AE Series Convection Reflow Ovens

User's Manual

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http://www.madelltech.com

1. Introduction

AE series reflow ovens include bench top infrared convection ovens, full scaled floor models and lead-free models. They are either controlled by the integrated microcontrollers or computers. Multiple heating zones from 3 and up are available on different models. Customer modifications are accepted.

The AE series reflow ovens can be used on all SMT components:

- SMT resistors, capacitors, LED
- PLCC, SOP, QFP, CSP and BGA
- SMT diodes and transistors
- SMT inductors, crystals, connectors, transformers and others.

2. Installation

1. Installation Site
   - Indoor
   - Avoid high temperature and moisture
   - Keep away from high energy magnetic field sources
   - Do not let the reflow oven's air inlet and outlet directly face other fans or an open window

2. Safety
   - Do not let items other than the circuit boards get into the oven
   - Be extremely careful about the high temperature to prevent human injury
   - Do not open the oven while it is operating or is still hot
   - Maintenance should be performed when the oven has cooled down enough, and power cable is unplugged.

3. Working Environment
   - Room temperature: 5-40°C
   - Humidity: 20-95%
   - Transportation: -25-55°C. It can sustain up to 65°C in transportation for less than 24 hours.

4. Power Supply

220V, 3 phase, good ground connection. Power supply installation should be performed by a certified electrician.

5. Height and Level Adjustment

The oven height can be adjusted by the four legs under each oven. Please note, the oven level should be checked and maintained every time the height is adjusted.

6. Notices:

- The oven should be installed in a very clean site for high quality PCB boards assembling
- Do not use or store the oven in an outside site, at high temperature or humidity
- Do not install the oven in an area with strong electronic or magnetic interferences
- Unplug the power cable every time the oven is under maintenance
- The oven should be checked thoroughly every time it is moved. Make sure the conveyor or screen chain does not fall off, is not blocked and no foreign objects inside the oven chamber
- The oven should be kept at a perfect horizontal level. Otherwise, the PCB boards may shift
- The oven is at high temperature while it is running. Do not touch the heating areas
- Make sure the conveyor is on the tension roller all the time

3. Features of AE Reflow Ovens

1. High Heat Efficiency.
    - Optimized heating chambers
    - Hot air circulation
    - Multi layers of insulation

2. Compact Design

- AE－R330,　1400（L）×612（D）×650（H）mm
- AE－RF430, 2000（L）×612（D）×1220（H）mm
- AE－RF530, 2000（L）×612（D）×1220（H）mm
- AE－RF630, 2500（L）×612（D）×1220（H）mm
- AE－RF830, 5200（L）×1200（D）×1470（H）mm

3. Long Life. Heating zones are made of stainless steel, sustain high temperature and not rust.
4. Digital Control. Digital display and control of both the heating temperatures and conveyor speed.
5. Simple Profiling. Every heating zone can be adjusted independently.
6. Hot air circulates within each heating zone.
7. Smooth conveyor movement.

4. AE Reflow Oven Heating Model

1. Heating Model
The AE series reflow ovens combine hot air with infrared to achieve even heat distribution.

Hot air heating has the following advantages:

- No shadow areas or dead corners
- Heat energy is transferred directly onto solder paste and pads
- Prevent overheat of components
- Even heat distribution on components
- Even heat distribution on circuit boards
- Accommodate different PCB's, including flex ones

Infra red heating has the following advantages:

- Infra red waveform heats the chamber air directly, reduces heat circulation volume
- Reduce oxidization of the solder paste
- Reduce the oven power consumption
- Short warm up time
- Infra red waveform keeps the heating chamber cleaning.

2 Heating Zones

4.2.1 Number of heating zones on different models:

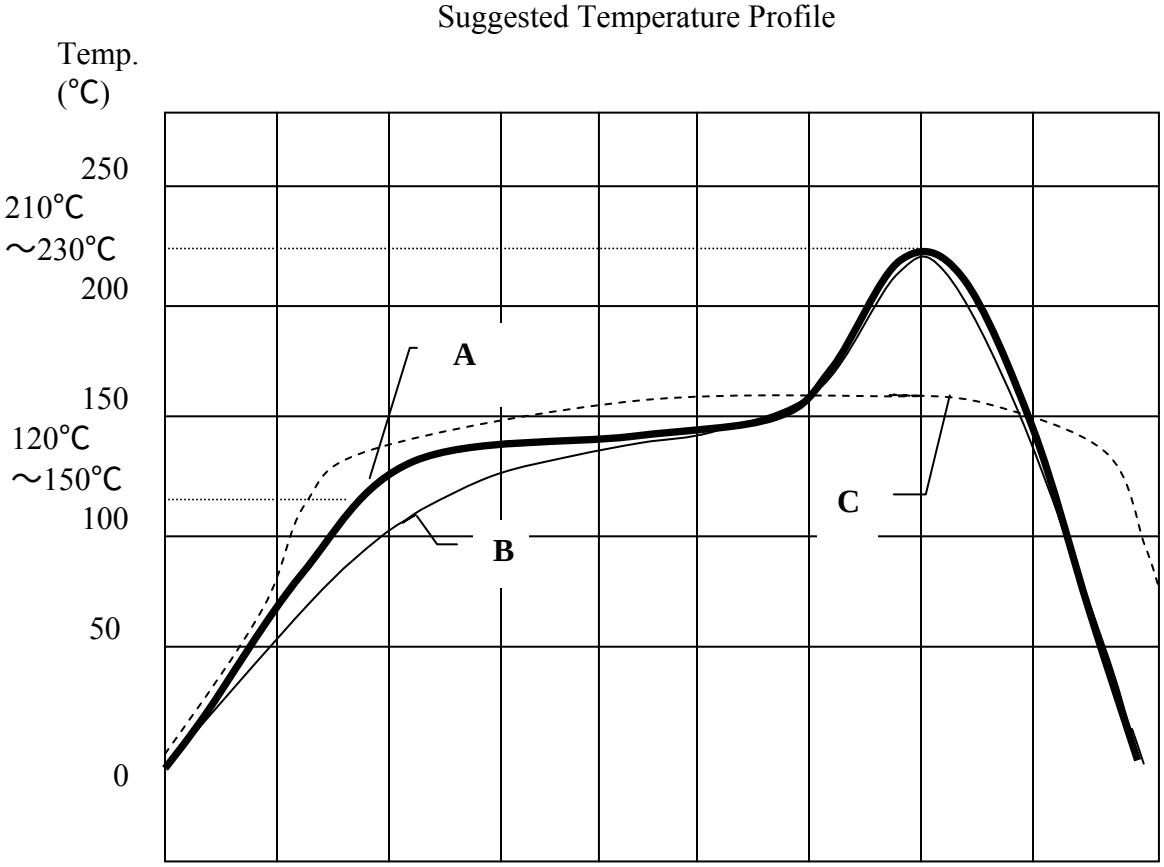
Model	Zones	Top	Bottom	Power
AE－R330	3	3	0	5kw
AE－RF430	4	3	1	6kw
AE－RF530	5	3	2	7kw
AE－RF630	6	4	2	8kw
AE－F440B	8	4	4	15kw
AE－F440C	8	4	4	18.5kw
AE－F540C	10	5	5	22kw
AE－F640C	12	6	6	25kw
AE－F740C	14	7	7	28kw
AE－F840C	16	8	8	32kw

