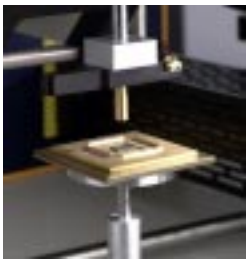
Why Buy A.P.E.?

A Simple Guide to Choosing The Right Rework System: Some Factors You May *Never* Have Considered!



You are shopping for a hot-air BGA rework machine. You want to find one that will handle your current rework tasks, yet will not be obsolete next year. Where do you start?

Most buyers typically select a unit or units that satisfy the task at hand, and then shop for the best price. Actually, this is not the most economical or effective use of resources! If a job requirement changes, or if new products are introduced, not considering the *total* capabilities of a rework unit before purchase can result in "early retirement" of that unit. By carefully analyzing the overall capabilities of a rework unit, this scenario can be avoided.

The trick is to buy a rework unit that will do the job at hand and everything else that you can imagine that will be soldered onto your circuit boards in the future.

Begin With The Demo - *Bring Your Own Board!*

Here's a tip – when participating in a rework equipment demo, use your own board! Make sure that the demo is done on your board, not a salesman's demo board. Any salesman can perform a successful demo on a board that he uses every day, over and over again. Don't settle for excuses, such as "Sure, we can do that, but I do not have the proper nozzle or tool." Also, if a special nozzle is required to rework your board, be sure to ask the price of that nozzle.

The 'Truth in the Pudding' about Actual Thermal Control

What type of thermal control does the system that you're looking at have? Virtually all hot air systems have some sort of digital control and display for setpoint temperature. The real test that the purchaser should subject the machine to is not to trust the LED that indicates, for example, 210° C., but whether or not, at that temperature indicated, a plastic part that will melt at 220° C. does not melt - sort of a 'truth' in the pudding.

Radar Board - A Tough Application

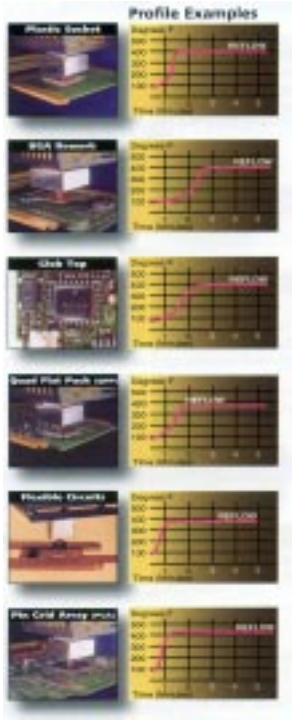
So what does it take, besides accurate temperature control, to rework the widest range of electronic components – including thermally-sensitive plastic parts, glob top BGAs, edge connectors, surface mount connectors and optoelectronic parts?

High Power/Low Temperature Rework

It takes a certain amount of energy to remove and replace any part. There are two ways to generate the required energy, either via temperature or via wattage. The calories of energy required must also be delivered in such manner as will not delaminate or burn the board. Simply being able to remove the part does not in itself solve the problem, since it usually takes even more energy to replace the part successfully.

Developing Thermal Profiles for Removal and Replacement

Every part that is going to be reworked needs a thermal profile. How capable is the machine that you are looking at when it comes to creating, storing, recalling, and running thermal profiles?

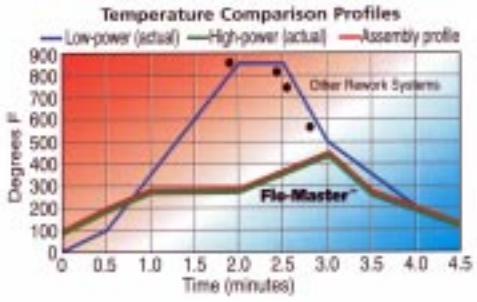


Advanced A.P.E. rework systems such as the Sniper can be easily programmed to match any profile needed. The machine's controller itself will store up to 16 different profiles, and each of those profiles can have as many as 16 heating zones. With a minimum of training, even the most complicated reflow profiles can

be run at the touch of a button. The Sniper can virtually duplicate the original manufacturing profile for optimum processing (and safety) of both the PCB and components. The Sniper's temperature control is extremely accurate(within +/- 5 degrees F).

Computer Control and Independent Control

Ask if the unit that you are considering buying is computer controlled. APE units can create profiles and store them within the unit's built-in controller itself, as well as on the PC that is supplied with the unit. Furthermore, the APE controller can recall and run these profiles independently even if the computer is not attached or is malfunctioning. This minimizes downtime and is designed to keep the customer up and running, something that competitive systems cannot do.



Since profiling often takes a lot of time, it is helpful if profiling can be changed or modified "on the fly" as process development is being done. This saves time and effort. A.P.E. rework systems are capable of profiling on the fly (adjusting the profile during the actual rework process).

Unlike other systems that will actually allow the operator to continue raising the temperature to dangerously high levels – even past the point where the board and/or component will burn - only A.P.E. equipment offers a "Preventive Overshoot" feature. Once the operator determines the maximum temperature that can be safely applied, the A.P.E. units will not allow that temperature to be exceeded during profile development, ensuring a safe profile and robust and repeatable rework process.

Does The Machine Offer 'Real' Preheating?

The solution now is probably to add pre-heating, since the thermal mass of the board *in the specific area of the component* must be overcome. The Delta-T (Temperature difference between the top and bottom of the board) should be minimal. By focusing the heat source directly under the part, the energy can be focused to the task at hand and not used to overcome the thermal threshold of the circuit board. Plastics do not conduct heat well and will hinder the caloric transfer. Using preheat for overcoming the thermal threshold of the board will complicate the process. In cases of heavy ground planes and metal boards the opposite it true. It is not likely that the plastics in the board will conduct enough energy to overcome the heat absorption of the board, and the part will be removable. The energy transfer from a pre-heat source can be regulated by varying the distance from the edge of the nozzle to the surface of the board. The distance is wholly dependent upon the wattage of the preheater. The only concerns are the true temperature of the air and the exhaust of the spent hot air.

