THE RIGHT RESULT.

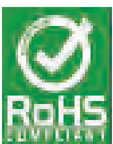
The right SMT solder products, and the right process, yields

AMTECH

A leader in advanced SMT solder products, AMTECH combines product innovation, advanced quality assurance systems, technical support and individualized customer service to consistently deliver

THE RIGHT RESULT.

AMTECH Inc. is an ISO 9001:2000 certified supplier committed exclusively to the board assembly market. Here at AMTECH, we strive to provide high quality SMT solder pastes and a wide range of process support products, backed by customer service levels unequaled in the industry. Our goal is to help you achieve defect-free assembly. The following pages contain information which serves as a guide to understanding the proper materials and equipment related to this complex process.



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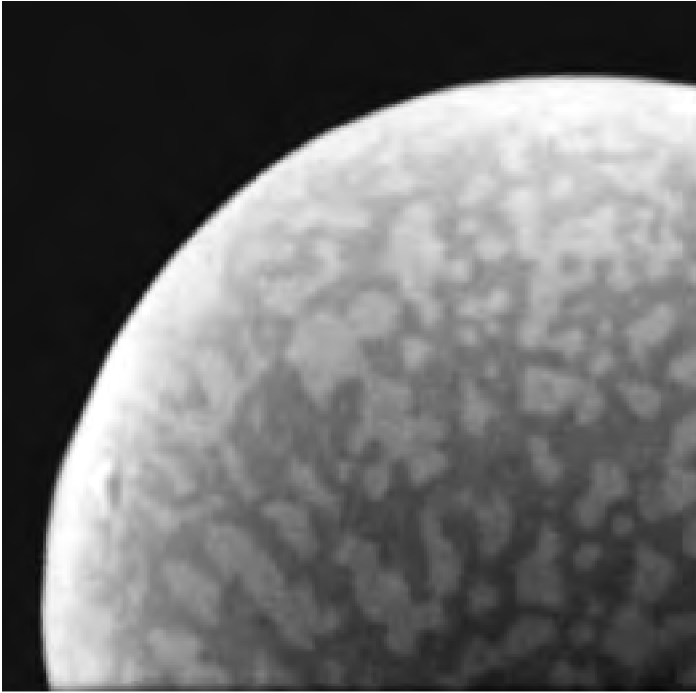
Introduction



62Sn/36Pb/Ag2 solder powder particle enlarged from 1000x scanning electron micrograph.

Since Surface Mount Technology (SMT) was introduced in the 1960's the process has become the state-of-the art in electronics assembly. By placing components on the board surface rather than through the board, PCB manufacturers have realized significant production benefits and cost savings. The shift to SMT has focused attention on the solder joints that now provide the electrical pathway from the component to the board, as well as the mechanical connection. As chip sizes and lead pitches have decreased — with a corresponding increase in lead counts — the mechanical and electrical properties of the solder joint have become ever more critical.

Powder and Alloys

To make the best solder paste, you start with the best solder powder. Only the highest quality solder powder is used in AMTECH products — solder powder manufactured by Advanced Metals Technology Incorporated (AMT). Solder powder quality is determined by alloy purity, particle size, shape and distribution, oxide levels, and lot-to-lot consistency. All of the alloys manufactured by AMT exceed the applicable IPC, QQS and J-Standard specifications.

AMT's proprietary processes allow the tightest control over size, shape and oxide levels in the industry. The degree of sphericity is related to the oxide levels of the powder. Generally, the more irregulars present, the higher the oxide level. Solder alloys cannot exist in free-flowing powder form without a thin oxide coat, but through a controlled production and classification process, AMT consistently produces the lowest oxide powder available. One of the properties of finer size powder is that, as the particle diameter decreases, the ratio of surface area (and therefore oxide level) to mass or volume increases. However, a major contributor to the higher oxide levels typically found on smaller particles is the extensive processing most other manufacturers require to produce these finer sizes. Excessive processing thickens the oxide layer. Through advanced technology, AMT makes ultra fine powder without excessive oxide levels.

Advanced technology means working to develop better, stronger and safer alloys for the electronics industry.

A cooperative effort with Hughes Aircraft led us to the development of a fatigue resistant solder that can prolong the life of solder joints exposed to cyclic stress. Ongoing research and development will continue to help us bring the latest in soldering technology to the circuits assembly industry.

No-Lead Solder Development

Current industry work on developing lead-free alternatives to the standard 63Sn/37Pb and 62Sn/36Pb/2Ag eutectic alloys has focused on altering the composition of the Sn-Ag eutectic alloy. The various proposals center on two approaches:

1- Substituting a Sn-Cu eutectic for the Sn-Ag eutectic alloy.