4.2.2 Temperature sensors
Every heating zone has its own temperature sensor. It is calibrated in the factory and should not be modified.

4.2.3 Temperature controller
Every heating zone has its own temperature controller. It is a standard PID controller with fuzzy logic function and large driving power SSR (solid state relay).

5. Temperature Profile

The reflow oven should achieve a temperature profile as shown below.



Curve A: for regular solder paste. This profile will raise the PCB temperature to 120~150°C within 60 seconds, temperature rising rate is <3°C/S. From 160S to 180S, the PCB temperature rises slowly to 183°C, the solder paste melting point. This ensures the solder paste has an even heat distribution. PCB temperature rises to 210~230°C and stays at that temperature for about 30 seconds for the solder paste to reflow.

Curve B: for fine pitch IC's and other small components (like 1005). PCB temperature rises slower than curve A. This delays the melting time of the solder and prevents components shifting.

Curve C: This curve is used for glues.

It is very important to design a proper profile for satisfactory PCB assembling.

6. Profile Design

Profile design includes selecting the proper zone temperatures and conveyor moving speed. The following factors need to be considered when selecting a profile: PCB material and thickness, SMT components and density on the board, sizes and shapes of solder areas, solder paste specifications and print thickness on the circuit board. The convection reflow ovens achieve the desired profile with heating zones and moving conveyor. The solder paste on the PCB goes through the stages of preheat, drying, melting and reflowing in the convection reflow oven chamber. The first heating zone (preheat) raises the PCB temperature rapidly; the second heating zone maintains the PCB temperature and raises it slowly at the same time. Moisture inside the solder evaporates at this stage; the third stage causes the solder to melt and reflow; solder cools down rapidly after the reflow stage. This completes a reflow process.

Top heating zones are commonly used in reflow ovens. The reflow time can be reduced by setting a higher temperature if the components are exposed directly under IR heat from top. Heating time needs to be set longer if components are not directly under IR light. Top mounted hot air heating zones can achieve more stable and evenly distributed heating effects on the circuit boards than mounted on other directions.

The conveyor moving speed is another key factor in profile design. It controls how long the circuit boards go through the reflow process. Also, the more the PCB layers, the longer(or slower of the moving speed) it takes to finish a reflow process.

Some reflow ovens are equipped with bottom heating zones. Top or bottom heating zones can be used selectively on these ovens. Bottom heating is preferred if the circuit board has components which could be easily damaged by high temperature. The PCB board absorbs heat evenly from the bottom side. This reduces heat absorption by those heat sensitive components. Top and bottom heating zones can also be used at the same time to achieve more even heat distribution, and to dry the solder paste slower than only from the top side. Top temperature can be set higher than the bottom temperature.

As an example, the profile of a 4 stages, 8 heating zones reflow oven can be set based on the following configuration:

Zone 1: top preheat zone
Zone 2: top 1st drying zone
Zone 3: top 2nd drying zone
Zone 4: top reflow zone
Zone 5: bottom preheat zone
Zone 6: bottom lower 1st drying zone
Zone 7: bottom 2nd drying zone
Zone 8: bottom reflow zone

If on a 4 stages, 4 heating zones reflow oven, all top mounted, these functions can be divided into:

Zone 1: top heating zone
Zone 2: top 1st drying zone
Zone 3: top 2nd drying zone
Zone 4: top reflow zone.

7. Heating Zones

Preheat zones: These zones raise the solder temperature rapidly, prepare the solder for the drying zones. It is necessary to keep the heating up rate under 3°C/S. Otherwise, some heat sensitive components may be damaged.

Drying zones: Solder temperature rises slowly in these zones. Solder paste goes thorough chemical and physical changes under high temperature, and prepares for the reflow zones. Moisture evaporates at this time.

Reflow zones: Solder paste melts and reflows in these zones under hot air or IR heating. The top reflow zone temperature should be set higher than the bottom reflow zone.

