 22"W x 21"D x 6"H
- **Maximum Board Size:** 13 3/8"W x 20"D
- **IR Preheater:** 12 1/4"W x 14"D
- **Temperature Range:** 50-260˚C
- **Electrical:** 1500 watts, 110 volts
- **Preheater Zones:** 1
- **Thermocouple Channels:** 1
- **Temperature Controllers:** 1

Model PHS4000

- **Dimensions:** 37"W x 23"D x 6"H
- **Maximum Board Size:** 22"W x 20"D
- **IR Preheater:** 24 1/2"W x 14"D
- **Temperature Range:** 50-325˚C
- **Electrical:** 4000 watts, 208 volts
- **Preheater Zones:** 2
- **Thermocouple Channels:** 2
- **Temperature Controllers:** 2

4.1 Schematics




Front Panel
Left Alert
Temp Controller
Right Alert
Temp Controller
Left Heater
Temp Controller
Right Heater
Temp Controller
Preheater 1
2618W @ 240 VAC
8" x 16" Element
Preheater 2
2618W @ 240 VAC
8" x 16" Element
SSR Left
50 Amp
48-660 VAC
4-32VDC
SSR Right
50 Amp
48-660 VAC
4-32VDC
Alarm
Beeper
SW DPDT
Fan
Manwell
24V @25A
100 - 240Vac
2.2K
2.2K
Contactor 1
AC Contactor
E Stop
Key Switch
220Vac (N)
220Vac (L)
25A
Breaker 2 Pole
Notes:
1. All wiring 14 Awg except were noted.
2. Breaker to Contactor to Terminal strip 10Awg.
3. Cal and SSR signal wires are 18 Awg.
4. Thermocouple cable is K type.
5. Heater sensor is RTD
6. High power wire is black.
7. Min wire temp ratings are 105c and 250c.
For heater and RTD (inside heater area)
8. F1-F6 to be min 5kA interrupt rating at 240vac.
TITLE:
Elec Schem, PHS4000
AIR-VAC ENGINEERING
30 PROGRESS AVE.
SEYMOUR,CT 06483 USA
WWW.AIR-VAC-ENG.COM
P/N: 1029.10.900
REV: G
B-Size
SHT: 1 of 2
DESIGNED BY: Joe Koutrakos
DATE: 19 April 2021
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