HEI-IR860
SMD/BGA Rework System

Operating Manual

Thank you for choosing the HEI-IR860 Solderlight. This appliance is specially designed for SMD/BGA rework and also very convenient for re-balling smaller BGA components. When used in conjunction with our Infra-Red Preheater, the system will achieve remarkable improvements in quality and efficiency of SMD/BGA rework operations.

Please read this manual carefully to maximize the advantages of using your new SMD/BGA rework system and keep this manual readily accessible for reference.

CATALOGE

INTRODUCTION

⚠ WARNING / CAUTION

⚡ ELECTRICAL SHOCK HAZARD

Warning and caution symbols are positioned at critical points in the manual to draw the user's attention to significant safety concerns. Be sure to comply with the following warnings and cautions for your safety.

1. Ensure the voltage rating of the unit and your power supply are identical prior to use.
2. Check carefully for any damage that may have occurred during transportation.
3. Put the products on a safe and stable working table. Table surface should consist of fire and heat resistant material due to the unit reaching very high temperatures that can be very dangerous.
4. During operation, the heater is extremely hot, and will cause serious burns if contact with skin occurs. Use gloves and/or any heat resistant tools to pick up the PCB assembly to eliminate the possibility of burns.
5. Do not use the product near combustible gases or flammable materials.
6. Turn the power switch OFF and allow the heater to cool before checking or replacing heater and other parts, or prior to storing the unit.
7. Keep the appliance clean; especially the quartz heater. This may be used with a damp cloth using a small amount of liquid detergent.   Never submerse the unit in liquid or allow any liquid to enter the station. Never use any solvent to clean the case.
8. The Quartz heater is fragile, be very careful when moving the station.
9. This unit is designed for SMD rework, BGA re-balling and pre-heating PCB assembly and should not be used for any other purpose without first consulting the manufacturer or its authorized agent.
10. Keep the unit out of the reach of children. Young Children should be supervised to ensure that they do not play with the appliance.

To prevent electrical shock, be sure to take the following precautions:

1. Make sure the unit is grounded. Always connect power to a grounded receptacle.
2. Do not pinch the AC power cord. Be sure the work area is well ventilated.
3. Do not bump, hit, pour water/liquids or otherwise subject the heating surface to physical shock. This may damage the quartz heater.
4. Be sure to unplug the unit before beginning any repairs or making any adjustments to avoid electric shock which may result in Death or serious injury.
5. Do not expose the unit to moisture or use the unit with wet hands.
6. Turn the power switch off and remove the AC power cord by pulling the plug (not the cord) when the unit will remain unused for a long period of time.
7. Do not modify the unit.

Warnings

- **This system is designed to be used for soldering/desoldering SMDs** and should not be used for any other purpose without consulting manufacturer or its agents.
- **The IR hand tool is designed for intermittent use only.** It is not designed to be used continuously without being allowed to cool. It should be used a maximum of 5 minutes before cooling. After using the IR hand tool, ensure that it is placed back in its cooling stand to cool down between rework operations. Also, do not switch the IR Hand tool on while it is in the cooling stand. **Failure to comply with these instructions may result in damage to the IR hand tool or the cooling stand.**
- **Do not aim the IR hand tool at your eyes.** Do not allow the IR spot from the IR hand tool (either directly or via mirror) to shine into the eyes as serious eye damage may occur.
- **The system can produce a lot of heat.** Do not allow the IR spot from the IR hand tool or IR from the PCB pre-heater, to contact exposed skin as burning may occur. To eliminate the possibility of burns, allow time for the equipment to cool before commencing maintenance.
- **Death or serious injury may result from electrical shock.** It is therefore essential to isolate the equipment from the power before beginning repairs.
- **Do not allow the spillage of any liquid to fall on the quartz emitter** (pre-heater) as damage may result. Due to the use of glass optical components, the IR hand tool should be handled with reasonable care.

Installation

The equipment must be placed on a firm surface at least 1.2M x 0.75M and at a height to suit the operator. The location should be chosen to suit the flow of work.