2- Modifying the Sn-Ag eutectic with small additions of other elements such as Sb, Cu, Bi or Ni.

In the first instances, the rationale of the Sn-Cu eutectic is to reduce the leaching of Cu from the pads of the circuit board and thereby reduce the formation of the Sn-Cu intermetallics and the resulting embrittlement of the solder joint. In the second instance, the additions lower the melting point of the alloy by a few degrees, and by reducing the Ag content, lower the cost of the resulting alloy.

However, it is the position of AMT that both of these approaches introduce factors that have not adequately been addressed:

1- Data on the Sn-Cu eutectic is extremely limited. The melting point of the 99.3Sn/0.7Cu alloy is reported as 227°C, which is higher than the 96.5Sn/3.5Ag eutectic of 221°C, for which there is plentiful data. Although the introduction of Cu into the alloy will reduce the concentration gradient of the Cu between the pad and the solder joint, the effect will be to lower the diffusion rate of the Cu; it will not eliminate the diffusion completely. Consequently, the resulting joint will be in a non-equilibrium state, and the actual properties of the joint will be largely determined by the cooling rate following reflow. Finally, the higher melting point will require peak temperatures in the reflow oven that will seriously affect the components currently available.

2- The multiple component variations of 96.5Sn/3.5Ag only lower melting temperatures by 3-4 degrees. The slight lowering of the melting point is insignificant when compared to the ability of reflow ovens to maintain precise temperature control, or the ability to accurately profile complex circuit boards. In addition to the lack of long-term reliability data, these multi-component systems have other problems. Due to the number of components, the thermodynamics (Gibbs phase rule) indicates that there will be a large number of phases present in the equilibrium state.

Unfortunately, the standard reflow conditions do not permit equilibrium conditions to exist. Consequently, the solder joint formed immediately after reflow will not be the solder joint that exists some time later. In addition, the distribution of phases following reflow will be largely determined by cooling rates, implying there can and will be wide variations in solder joint properties, even across a single board.

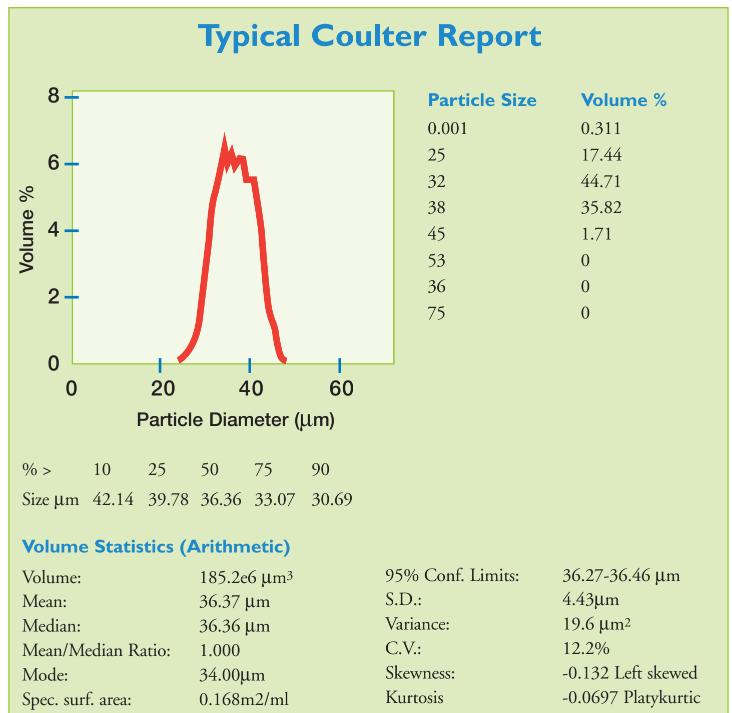
It is AMT's position that for the immediate future, the most predictable lead-free solder joint is the Sn-Ag eutectic. Its properties are well documented and its shortcomings are no greater than currently proposed alternatives. In its own development work, AMT is working on a number of alloys with melting points in the neighborhood of the standard Sn-Pb and Sn-Pb-Ag eutectic. Getting the right melting point is only part of the problem. AMT is utilizing the same principles utilized in the development of the Fatigue Resistant Solder (using non-alloying dopents) to get the desired metallurgical properties in no-lead.

Meanwhile, AMT and its subsidiary, AMTECH Solder Products, Inc. can and will provide powder and paste to customers who want the currently proposed lead-free alternatives.