Are You Buying Controllable, Effective Hot-air Preheating ?

Hot plates and IR preheaters are *not* recommended. Why? Because the thermal reaction times and energy transfer rates and efficiency are never consistent due to the nature of electronic devices. They can be used, however, for large metal and ground plane boards in limited applications, where the size of the board happens to match the size of the preheater in area. These devices heat only under a circuit board and have little capacity to ramp and soak to perform properly engineered repair scenarios and support the creation and running of complicated thermal profiles. They are also limited in their ability to preheat beyond the physical dimensions of the heating surface.

Hot air preheating, conversely, can be ramped, soaked and (on some systems) synchronized to the reflow process. This allows duplication of the actual manufacturing profile that was used in manufacturing the assemblies initially. Efforts to attain zero defect levels in repair and rework will eventually lead producers of some repair equipment to offer the advantages of hot air preheat in the future. For now, however,

During a rework equipment evaluation demonstration, ask to see an 0201 chip removed and replaced!

Photo courtesy of Vectron Inc. as originally published in *SMT* Magazine

non-convective preheat options are a cheap and easy way to offer apparent features of preheating with out the ability to actually preheat properly. Glob top BGAs and photoelectrical parts are very much heat sensitive and any attempt to preheat with marginally controllable heat sources is risky.

A.P.E. pre-heaters have the ability to cool under a circuit board. If a particular circuit board has an LCD display, conductive epoxy connectors, thermally sensitive parts, or back-to-back BGAs, the rework task is not only made possible, but also fairly simplified.

All A.P.E. pre-heaters also have the ability to focus underside heat, and are Z-axis adjustable. This allows the user to control proximity of the heater to the board, and thus concentrate the power to a very localized area allowing rework without preheating a large area. This feature is unique to A.P.E.

High power/low temperature has the ability to pump large amounts of thermal energy into high-mass boards such as solid copper or aluminum, or boards with heavy ground planes. High power doesn't mean high winds; the airflow through our heaters is only 12cfm, gentle enough that surrounding components are not moved or misaligned during reflow. High velocity hot air is sometimes used in low power rework systems (you can tell if components have been blowing around after reflow). If you have one of these systems, it is best to glue or tape the part into place prior to heating.

Less powerful systems also use large, area pre-heaters to compensate for their lack of heating power and use a computer to control their very, very hot process air. This often means removal and replacement times in excess of 15 minutes per cycle, in some cases. APE power delivers a comparable process time to an average of 3 minutes.

A.P.E. technology also facilitates the removal and replacement of parts that may be conformally coated, without the need to laboriously remove the coating first.

Precision construction results in a high placement accuracy – for the A.P.E. Sniper II, this accuracy is 0.001". The system can place hundreds of thousands of components without the need for alignment or calibration. Customers report that even after 24/6/300 and about 100,000 placements, no alignment was required. This means high repeatability, especially with highly accurate and repeatable stored thermal profiles, which ensure that the entire rework procedure from placement to reflow will be repeatable.

A.P.E. Capability: We Can Do All of This – and *More!*

Components

- CSP
- BGA
- Micro BGA
- LGAs
- BCC
- Area Array Packages
- CGA
- LCC
- PGAs
- 2.5 " X 2.5 " QFP
- Metal Top CGA And BGA
- Large Metal MCMs
- Copper Heat Sunk Power Amps

Chips

- 0201
- Flip Chips
- Glob Tops
- Stacked Memory Chips

All Types of Parts

- Plastic Parts
- Plastic Sockets
- SMT Connectors
- Barrel Plugs
- SMT Edge Connectors
- CPU Sockets
- Through-Hole Plastic Edge Connectors
- RF Shields
- RF Connectors
- Fiber Optic Parts

All Types of Boards

- Solid Copper
- Solid Aluminum
- Heavy Ground Planes
- Mylar Boards

Features and Capabilities

- True Full Board Pre-Heat
- Position PLCC And QFP *Without* Removal/ Replacement
- True Duplication Of Mfg. Profiles
- Pb-Free Compliant
- Back To Back BGA
- Z Axis Height Adjustable
- Lowest Ops. Temp Available
- Rework Through Conformal Coatings
- Rework Underfilled Components
- Auto Component Removal At Eutectic
- Minimum Pad Prep
- Re-Ball BGAs
- Component Stencil

Free Nozzle Exchange Program Saves Money!

When you purchase an A.P.E. system, you receive a set of 10 different nozzles of your choice. Only A.P.E offers its customers a free nozzle exchange program. Some manufacturers charge over $ 1,800.00 per nozzle if you need one, and once you have it – they don't want them back!

An accurate assessment of a prospective rework machine's capabilities – present and future – is key to making the right choice. Looking for "hidden" costs such as high-priced nozzles is another way to ensure early payback of your machine. The key word is capability, which also includes the flexibility to respond to many different applications. When all these factors are considered, A.P.E. rework systems are the obvious choice for all rework requirements.

Following are some typical examples of components in use today that actually require low-temperature rework. *These components cannot withstand high temperatures – but A.P.E. can rework all of them safely!*

- Glob Top BGAs **PHOTO**
- Plastic Sockets
- Plastic Parts
- CPU Sockets
- Through-Hole Edge Connectors
- SMT Surface Connectors **PHOTO**
- SMT Edge Connectors
- Fiber Optic Parts
- RF Connectors
- RF Shields **PHOTO**