Place the controllers on the left or right of the main system and arrange the system as in the picture (A) below. The immediate area must be free from draughts that may reduce the heating efficiency. An electrical supply, free from R.F. interference, other noise, glitter etc. must be readily available.

(A) Standard package for IR860 SMD/BGA rework system


IR810 Infra red SMD/BGA rework station

Specifications for IR860

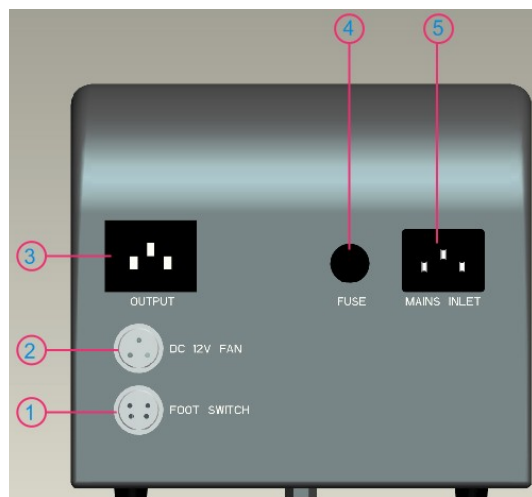|	SOLDERLIGHT CONTROL	
Power rating	220-240Vac 50Hz	100-120Vac 60Hz
Fuse	T2A (Slow type)	T3.15A (Slow type)
Output	15Vac 150W	
IR Lamp temp. range	45°-450° Celsius (113°-842° Fahrenheit)	
Time setting	0 – 900sec	
Size (W*H* D)	170 x 100 x 200mm (6.7" x 3.94" x 7.9")	
Net weight	3.3kg (7.25 lbs.)	

Specifications for Pre-heater

	Pre-heater	
Rating	230Vac	115Vac
Fuse (Delay type)	T5A	T10A
Output	650W	
Temperature range	30°-350° Celsius (86°-662° Fahrenheit)	
Controller Dimensions (W x H x D)	170 x 100 x 200mm (6.7" x 3.9" x 7.9")	
Pre-heater Dimensions (W x H x D)	280 x 90 x 257mm (11" x 3.5" x 10")	
Weight (w/o AC power cord)	2.8Kg (6.2Lbs.)	

Features of IR860 Front panel
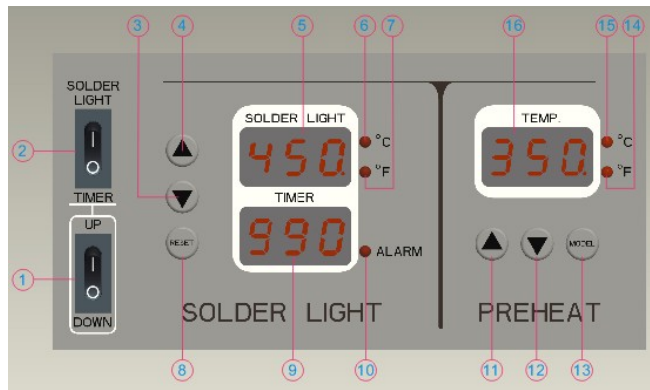
1. **Timer switch**
2. **Power Switch for Solderlight**
3. **"Down" key - Time counting & temperature decrease**
4. **"Up" key - Time counting & temperature increase**
5. **"SOLDER LIGHT" - Temperature display (3 segment) IR hand tool intensity (power)**
6. **Celsius (°) temperature light for Solderlight**
7. **Fahrenheit (°) temperature light for Solderlight**
8. **"RESET"- Offset frontward counting**
9. **"TIMER"- Time counting display (3 segment) Process timer**
10. **"ALARM"- Time setting**
11. **Temperature up pad (increase numerals) for PREHEAT**
12. **Temperature down pad (decrease numerals) for PREHEAT**
13. **MODEL: Temperature offset pad**
14. **Fahrenheit (°) temperature light for PREHEAT**
15. **Celsius (°) temperature light for PREHEAT**
16. **Temperature setting display (3 segment)**