Particle Size and Consistency

Classification of powders has been a much-disputed area. A good deal of the controversy centers on the tools available for analysis. Until the advent of computers, determining the particle size distribution was carried out through the use of test sieves or screens. This technique was fairly quick and easily carried out by personnel with little training. With particle size distributions that ranged from 150µ – 20µ (-100/+635 mesh) the technique was adequate. However, the demand for more restrictive size distributions pointed out a lack of precision and resolution of test sieves. The development of supplemental sizing techniques (e.g., the Coulter method) permits more precise characterization of powder distribution.

However, the labeling of a given powder distribution is still tied to sieve designations. Unfortunately, these designations can be misleading since test sieves have defined tolerances from sieve to sieve as well as tolerances in the openings of a given sieve. It is much more prudent to specify a given distribution by stating the actual particle diameters required. Saying that a powder contains particles between 45µ and 25µ (-325/+500 mesh) still does not define the distribution. Two powder samples may have the same average particle size (whether the average is calculated on a weight percent basis or population basis) but have widely different properties.



Therefore, to properly specify a powder, it is necessary to recognize that it is a population of particles, and it is necessary to characterize that population in terms of the distribution of parameters that are important to the particular application.

The demand for finer pitch printing and the development of no-clean pastes require proper characterization of the powders used in solder pastes and creams. Considering Stokes Law ($F=6\pi a\eta v$, where F is the force on a spherical particle of radius a and velocity v in a medium of viscosity η) for the behavior of particles in a viscous fluid, it is seen that variation of size distribution in a solder paste will have a significant impact on the rheology with a corresponding effect on the paste's printing characteristics. Secondly, with no-clean pastes, it is imperative that solder balling be nonexistent.

This requirement demands that the printed solder paste come to reflow temperature uniformly. This can only occur if the individual solder particles are heated at the same rate, which requires that they have nearly the same specific area. Hence, the size distribution must be uni-modal with a small standard deviation. Under these conditions the paste will have a consistent rheology and the oxide content of the powder will be tightly controlled. A beneficial side effect will be metallurgical uniformity in the powder particles themselves, which will promote a metallurgically sound solder joint. Of course these specifications will preclude irregular particles and multi-modal distributions.

Solder Paste Chemistry

Solder paste (sometimes referred to as solder cream) is made up of the powdered alloy and the flux binder system. As the name implies, one of the system's duties is to act as a flux. Lead finishes are normally covered by thin films of tarnish, which can be described as two layers, differentiated by the way they are bound to a surface. Located directly on the metallic substrate and chemically bound are the layers of oxide, sulfide and carbonate, as well as products from any preceding production steps. On top of this layer is the physically bound absorption layer. Absorptive forces attract residues including water, gases and residues from preceding reactions, which will collect on the first layer. Therefore, the specific requirements for a flux are:

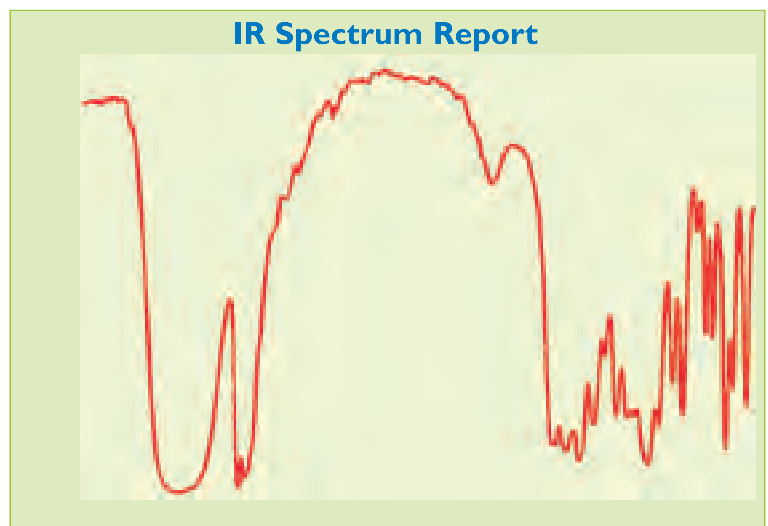
- The dissolution of the outer absorption layers.
- The displacement of the chemically bound reaction layer.
- The dissolution of some of the substrate molecules to permit metal diffusion.