8. Reflow Oven Settings

1. Start the oven with the default settings.
2. Warm up the oven for 20~30 minutes.
3. Run some testing PCB boards. If the boards do not reflow, go to step 4. If the temperature is too high, reduce zone temperatures or increase conveyor moving speed. Run the testing boards again until satisfactory results achieved.
4. If no reflow occurs:
    - Reduce the conveyor speed 5~10%. For example, reduce the conveyor speed from 500mm/min. to 460mm/min.
    - Or, raise zones temperatures gradually, at 5°C every time. Do not exceed the PCB and components specified temperatures.
5. Run the PCB's under the new conveyor speed or zone temperatures. Repeat step 4 and 5 until a satisfactory profile is achieved.
6. Keep in mind that the PCB temperature will be reduced if the conveyor speed is increased, and the opposite is true if the speed is decreased.
7. The zone temperatures should be adjusted from low to high during profile setting.
8. Most circuit boards can go through the reflow oven a second time during profile adjustments. Components will not get damaged in most situations.

9. Start the Reflow Oven

1. Turn the oven power switch on, press the green button.

2. Turn the conveyor switch from “STOP” to “RUN”. Check the heating zone temperature settings and make sure they are the desired values.
3. Turn on the hot air and cool air switches, if they are equipped with the oven. Turn the air volume gradually from low to high. Do not use hot air, or use low hot air when the circuit board is small or very thin. Use IR only.
4. Turn on the zone temperature switches (press the SET key first, and use the ▲ or ▼ keys to change the zone temperatures, and press the SET to accept the change).
5. After the oven is turned on for 20-30 minutes, check if the actual zone temperatures match the set temperatures, and if they are stable. If the temperatures are not stable, increase the temperature gate time as follows:

> Press and hold the SET key for 10 seconds until the LED blinks, release it and press again, the ATU menu shows up. Change it from 0000 to 0001. Press and hold the SET key again until the LED stops blinking. Wait for 5 to 10 minutes and check the zone temperatures again.

6. It may be necessary to check the oven performance and make sure they match the designed profile by using a profiling device. A simple way to do this is to use a thermometer (like our QK191). Tape the temperature probe on a sample circuit board, and let it go through the reflow oven while recording the temperature changes at different time points. AE series ovens equipped with computers have built in profiling software.
7. The oven can be used for production if the actual profile matches the designed one. Otherwise, adjust the zone temperatures or conveyor speed until they match. It is recommended to adjust the temperature 5°C at a time.
8. Please note, at the beginning of the production, when PCB boards just start to get into the oven, the oven temperature will change a little bit. It will take about 5 to 10 minutes for the oven to get stabilized.
9. The PCB boards should be placed on the conveyor in regular intervals.

10. Stop the Reflow Oven

1. Normal stop:
    1. Make sure there is no remain circuit boards inside the oven.
    2. Turn off all the zone temperature switches.
    3. Let the conveyor run for 10~15 minutes to cool down.
    4. Turn off the conveyor switch.
    5. Turn off the hot and cool air switches if equipped.
    6. Turn off the oven power switch.

2. Emergency stop:

Press the red EMERGENCY STOP button. This will cut off the power supply to the conveyor and heating zones. Turn off the oven power switch if needed. Please do not use the emergency stop in normal situations. It may reduce the life of the power supply relays inside the oven.

11. Considerations for Double Side Boards

Double side circuit boards have components on both sides. Both the IR and hot air reflow ovens can be used for double side boards. Here are the general procedures to work with double side boards:

- First finish one side as described in previous sections; both top and bottom heating can be used.
- Place the circuit board one side finished on the conveyor upside down, and let it go through the oven a second time. Use only top heating at this time. Since the solvent in the paste on the first side has evaporated, and the solder melt point (260°C) is higher than the paste melt temperature (183°C), components on the first side will not fall off.

Circuits with glue on one side can be processed similarly, while low temperatures need to be used to reflow the glue side.

To make sure the circuit boards are flat on the belt, it may be necessary to use PCB fixtures to support them for double side boards.

12. Heating Zone Settings for Some Models

1. AE-R330

- This is a table top IR convection reflow oven, with three top heating zones: one preheating zone, one drying zone and one reflow zone.
- Dimensions:
  Outside: 1400(L)x612(W)x650(H)mm
  Heating chamber length: 860mm
  Weight: 50Kg
  Max. power (warm up): 5Kw
  Regular working power: 1.8Kw
  Power supply: 2 phase or 3 phase, 220V, 50/60Hz, 11A
- Conveyor:
  Width: 300mm
  Height: 420±20mm
  Moving direction: left→right (left←right can be ordered)
  Pass through time: 4-5 minutes
  Speed: relative dial mark: 0-10
  Actual moving speed: 200-800mm
  Usable speed marks: 0.5-3
- Heating zones:
  1 Preheat zone, digital control, 1.0Kw
  2 Drying zone, digital control, 2.0Kw
  3 Reflow zone, digital control, 2.0Kw
- Default setting:

	Solder Paste	Glue
1 Preheat zone:	210±15°C,	200±5°C
2 Drying zone:	200±10°C,	150±5°C
3 Reflow zone:	235±15°C,	150±5°C

2. AE-RF430
- This is a floor model IR and hot air convection reflow oven, with four heating zones: one top preheating zone, two drying zones (top and bottom) and one top reflow zone. IR heating is used in preheat and reflow zones, while hot air is used in the drying zones.
- Dimensions:
  Outside: 2000(L)x612(W)x1220(H)mm
  Heating chamber length: 1000mm
  Weight: 150Kg
  Max. power (warm up): 6Kw
  Regular working power: 2.2Kw
  Power supply: 3 phase, 220V, 50/60Hz, 15A
- Conveyor:
  Width: 300mm
  Height: 880±20mm
  Moving direction: left→right (left←right can be ordered)
  Pass through time: 3-5 minutes
  Speed: 200-800mm
  Heating zones:
  1 Top preheat zone, digital control, 2Kw

2 Top drying zone, digital control, 1Kw
3 Top reflow zone, digital control, 1Kw
4 Bottom drying zone, digital control, 2Kw

- Default setting:

	Solder Paste	Glue
1 Top preheat zone:	190±15°C,	170±5°C
2 Top drying zone:	180±10°C,	160±5°C
3 Top reflow zone:	235±15°C,	160±5°C
4 Bottom preheat zone:	180±15°C,	160±5°C

3. AE-F530-C

- This is a computer controlled floor model IR and hot air convection reflow oven, with five heating zones: two preheating zones (top, bottom), one drying zone (top) and two reflow zones (top, bottom). Preheating and reflow zones use hot air while the drying zone uses hot air.
- Dimensions:
  Outside: 2000(L)x612(W)x1220(H)mm
  Heating chamber length: 1000mm
  Weight: 180Kg
  Max. power (warm up): 7Kw
  Regular working power: 2.5Kw
  Power supply: 3 phase, 220V, 50/60Hz, 25A
- Conveyor:
  Width: 300mm
  Height: 880±20mm
  Moving direction: left→right (left←right can be ordered)
  Pass through time: 3.5-5.5 minutes

Speed: 200-800mm
Heating zones:

1 Top preheat zone, digital control,	2Kw
4 Bottom preheat zone, digital control,	1Kw
2 Top drying zone, digital control,	1Kw
3 Top reflow zone, digital control,	2Kw
5 Bottom reflow zone, digital control,	1Kw

- Default setting:

	Solder Paste	Glue
1 Top preheat zone:	200±15°C,	210±5°C
2 Top drying zone:	195±10°C,	150±5°C
3 Top reflow zone:	235±15°C,	150±5°C
4 Bottom preheat zone:	200±15°C,	150±5°C
5 Bottom reflow zone:	200±10°C,	200±5°C

4. AE-F830

- This is floor model IR and hot air convection reflow oven, with eight heating zones: tow preheating zones (top, bottom), two drying zones(top and bottom) and four reflow zones(top and bottom).
- Dimensions:
  Outside: 2700(L)x612(W)x1220(H)mm
  Heating chamber length: 1300mm
  Weight: 200Kg
  Max. power(warm up): 8Kw
  Regular working power: 3Kw
  Power supply: 3 phase, 220V, 50/60Hz, 35A
- Conveyor:
  Width: 300mm
  Height: 880±20mm
  Moving direction: left→right (left←right can be ordered)
  Pass through time: 3.5-5.5 minutes
  Speed: 200-800mm
  Heating zones:

1 Top preheat zone, digital control,	2Kw
5 Bottom preheat zone, digital control,	1Kw
2 Top drying zone, digital control,	1Kw
3 Top drying zone, digital control,	1Kw
4 Top reflow zone, digital control,	2Kw
6 Bottom reflow zone, digital control,	1Kw
7 Bottom reflow zone, digital control,	1Kw
7 Bottom reflow zone, digital control,	2Kw

- Default setting:

	Solder Paste	Glue
1 Top preheat zone:	190±15°C,	210±5°C
2 Top drying zone:	180±10°C,	150±5°C
3 Top drying zone:	190±15°C,	150±5°C

4 Top reflow zone: 240±15°C, 150±5°C
5 Bottom preheat zone: 190±10°C, 200±5°C
6 Bottom reflow zone: 180±15°C, 150±5°C
7 Bottom reflow zone: 180±10°C, 150±5°C
8 Bottom reflow zone: 240±10°C, 150±5°C

5. Additional Models

MODEL	AE-3300C	AE-6600	AE-7700	AE-8800	AE-1010
Heating					
Heating zones	Top 3 Bottom 3	Top 6 Bottom 6	Top 7 Bottom 7	Top 8 Bottom 8	Top 10 Bottom 10
Heating Length	1200mm	2140mm	2390mm	2715mm	3365mm
Cooling zones	1		2		
Conveyor					
Max.width of PCB	300mm		460mm		
Rail adjustment range	50-260mm		50-460mm		
Conveyor direction	L→R(R→L, option)				
Rail mount	front or rear				
Mesh height	900±20mm				
Conveyor type	Chain+ mesh				
Conveyor speed	0-2000mm/min				
Power					
Power supply	3 phase 380V 100A 50/60Hz, or 3 phase 220V 120A 50/60Hz				
Start up power	8KW	28KW	34KW	44KW	60KW
Regular operation power	Approx.3KW	Approx.8KW	Approx.9KW	Approx.12W	Approx.15W
Warm-up time	20min				

Temperature range	Room temperature-400℃				
Temperature control mode	Closed loop PID, SSR(solid state relay) drive				
Temperature control precision	±1℃				
Temperature distribution	±2℃				
Alarm	Multi alarms				
PCB fall down alarm	option				
Weight	300kg	1300kg	1900kg	2000kg	2200kg
Dimension(mm)	2000×1210×1470	4090×1210×1470	4340×1410×1470	4665×1410×1470	5315×1410×1470

OPTIONS (options can only be installed in factory)

Nitrogen system (GS-800-N)	Low nitrogen consumption, 20-30M^3/h when the oxygen concentration is controlled within 400-1000ppm.
Inner circulation cooling system, flux recycle system	Non-filter design, longer intervals between chamber cleaning.
Dual rail conveyors system	Two different PCB's can be processed at the same time. Conveyors widths can be adjusted independently.
Retractable Central Support(RCS)	Support of multiple panels, while temperatures of heating zones and PCB's not affected.