IR810 Back panel

1. **Foot switch socket (4 pin)**
2. **DC12V Cooling fan socket (3 pin)**
3. **Output to PREHEATER**
4. **Fuse Holder Solderlight connector**
5. **AC power inlet**

Infra-red pre-heater back panel

1. **Inlet (connect with controller output - #3 on IR810 back panel image)**

Benefits of the IR810

1   **Quartz heater gets faster heat-up time.**
2   **The efficient pre-heat height is 45mm from quartz surface to the bottom of the PCB assembly.**
3   **The temperature of back heater setting at 220° can get (75% energy is provided by the back heater and 25% of the energy provided by the top heater) efficient preheating performance and prevent the bending of bigger PCBs and/or damage of the components just heating from the top heater.**

Principle of Operation

Overview

The principle of operation of the IR rework system is that during rework, heating from above and below, a single SMD is subject to a similar temperature/time profile as it experiences during reflow in the original production process.

- **Temperature setting range:** Celsius **45°~450° (113°~842°)**
  Original temperature setting: 45° (113°)

- **Timer setting range: 0 - 900sec**
  Time counting: Forward counting starts from 000s (UP/DOWN switch flip to "UP" position). Backward counting commences from 015S (UP/DOWN switch to "DOWN" position).

IR hand tool operation:

♦ Flip the "**IR/TIMER"** switch to the **IR** position.
♦ Reset IR Lamp temperature: By pressing "▲" or "▼"

>   Adjusting the temperature: Pressing "▲" key one time increases display "1" numeral. Press and hold "▲" key for 2 seconds for automatic increase.   Depressing the "▲" key again stops automatic increase.
>   By pressing the "▼" key one time the digital display will be decreased "1" numeral. Press and hold "▼" key for 2 seconds for automatic decrease.

Depressing the "▼" key again stops the automatic decrease.

● Using the "footswitch":　Depressing the footswitch begins the IR lamp warm up, releasing the "footswitch" stops IR lamp operation.

IR lamp operating with positive numeral module

● Flip the "TIMER/IR" switch to "TIMER" position and "UP/DOWN" switch to "UP" position, then IR lamp will be operating with positive numeral digit. (See picture on right side)

● **Please note**: The feature of positive counting is to calculate the IR lamp heat up time and is not able to be adjusted. Time counting can be calculated automatically by stepping on the "footswitch".

Press the "RESET" then the positive counting will be off and numeral shown "0".

● If you release the footswitch at this time then positive numeral time counting will be stopped, step again then the timing will be calculated continuously.

● The IR lamp and positive numeral counter will be commenced counting when footswitch being stepped. And vise-versa.

IR lamp operating with negative numeral module

● Flip the "TIMER/IR" switch to "TIMER" position and "UP/DOWN" switch to "DOWN" position, then IR lamp will be operating with inverse counting. (See picture on right side)

● **Please note**: The feature of positive counting is to calculate the IR lamp heat up time and it is not able to be adjusted. Time can be calculated automatically by stepping "footswitch".

● Press the "RESET" then the negative counting will be off and numeral shown "0".

● If footswitch is released positive numeral counting will be stopped, step again then the timing will be calculated continuously.

● The IR lamp and positive numeral counter will begin counting when footswitch is depressed, and vise-versa.

● To check a reflow time of new component, there are two ways to get the negative numeral counting, one by using positive numeral counting data converse to negative numeral counting and the second way by adjusting

OPERATION FOR PREHEATER

1 Flip the "POWER" switch to "OFF" position.
2 Insert the female plug into the AC power receptacle (Mains inlet) on the back of the unit.
3 Insert the connector/receptacle cord from the back output of controller to back of pre-heater inlet.
4 Plug in the AC power cord and flip the mains illuminated switch to the "ON" position.
5 The PREHEATER is ready to use.

Temperature parameter value setting

Temperature setting range: 30°~350° (86°~662°)

Temperature compensation range: +99°~ -99° (+99° ~ -99°)

Preset temperature: 30° (86°)

Temperature adjustment: "00" or "-00"

Pre-heater temperature setting: By pressing "▲" or "▼" pad to increase or decrease the temperature. Would suggest set temperature at "220° (430°approx.) for better performance.