The flux binder system has to perform many additional tasks during the life of the paste. It must:

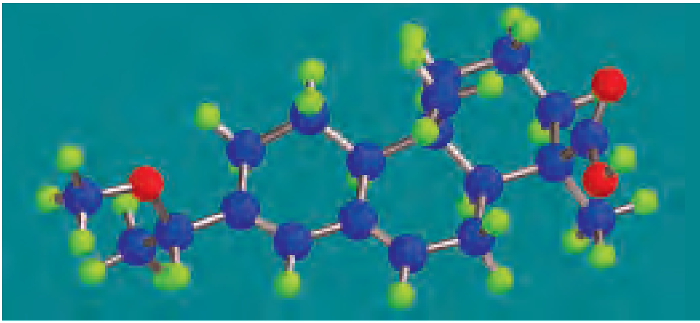
- Suspend the powder so it does not separate in the container.
- Protect the powder from oxidation without reacting with the surface at storage temperatures — to promote a long shelf life.
- Give the paste thixotropic properties to aid in the printing and releasing from the stencil.
- Provide enough tack to allow for processing time between printing and component placement and between the placement and reflow.
- Perform the fluxing actions to promote coalescence of the molten solder.
- Protect the freshly cleaned surfaces from re-oxidation prior to reflow.
- Leave a residue that can be easily cleaned in the selected process, or if left on, be non-conductive, non-corrosive and not interfere with or detract from visual inspection or mechanical testing of the assembly.

RMA pastes were the major type used for SMT applications. Rosin, along with the proper solvent, activator system and rheology modifiers, was able to meet all of the above criteria. The residues could be left on most assemblies without concern or could be easily removed with the then readily available chlorofluorocarbons (CFCs). The adoption of the Montreal Protocol has phased out the production and use of CFCs with total elimination not too far away. The elimination of CFCs as a cleaning option presented a problem to manufacturers. Customers had become accustomed to sparkling clean assemblies and would not settle for less. Drop-in replacements for CFCs were not yet perfected.

New solutions were needed for customers who wanted cleaned assemblies leading to the development of water-washable assemblies. The other alternative was to modify the RMAs to leave a less tacky, less noticeable, cosmetically acceptable residues. Today, there are two main options for post reflow residues, they can be cleaned or left on the board. Presently, a different flux binder must be chosen for each option. The benefits of cleaning include better looking boards, easier visual and bed-of-nails inspection (ICT), better adhesion for conformal coatings and removal of residues and contamination from other manufacturing processes. Cleaning also allows the use of more aggressive fluxes to widen



IR spectrum of a polyhydric alcohol, the primary component of AMTECH's polymer activator.



Molecular model of abietic acid, the primary component of rosin.

the process window, with less concern over the solderability of boards and components. Another concern has been raised over the effect residues will have on high frequency circuits.

The first water-washable pastes had very short working lives, measured in minutes, and also left residues that had to be removed almost immediately to avoid corrosion problems. Developments in formulation technology have resulted in significant improvements in the succeeding generations of water washable formulas. Today, formulations are available which offer excellent working life and activity, with reduced concerns for corrosiveness prior to cleaning.

The main benefits of leave-on formulations are that they reduce manufacturing operations, saving on equipment and the associated expenses of labor, maintenance, power, chemicals and waste treatment. Many leave-on formulations offer RMA activity and robustness in a no-clean product. Newer formulations also have reduced residue levels thereby addressing cosmetic concerns. Visual inspection has resulted in potentially damaging rework being done on solder joints that were merely cosmetically unacceptable while passing defective joints. Also, as board complexity increased, the practicality and reliability of visual inspection decreases. With the increased use of J-leads and BGAs, unaided inspection is impossible. The assembler must make the leap of faith that if his process is in control, the solder joints will be acceptable. In developing a leave-on formulation, the ultimate goal is no residue. The drive for less residue is accomplished in two ways. The first is to increase the percent metal. A small increase in weight percent makes a large difference in volume percent. The second way is to reduce the total non-volatiles in the flux.

When one or both of these modifications are used, all of the paste parameters are affected. In the very low residue formulations, the flux is no longer able to prevent re-oxidation of the cleaned surfaces prior to reflow. To combat this situation, many ovens are being designed with a nitrogen option. The nitrogen displaces the oxygen and reduces both the potential for re-oxidation and the charring of any remaining residue. The user must decide if the added expense in nitrogen and process modifications is justified for his particular product.

The R&D team at AMTECH continues to develop formulations that give manufacturers the widest possible process window. A new generation of no-clean solder paste has been developed using synthetic poly-adduct components instead of traditional organic-based solder rosins/resins. This new synthetic technology delivers performance advantages such as improved thermal and photochemical stability, unparalleled lot-to-lot consistency, reduced scrap and rework, and higher hourly throughput. Due to the rigid structural integrity of the poly-adduct components, isomerization of the resin is inhibited compared to conventional rosin technology. A unique aromatic solvent system homogeneously suspends the poly-adduct so that no crystallization occurs during the processing of the paste, including printing and placing of components. The unique solvency of the flux enables higher metal loading: 91% in printing applications; and 88% in dispensing applications. Furthermore, the high thermal stability of the poly-adduct makes it ideal for use with many different alloys, including some of the high temperature lead-free alternatives.