The following models are also available:

AE-6600-LF-N2, 6/6 lead-free hot air nitrogen reflow oven.
AE-7700-LF-N2, 7/7 lead-free hot air nitrogen reflow oven.
AE-8800-LF-N2, 8/8 lead-free hot air nitrogen reflow oven

13. Trouble Shooting (Reflow Oven and Circuit Boards)

1. Reflow oven problems:

Problem	Check
Reflow oven does not start	1. check power supply 2. check fuse

Temperature low	1. check SSR connection, replace SSR 2. Heating tube bad connection
Convey does not move	1. check if the belt is on the pullies 2. check if the motor is bad
Fans not on	1.check for bad fan connection 2. check for bad fan
Overheat	1.bad fan 2. temperature controller module bad 3. SSR bad

2. Circuit board reflow problems:

Problems	Possible Reasons	Remedies
Paste not reflow	1.Temperature low 2. PCB is shaded large parts 3 Copper ground layer	a. Reduce belt speed or raise temperature a. Increase bottom heating temperature a. Increase heating zones
PCB bent	Overheat	a. Reduce the top and bottom zone temperature difference b. Increase belt speed
PCB color changed	1. Temperature too high 2. Temperature rises too fast	a. Increase belt speed b. decrease preheat temperature a. Decrease belt speed
Solder residues	1.Preheat temperature too high 2.Solder paste too thin, or stencil too thick	a. Reduce top preheat temperature or add bottom heating a. check paste, replace stencil
Solder balls	1. Drying too fast 2. Bad paste printing 3. Old paste 4. Moisture in paste 5. Too much paste	a. Reduce belt speed and drying zone temperature a. Improve paste printing a. Use new paste a. Keep working area humidity low a. Use less paste
Flux carbonized	1.Temperature too high	a. Increase belt speed b. Decrease preheat temperature
Parts shift	1.Parts not placed correctly 2. Paste not even on pads 3.Drying too fast	a. Check placing accuracy a. Check paste shape and thickness a. reduce belt speed and drying temperature

Solder bridge	1.Paste not printed on the right place 2. Paste not good 3. Temperature rises too fast	a. Check stencil position, clean stencil and adjust printing pressure a. Replace solder paste a. Adjust profile
Solder paste shift	1. Paste too thin, working area temperature too high 2. Bad paste	a. Adjust profile, increase belt speed, control working area temperature and moisture a. Replace paste
Standing parts	1. Temperature rises too fast 2. Bad components 3. Bad paste	Adjust profile a. Check circuit parts a. Replace paste
Parts partial soldered	1.Not enough paste 2. Paste not even 3. Dirty part	a. Adjust stencil printing a. Make sure paste is even a. Check parts
PCB overheat	1. Temperature increases too fast	a. Reduce belt speed and temperature

14. Basic Maintenance

- Before turning the oven on, make sure the power supply is within the correct range and stable, also check if the settings are the same as the last time it is used. The belt should not be stopped when it is still hot. Otherwise its life will be reduced. Check if there are items inside the heating chamber.

- Lubricate the belt at least once in two months with high temperature lubrication oil.

- Adjust the belt pressure whenever necessary.

- Keep the belt clean and parallel.

- Lubricate the belt motor with high temperature lubrication regularly, at least twice a week if used everyday.

- Keep the fan clean.

- Make sure there is good ground connection.

Cautions during maintenance:

- When the oven is stopped with the emergency button, the power is still on. Unplug the power before working on the oven.
- The convey belt can be replaced easily by first finding the connection points. The belt should be adjusted properly after replacement. It should not be too loose or too tight. It should be able to be pressed downward without too much effort.

Appendix 1. About Solder Paste

Solder paste contains lead and other chemical elements which are poisonous. Do not touch the solder paste directly. Reflow oven exhaust should be properly conducted to outside. Prevent direct skin contact with solder paste. Please refer to solder paste manufacturer's directions.

Cautions:

- If solder paste is accidentally fall on skin or cloth, clean it as soon as possible with alcohol.
- Wear protection glasses and gloves.
- Wash hands after work.
- Clean solder paste residues on the working table and tools. It is difficult to clean once it is dry.
- Do not use solvents other than special solder thinner.

Storage and use:

- Solder paste should be stored inside the refrigerator at 0 to 10°C. Also, the solder paste container should be kept in horizontal position. Otherwise, solder and flux may separate.
- The solder paste can only be used after 1 to 2 hours, till it reaches the room temperature, after it is outside of the refrigerator. Clean the condensed water drops outside the container to prevent it gets into the paste.
- Open the container and stir the solder paste with a tool for 20 to 30 times. Smear certain amount of paste on the stencil, press and move it with a squeegee for a few times to increase its softness. The container should be closed as soon as possible.
- Do not let anything get into the solder.
- The top layer will be hard if the solder paste has been in storage for a long time. This layer is not usable and should be taken out. Also, the remain solder should be tested to decide it is still good for production.
- Do not put left over solder paste into the original container. It may be kept in a different container and should be tested before it is used next time.

Thinning of the solder paste:

- Thinner solvent can be used to reduce the thickness of the solder paste. Please consult solder paste manufacturers for this issue. It is impossible to increase its thickness. Also, too much thinner may degrade solder paste quality.
- An automatic solder paste mixer may be used to reduce the thickness of solder paste. Mixing time should be kept at 5 to 10 minutes. Solder paste temperature will rise to cause degradation if mixed to long.

Environment:

- Temperature and humidity both affect the solder paste. Best working temperature is at 23°C to 25°C, 6% humidity. To high temperature will reduce the stickiness of the

solder paste, while too low will make the solder paste hard and difficult to print. Solder paste may absorb water particles and cause solder balls and residues at high room temperature and humidity.

- Solder solvent will evaporator if exposed under moving air. Do not blow it directly with fan or air conditioner.
- Solder paste should be reflowed within 4 hours. Solder solvent will evaporator and cause bad connections, solder balls, etc.

Expiration date:

Solder paste normally expires in 3 months if it is stored in refrigerator. It should be thrown away after 6 months.