Temperature forward counting: If pressing "▲" pad one time, the digital will be increased "1" numeral. If continuous pressing "▲" pad then the digital numerals will be forwarded till the temperature you would set or adjust and then depressing the "▲" pad off.

Temperature backward counting: If pressing "▼" pad one time the digital will be decreased "1" numeral. If continuous pressing "▼" pad then the digital numerals will be backward till the temperature you would set or adjust and then depressing the "▼" pad off.

1. **Check actual temperature compensation value**:

   Press "MODEL" pad until digital display shows "- - -", then release the "MODEL" pad, the display will show the actual temperature compensation value automatically after 4 seconds. After 2 seconds the display will be back to preset temperature.

2. **Actual temperature adjustment**:

   Press "MODEL" pad until digital display show "- - -" ,then press the "MODEL" pad again within 4 seconds, the display will show the actual temperature compensation value automatically and twinkling. Now it is ready to adjust by using "▲"and "▼" pads.

   Press "▲" pad the temperature will be up and press "▼" pad the temperature will be down. If there is no need to adjust the temperature, after 2 sec. the display will become normal situation. For example: Assume the temperature set at 200° and actual temperature being measured 190°, then the temperature to be needed to adjust +10° and the parameter value shows "00 or -00 " then temperature compensation value is"10 " [00 +

10=(increase 10°)]. If the parameter value shows -20 then temperature compensation value is 10 (-20+10=10°). If the parameter value shows 20 then the compensation value is 30 [20 (20)+10 (10)=30 (30°)].

⚠ **CAUTION**! To avoid burning your skin, do not touch the heater or PCB directly, please use clips or tweezers for pick up.

CAUTION!   Do not allow water/liquids/solvents to touch the heater surface to avoid temperature drop cracks while the unit is still hot. Such cracks can lead to electrical shorts or failure of the heater.

CAUTION!   Do not touch the PCB holder to avoid burning your skin during preheat!

Preparation

The procedure while preparing to rework SMT/BGA components as follows:
1. **Switch on** and **warm up.**
2. **Set 'control settings'** required for PCB/component
3. **Sort tools and fluxes required.**

Switch on and **warm up** The following simple procedure will warm the system up
1. **Switch on** the IR 810 controller

   - **Adjust control settings as follows**

     a. Set IR hand tool power setting between 220-380° (normal = 240°)

     b. Set Pre-heater power setting between 200-290° (normal = 240°)

     c. **Allow system to warm up** – switch pre-heater on and wait 5 minutes.

Tools and fluxes required

The following are required for use in soldering/desoldering operations:

   - SMT Tweezers, fine tipped
   - Flux dispenser bottle
   - Low solids and gel/paste flux

When using IR 860 rework system it is vital to use correct materials for successful rework. We use two types, a low solids liquid flux for general rework and a gel/paste flux for QFP/DGA rework. The above tools/fluxes are available as kits.

Temperature Profile
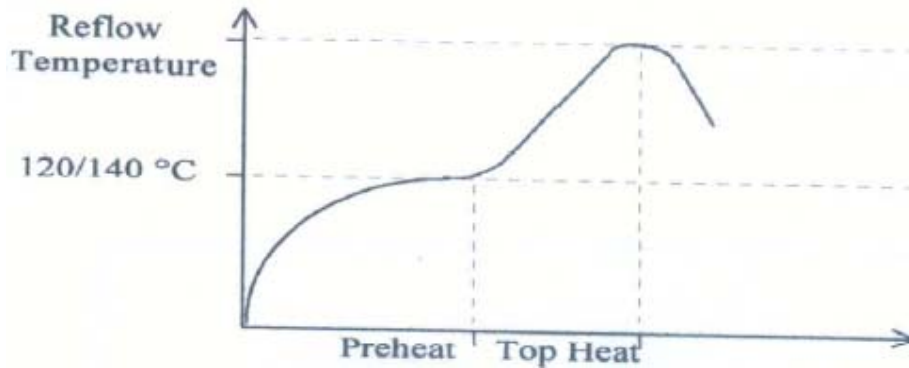
In operation the component is first put through a preheat stage, followed by a reflow stage. The system is designed for rework single/double side and mixed technology PCB. The top heat is derived from a 150W short wave IR lamp focused through a reflective chamber system. The bottom heater delivers a maximum of 650W medium wave IR.