Paste Deposition

The primary method for paste deposition is the stencil printing process. The increased complexity of board design has led to tighter tolerances for the printing process. This progression has resulted in a shift from screens to stencils and the increasing popularity of polymer-coated metal blades. The consistent deposition of solder paste is the first step in controlling the SMT process. Having the proper amount of paste will enable the formation of a solder joint with the proper fillet geometry, which will determine the thermal and mechanical properties of the joint. Too little solder paste can result in opens or mechanically and metallurgically weak joints. Too much paste can lead to bridging. Also, excess solder will make the joint less compliant and more prone to cracks due to component/substrate thermal coefficient of expansion (TCE) mismatch.

The printing process involves using a squeegee to roll the paste across the stencil surface. The paste fills the apertures corresponding to the pads, and releases onto the pads as the stencil is separated form the board. Many factors combine to determine the success of the printing process. These factors include the printer itself, the stencil, the squeegees, the operators and their training, the environmental conditions, the board characteristics and the solder paste. Optimizing these factors is the key to printing consistently.

AMTECH has found excellent results both in the lab and in the field by using 4–6 mil metal stencils with metal blades in the on-contact printing mode. Squeegee pressure should be just enough to wipe the stencil clean, with print speeds in the range of 10–100 mm/sec. The design, quality and accuracy of the stencil become increasingly important; as the openings and spacing decrease, tolerances become much tighter. Recent improvements in the fabrication of stencils have resulted in less variation in apertures, less roughness in the walls, and more uniform prints.

An often-overlooked cause of print variation is the preparation of the bare boards. Uneven leveling on fine pitch pads can lead to voids or insufficient solder. This is one reason for the increased interest in organic solderability preservatives (OSP) as an alternative to hot air solder leveling (HASL). Solder paste factors for printing include powder size and shape, percent metals and viscosity of paste. For applications down to 16 mil, AMTECH recommends our –325/+500 mesh powder. For 16 mil and below, the –400/+500 mesh powder gives increased resolution without an excessive number of fines. For stencil printing the range of 89–91 percent metal is recommended, as well as viscosity range of 180–340 Malcom (700–1400 Kcps Brookfield).

The conventional instrument for viscosity measurement has been the spindle type viscometer. AMTECH has found the spiral pump viscometer to be more repeatable and more representative of the shear actually experienced in the printing process. AMTECH currently tests at 5, 10 and 20 rpm, with the 10-rpm reading being the reported measurement, also expressed in Kcps.