Appendix 2. Stencil Printing

- Solder paste can be printed on the circuit board directly with a stencil printer.
- Printing speed is very importing. Too fast will cause skipping and missing. Too slow will cause uneven paste or running away from circuit pads. Generally speaking, the squeegee should be moved at a speed of 10-25mm/S. Increase the speed if the circuit board does not have fine component pads, decrease the speed if the stencil is thick or the paste is sticky. Also BGA pads do not be covered completely by paste.
- Steel squeegee is recommended for fine pitch circuit boards, and nylon squeegee is recommended for large pads.
- Recommended pressure on the squeegee is 0.03-0.05KG/mm. It should be adjusted according to circuit boards, stencil thickness and solder paste thickness.

Appendix 3 Zone Temperature Controller

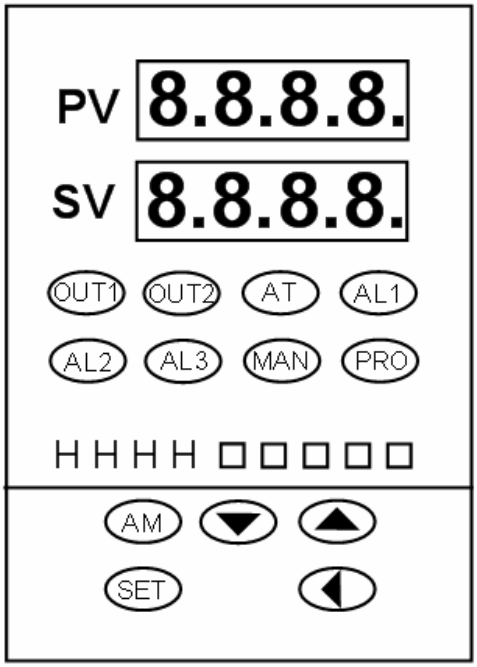
Microcontroller based zone temperature controllers are used on some reflow ovens if not equipped with a computer, like the AE-R330. These controllers are standard modules. The following is the front panel of the controllers. Please note, only limited keys are used for the oven operators. These are:

SET, ▲ ,▼ , ◄.

Indicators relative to the reflow oven operation are PV and SV.

Other keys and LED's are used for factory programming and diagnostics.

Press the SET key to get into programming mode. One LED will blink in the SV window.
Use the ▲ or ▼ key to change it. Use the ◄key to move to the next digit.



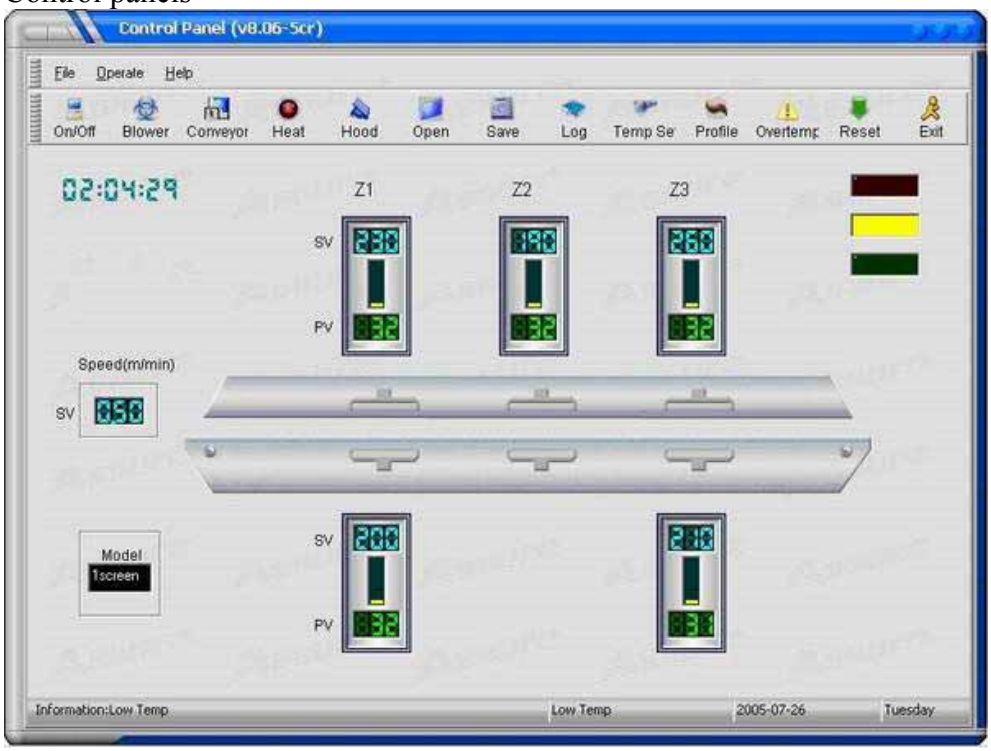
Temperature controller panel

No.	LABEL	Description
1	PV	Measured value
2	SV	Set value
3	OUT1	Output 1 LED
4	OUT2	Output 2 LED
5	AT	PID on LED
6	AL1	Warning 1 LED
7	AL2	Warning 2 LED
8	AL3	Warning 3 LED
9	▲	Increment
10	▼	Decrement
11	◄	Shift
12	SET	Set
13	PRO	Program on
14	MAN	Auto/manual indicator
15	LED BAR	Output power indicator
16	A/M	Auto/manual selection