In normal use, approximately 25% of the energy is proved by the top heater, and 75% of the energy is provided by the back heater (pre-heater). Figure below shows how the energy is applied to a component.
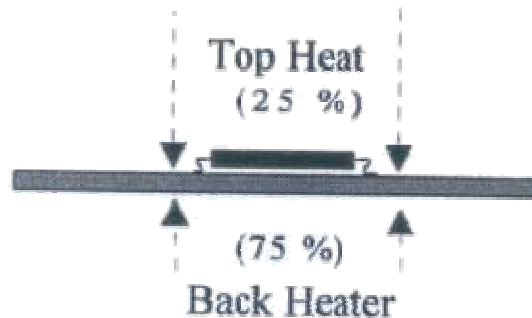
Soldering

1. **PREPARATION -** Place PCB in the PCB holder, positioning the component site to be reworked over the center of the PCB pre-heater. For BGAs, apply a very small amount of gel flux (approx. 0.1 - 0.15mm thickness). Place and align component. (NOTE – depending on the application, you may be required to apply solder paste to the PCB before placing component.)

    a. **PREHEAT** – the fluxed component/PCB to approximately 120° (as measured by the IR sensor).

    b. **REFLOW** – use the IR hand tool (operated by pressing the footswitch) for the reflow phase to heat the component up to reflow temperature (200-225°). It is not so easy to measure temperature during the reflow phase so therefore we use the timer on the IR 810 controller to limit the reflow phase time (normally 30-45 seconds for a small PCB).

    c. **SOAK** – for a short period (about 10 seconds) this will allow the component joints to fully bond.

    d. **COOL** – allow the component to cool to below 180° before moving the PCB.

IR Reflow Procedure
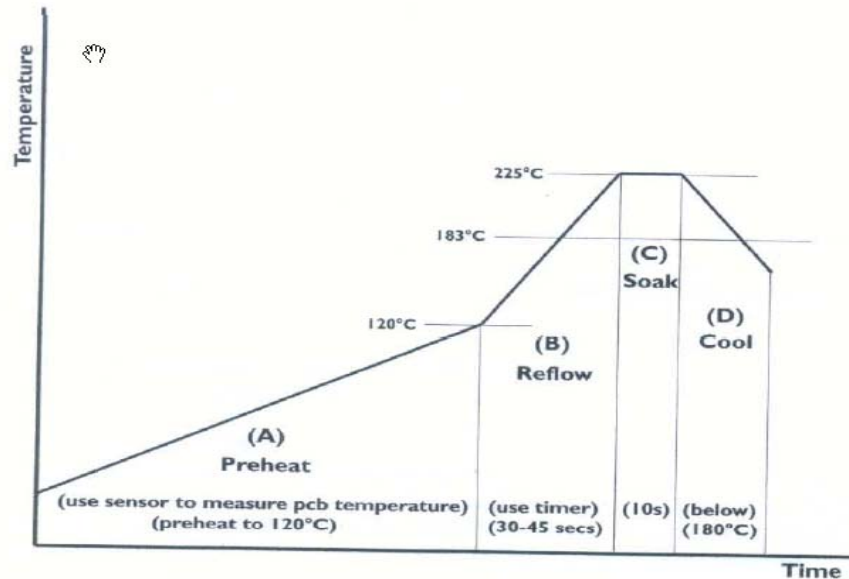
Desoldering
1. **PREPARATION -** Place PCB in the PCB holder, positioning the component site to be reworked over the center of the PCB pre-heater. Apply a very small amount of flux under/around the component.
    a. **PREHEAT** – the fluxed component/PCB to approximately 120° (as measured by the IR sensor).
    b. **REFLOW** – use the IR hand tool (operated by pressing the footswitch) for the reflow phase to heat the component up to reflow temperature (200-225°). It is not so easy to measure temperature during the reflow phase so therefore we use the timer on the IR810 controller to limit the reflow phase time (normally 30-45 seconds for a small PCB).
    c. **SOAK** – for a short period (about 10 seconds) this will allow the component joints to fully bond.
    d. **COOL** – allow the component to cool to below 180° before moving the PCB.