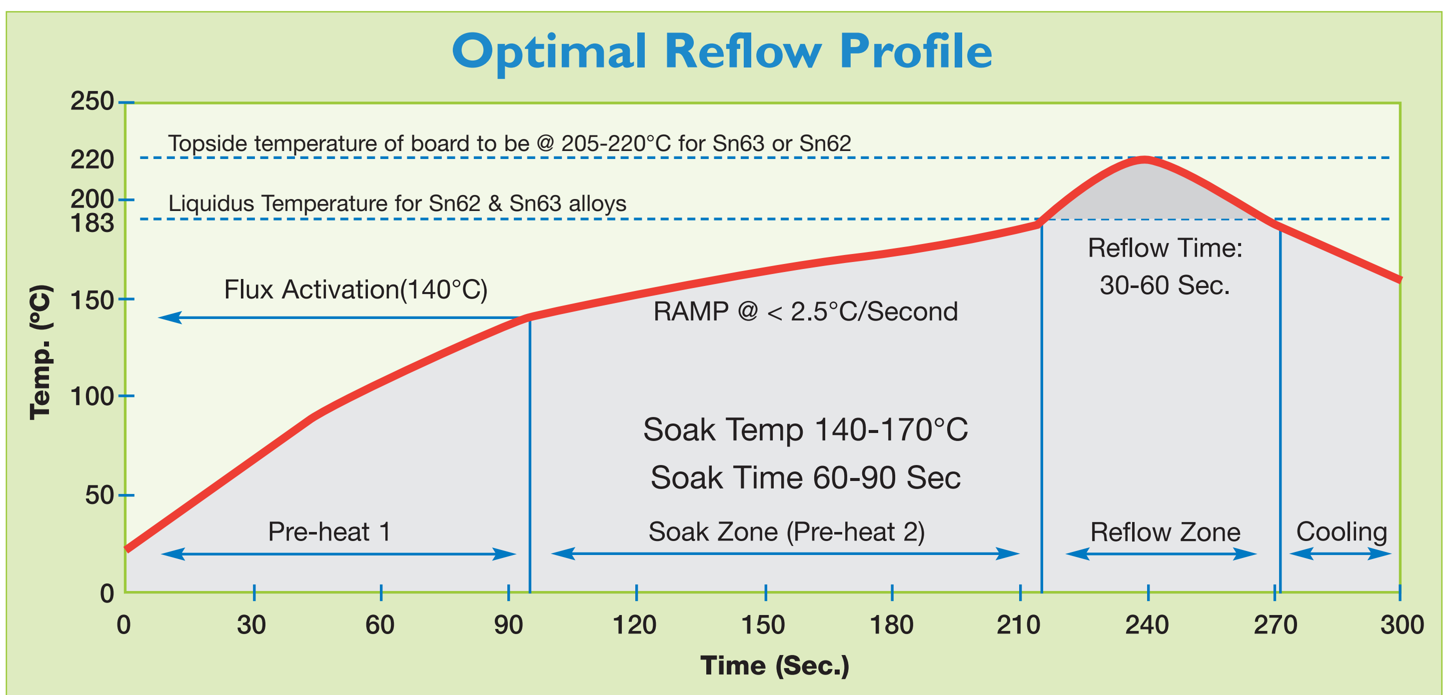
Reflow

An optimal reflow profile is the most critical factor in achieving soldering quality solder joints on a printed circuit board (PCB) assembly with surface mount components. The profile is a function of temperatures applied to the assembly over time. When graphed on a Cartesian plane, a curve is formed that represents the temperature at a specific point on the PCB, at any time, throughout the reflow process.

Several parameters affect the shape of this curve; the most critical of which are the conveyor speed and temperature settings in each zone. The belt speed determines the duration at which the board is exposed to specific temperatures set in each zone. Increasing this duration will allow more time for the assembly to approach the temperature set in that zone. The sum of the duration spent in each zone determines the total process time.

The temperature setting in each zone affects the speed with which the PCB temperature rises. A high temperature produces a greater temperature differential between the PCB and the zone temperature. Increasing the set temperature of the zone allows the board to reach a given temperature faster. A graph or chart must be generated to determine what the PCB's temperature profile is. The following is an outline of the procedure, known as profiling, needed to generate and optimize this chart.

Before starting the profiling procedure, the following equipment and accessories will be required: A thermal profiler, thermocouples, a means of attaching the thermocouples to the PCB, and a solder paste Technical Data Sheet (TDS).



Many reflow machines available today include an on-board profiler, even some of the smaller, less expensive, bench-top ovens. If the oven being used is not equipped with a profiler, after market temperature profilers are available.

These profilers generally fall into two categories: a real-time profiler transmits the temperature/time data and creates the graph instantaneously, while other profilers capture and store the data for uploading to a computer later.

The thermocouples used to profile a PCB should be of sufficient length as required for the profiler, and must be capable of withstanding typical oven temperatures. In general, thinner gauge thermocouples are more desirable because they produce accurate results (small heat mass increases responsiveness). They are also more delicate and fragile, requiring care when handled to prevent breakage. There are several ways to attach thermocouples to the PCB. The preferred method is to attach the thermocouple tip using high-temperature solder such as a tin/silver alloy. Use the smallest amount of solder possible. Another acceptable method is quick, easy and adequate for most applications. A small dab of thermos compound is applied to the thermocouple tip, which is then attached using a high-temperature tape such as Kapton. The attachment location should also be determined. Normally, it is best to attach the thermocouple tip between a PCB pad and the corresponding component lead or metalization.

A solder paste specification sheet is also necessary. AMTECH supplies a Technical Data Sheet for each paste formula we produce. This sheet will contain information critical to the profile such as desired profile duration, paste activation temperature, alloy melting point and desired reflow peak temperatures. A basic understanding of an ideal profile is necessary prior to starting. A theoretically ideal profile is made up of four parts or zones. The first three zones are heating and the last is cooling. Ovens that contain more zones enhance the ability to achieve better control in the reflow process. Most solder paste can be successfully reflowed with four basic zones.

The preheat zone, also referred to as the ramp zone, is used to elevate the PCB temperature from ambient to the desired activation temperature. In this zone, the temperature of the product is constantly rising at a rate that should not exceed 1 to 3°C per second. Raising the temperature at a fast rate may induce defects such as micro-cracking of ceramic chips. The oven's preheat zone should normally occupy 25 to 33 percent of the total heated tunnel length.