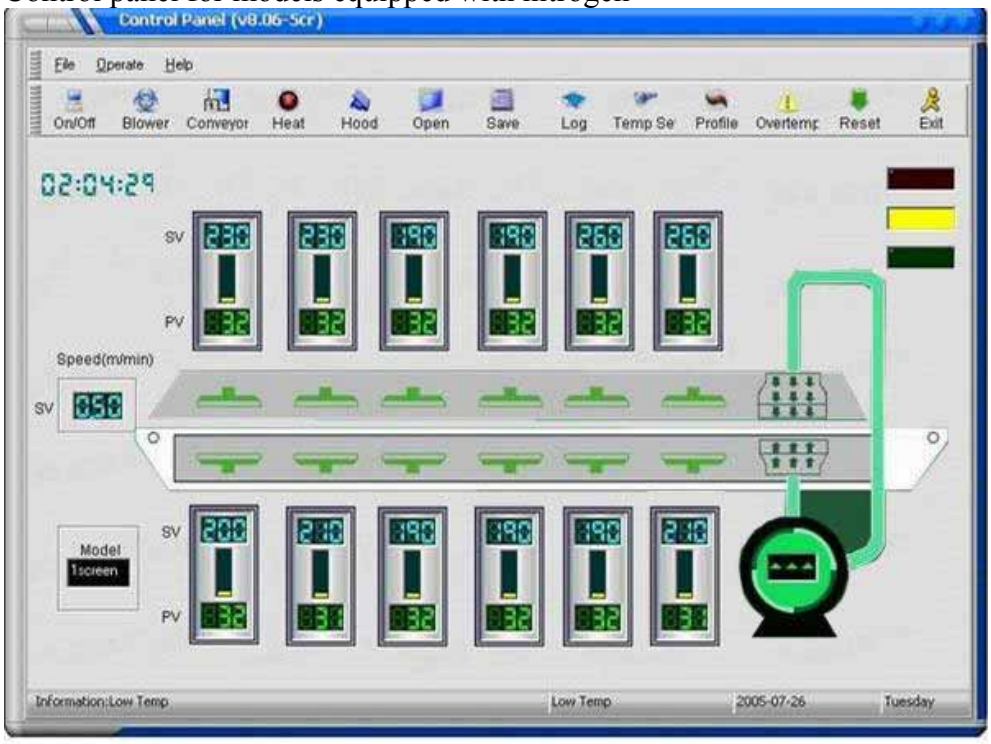
Appendix 4 Computer Interface

(for models equipped with a computer)

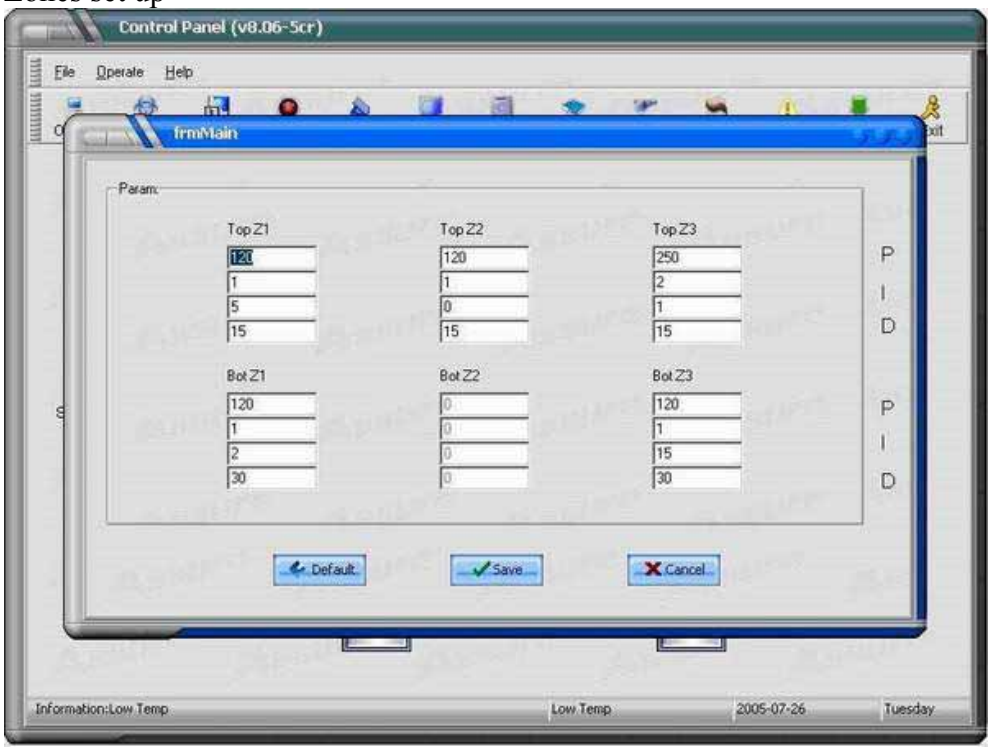
Control panels



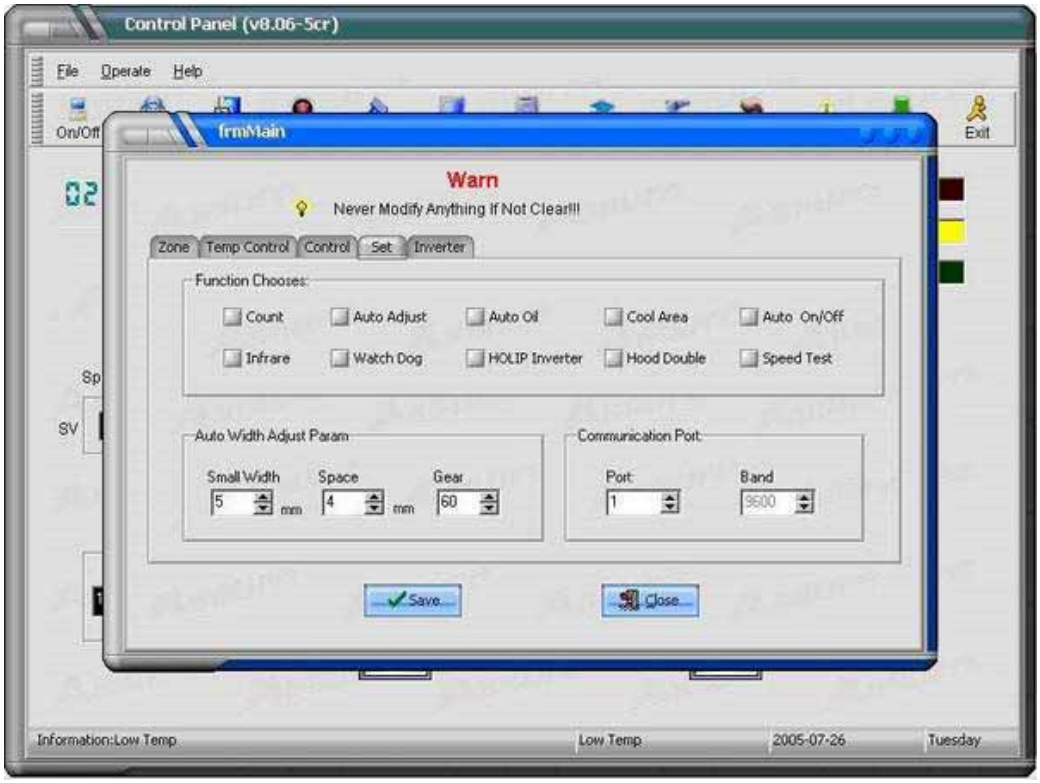
Control panel for models equipped with nitrogen