Aftercare
- Clean flux residue off PCB if necessary
- Check solder joints
- Test

Q & A

What Top Heat setting should you use?

Between 220-380°. Normal setting is 240°

What's the working distance of the IR Hand tool and how do I move it for rework?

Approximately 5 – 10 mm when reworking and move up to 30mm when removing Component – move the hand tool in a scanning motion to heat leads, taking about one second for each scan of the component.

What pre-heater setting should I use?

Between 200-290°. Normal setting is 240°

How long do I preheat the PCB?

Always preheat the PCB (up to 120° or between 45 – 90 seconds) to allow the heat to conduct through to the component before introducing the Top Heat. With the 700W pre-heater the top of a small PCB will reach 120° in approximately 45 – 90 seconds. Larger PCBs will take longer to pre-heat. To check the PCB/component temperature, use the hand-held IR temperature sensor to 'look' down at the PCB/component from about 60mm away and at about 45° angle.

How long does it take to reach reflow temperature?

After preheating the PCB up to 120°, it should normally take about 30 – 45 seconds of heating with the IR hand tool to reach reflow (200-220°). It is not so easy to measure temperature during the reflow phase so therefore we use the electronic process timer to warn us when the reflow phase time is over.

TROUBLE SHOOTING

⚠

WARNING!

1 Unless otherwise stipulated, carry out these procedures with the power switch OFF and the power UNPLUGGED before the trouble is cleared.
2 If the unit is damaged, it should be repaired by the manufacturer or its authorized repairing centers to preclude damage to either the unit or injury to personnel.
3 Be sure the unit has been cooled to room temperature before beginning work.

Item	Problem	Remedy
1. No Power when Power switch "ON"	a. Check the AC power cord and receptacle. b. Mains switch no good. c. Fuse blown out.	1. Re-insert the plug. 2. Replace the switch. 3. Investigate why the fuse blew then replace with a new fuse. (If the cause can not be determined, just replace the fuse. If the fuse blows again, send the unit to repair.)

Item	Problem	Remedy
2. Heater doesn't heat up.	a. Quartz heater open. b. Check connector / receptacle cord connecting in good condition or not c. Check the controller PCB assembly failed or not d. Check the display PCB assembly	1. Replace the quartz heater assembly. 2. Re-insert the cord. 3. Replace a new PCB assembly 4. Replace a new display PCB assembly
3. No display shown when Mains is ON.	a. Check the AC power cord inlet. b. Check the AC power transformer output is AC12V for IR810 and AC9V for IR 610. c. Check the controller PCB has DC5V output d. Display burnt	1. Reconnect. 2. Replace a new transformer if burnt. 3. Replace the PCB assembly if failed. 4. Replace the display PCB assembly.

4. IR Lamp not Lit.	a. Check the IR lamp b. Check the 15A fuse on IR810 c. Check the AC power transformer has AC15V output. d. Forgot to step on foot switch	1. Replace the IR lamp if burnt. 2. Investigate why the fuse blew then replace a new fuse (If the cause can not be determined, just replace the fuse. If the fuse blows again, send the unit to repair.) 3. Replace a new transformer if burnt. 4. Step foot switch. Replace the foot switch if no function.
5. Cooling fan no function	a. Check the cooling fan b. Check back panel has DC12V output.	1. Replace the cooling fan if burnt. 2. Replace control board if no output. 3. Re-inset the cord, if there is output.
6. IR lamp stays lit	a. The foot switch has a short b. The receptacle and/or connector has a short. c. Keep light on after main switch off and re-on.	1. Check the foot switch if short. 2. Re-solder if short. 3. Replace the control or display PCB.