The activation zone is sometimes referred to as the dry-out or soak zone. This zone, which normally makes up 33 to 50 percent of the heated tunnel length, is responsible for two functions. The first is to expose the PCB to a relatively steady temperature that allows components of different mass to become homogenous in temperature by reducing their differential. The second is to allow the flux to activate and the volatiles to escape from the paste. Common activation temperatures normally range between 120°C and 150°C. The slope of the profile curve can also be an upward increasing gradient. This is used to provide a higher percentage of flux for the liquidous stage of the profile, most commonly used with no-clean solder paste. Some commercially available ovens are not capable of maintaining a flat activation profile; choosing one that can will enhance the solderability and afford the user a wider process window.

The reflow zone is sometimes referred to as the spike or final zone. The function of this zone is to elevate the temperature of the PCB assembly from the activation temperature to the recommended peak temperature. The activation temperature is always somewhat below the melting point of the alloy, while the peak temperature is always above the melting point. Typical peak temperatures range between 15-40°C above the alloy's liquidus temperature. Setting too high a temperature in this zone may cause the ramp rate to exceed 1 to 3 degrees per second or to achieve a reflow peak above what is recommended. This condition may cause excessive warpage, delamination or burning of the PCB material and may compromise the integrity of the components.

The most popular alloy used today is Sn63/Pb37. This proportion for tin and lead make the alloy eutectic. Eutectic alloys are blends that reach liquidus and solidus at the same temperature. Non-eutectic alloys have a melting range, sometimes referred to as a plastic state, rather than a melting point. For now all examples will refer to eutectic tin/lead because it is the most widely used alloy. The melting point of this alloy is 183°C.

The ideal cooling zone curve should be a mirror image of the reflow zone curve. The more closely this curve mimics the reverse of the reflow curve, the tighter the grain structure of the solder joint will be upon reaching its solid state, yielding a solder joint of higher quality and bonding integrity. The first parameter to be considered in creating a profile is the conveyor speed setting. This setting will determine the time that the PCB will spend in the heating tunnel. Typical paste manufacturer specifications require a three to four minute heating profile. To calculate the ideal conveyor speed, divide the total heated tunnel length by the total heated exposure speed. For example, when a solder paste that requires a 4-minute profile is used in an oven with 6 ft heated tunnel length, the calculation is as follows: 6 feet divided by 4 minutes = 1.5 feet per minute, or 18 inches per minute.

Setting of the individual zone temperatures must be determined next. It is important to note that the actual zone temperature is not necessarily the temperature displayed for that zone. The display temperature merely reads the temperature of the thermocouple located somewhere within the zone. If the thermocouple is located closer to the heating source, the displayed temperature may be considerably higher than the zone temperature. The closer the thermocouple is located to the path of the PCB, the more likely it is for the display temperature to reflect the zone temperature. The table below lists zone temperature settings used to reflow a typical PCB assembly.

Typical PCB Reflow Zone Temperature Settings

Zone	Zone Set Temp.	Actual Board Temp. at end of zone
Preheat	210°C (410°F)	140°C (284°F)
Activation	177°C (350°F)	150°C (302°F)
Reflow	250°C (482°F)	210°C (410°F)

Now that the speed and temperature have been determined, they must be entered into the oven controller. Consult the oven manufacturer's owner's manual to determine other parameters that may need to be adjusted on the oven. Such parameters may include cooling fan speed, forced-air impingement and inert gas flow. Once all parameters are entered, the machine may start, and profiling can begin after the oven has stabilized (i.e., all the actual displayed parameters closely match the present parameters). Next, place the PCB to be profiled on the conveyor and trigger the profiler to start recording. For convenience, some profilers include a triggering feature that automatically initiates the start of the profiler at a relatively low temperature. Typically, this temperature is slightly higher than the human body temperature of 37°C (98.6°F). For example, an automatic trigger at 38°C (100°F) allows the profiler to start working almost immediately upon the PCB entrance into the oven, yet does not jeopardize false triggering by thermocouple handling with human hands.

Once the initial profile graph is generated, it can be compared to the profile recommended by the paste manufacturer. First, it is necessary to verify that the overall time from ambient temperature to the reflow peak temperature corresponds to the desired heated profile duration. If the time is too long, increase conveyor speed proportionally. If the time is too short, do the reverse.