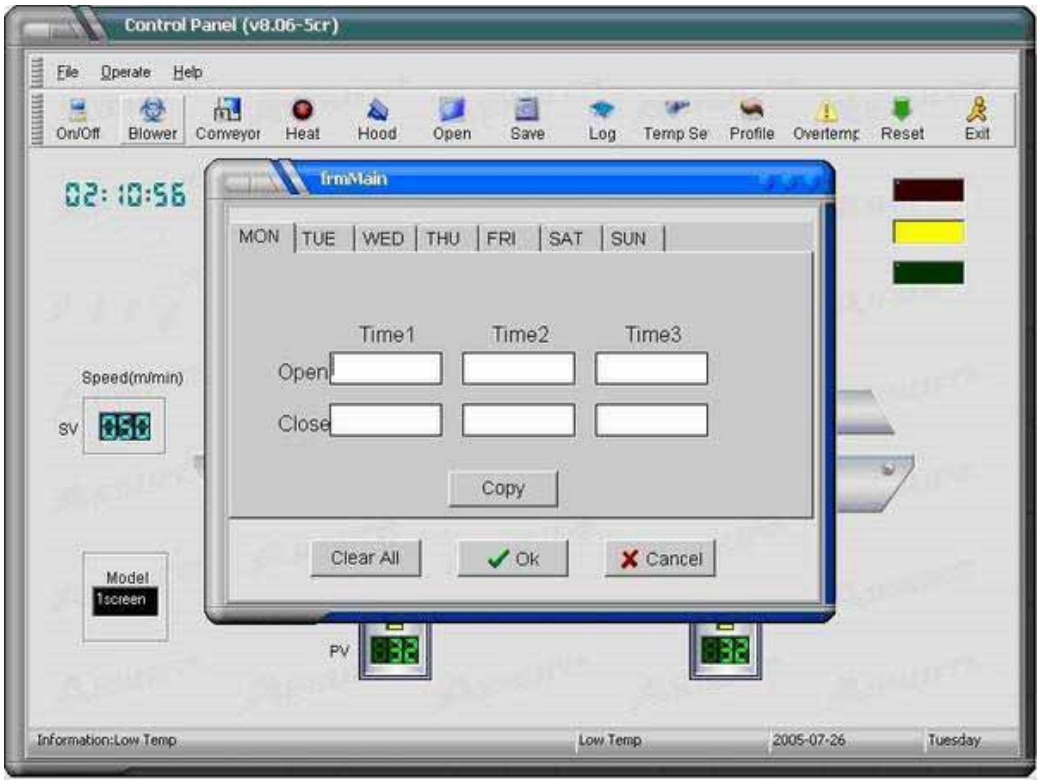


Zones set up


Control Panel (v8.06-5cr)
File Operate Help
frmMain
Param
Top Z1
Top Z2
Top Z3
120
120
250
1
1
2
5
0
1
15
15
15
Bot Z1
Bot Z2
Bot Z3
120
0
120
1
0
1
2
0
15
30
0
30
P I D
P I D
Default
Save
Cancel
Information:Low Temp
Low Temp
2005-07-26
Tuesday


Control Panel (v8.06-5cr)
File Operate Help
On/Off
Blower
Conveyor
Heat
Hood
Open
Save
Log
Temp Se
Profile
Overtemp
Reset
Exit
frmMain
Solid State Delay Out:
Top Z1
Top Z2
Top Z3
Bot Z1
Bot Z2
Bot Z3
SV
Control Led Out
Red
Green
Yellow
Warn
Close
PV
Information:Low Temp
Low Temp
2005-07-26
Tuesday


Control Panel (v8.06-5cr)
File
Operate
Help
On/Off
Exit
frmMain
Warn
Never Modify Anything If Not Clear!!!
Zone
Temp Control
Control
Set
Inverter
Function Chooses:
Count
Auto Adjust
Auto Oil
Cool Area
Auto On/Off
Infrare
Watch Dog
HOLIP Inverter
Hood Double
Speed Test
Auto Width Adjust Param
Small Width
Space
Gear
mm
Communication Port:
Port
Band
Save
Close
Information:Low Temp
Low Temp
2005-07-26
Tuesday


Control Panel (v8.06-5cr)
File
Operate
Help
On/Off
Blower
Conveyor
Heat
Hood
Open
Save
Log
Temp Se
Profile
Overtemp
Reset
Exit
02:10:56
frmMain
MON
TUE
WED
THU
FRI
SAT
SUN
Time1
Time2
Time3
Open
Close
Copy
Clear All
Ok
Cancel
Speed(m/min)
SV
Model
1screen
PV
Information:Low Temp
Low Temp
2005-07-26
Tuesday