Next, the shape of the graph curve must be compared to the one desired. The deviations should be considered from left to right (process order). For example, if a discrepancy exists in the preheat and reflow zones, make adjustments to correct for the preheat deviation first. It is generally preferable to change only one parameter at a time and rerun the profile prior to making further adjustments. This is because a change in any given zone is likely to also affect the results in subsequent zones. It is also recommended that a novice make adjustments of relatively smaller increments. Once experience is gained with a particular oven, a better "feel" will be acquired for the magnitude of adjustments that need to be made.

When the final profile graph matches the desired graph as closely as possible, the oven parameters should be recorded or stored for later use. Although the process may be slow and painstaking at first, proficiency and speed will be gained in time, resulting in efficient production of high-quality PCBs.

Solder Pot Analysis

AMTECH offers affordable and accurate analysis of your solder pot. Solder pot analysis is recommended every 30 days to ensure solder alloy integrity. The test consists of a comprehensive analysis of 1 to 2 lbs. of pot material. AMTECH tests for the following contaminates: Tin, Antimony, Gold, Copper, Cadmium, Indium, Zinc, Aluminum, Iron, Bismuth, Silver, Nickel, Sulfur, Phosphorus and Arsenic.

Solder Pastes

Designed for advanced SMT requirements

AMTECH is committed to bringing you the most advanced solder paste formulations available. We back our products with a highly trained staff ready to support you with all of your present and future assembly requirements.

All AMTECH solder pastes conform to ANSI/J-STD-006 and are available for immediate delivery in jars, cartridges, syringes and ProFlow Cassettes. They are also available in FreshMix™ kits. All AMTECH lead-free products meet the requirements of RoHS directive 2002/95/EC with lead content guaranteed at <200ppm.

Our customer representatives are ready to discuss your SMT requirements. We offer a short turn around time on orders and can ship to meet your just-in-time requirements. To help us meet your particular needs, please provide us with information on your alloy, flux type, powder size and packaging preferences. If you are not sure which combination is best for your process or have questions regarding soldering techniques, procedures or products, our technical support staff will assist you.

Featured Product

LF-4300 & 4300

Is there anything these solder pastes can't do?

LF-4300 (lead-free) and 4300 (tin-lead) synthetic solder pastes offer true multi-process capabilities, no-clean formulas that are also water washable, able to be cleaned using standard aqueous cleaning systems without saponification. LF-4300 and 4300 deliver ideal printing characteristics, unparalleled lot-to-lot consistency and extremely long stencil life and abandonment time, allowing PC assemblers to change shifts or experience prolonged downtime without jeopardizing production yields. They are also VOC and halide-free, and classified as REL0. When used as a no-clean, their flux residue remains clear and meets S.I.R. requirements as per IPC-TM-650.2.6.33. Unique features include:

- LF-4300 complies with RoHS directive 2002/95/EC
- Suitable for high temp. alloys up to 300ºC
- RELO flux classification
- Low voiding, no mid-chip beading
- 12-hour stencil life, 24-hour abandonment time
- Pin Probable for ICT inspection
- Compatible with AOI inspection
- Works well in convection and vapor phase processes

No-Clean Solder Pastes		Class
SynTECH	The SynTECH series solder paste is a synthetic poly-adduct designed to exceed requirements for reliable solder joints in SMT PC board assemblies. This paste was formulated to replace traditional rosin/resin based no-clean formulations with more reliable synthetic materials. The residue is pin probable for ICT inspection. The SynTECH series does not require refrigeration if left at room temperature for 6 months and has a 12-month refrigerated shelf life.	REL0
NC-559	The NC-559 series is designed to meet requirements for reliable solder joints in SMT PC board assemblies. This formula was designed to have a wider process window and better compatibility with OSP surfaces. This formulation exhibits long print life in continuous printing operations. Residue can be removed using traditional solvents or Kyzen's Aquanox® with semi-aqueous systems.	REL0
NC-559-AS	The 559-AS solder paste was formulated with an extended tack and stencil life. The residue of 559-AS is pin probable for ICT inspection. This formula is designed to be very robust with a wider profiling window.	REL0
NC-559-ASM	The NC-559-ASM is a modified version of the NC-559-AS that contains a U.V. tracer for easier flux splatter inspection. This modified version is completely odorless. This product is designed for manual or semi-automatic stencil printing, where the operator is exposed to the smell of the product.	REL0
NC-560-LF	NC-560-LF is an RoHS-compliant lead-free, no-clean solder paste that delivers improved solderability with all Pb-Free metallization, including ENIG (Gold), OSP, HASL and immersion silver boards. NC-560-LF increases production yields with its unparalleled lot-to-lot and stencil printing consistency, and offers superior print performance characteristics, including excellent wetting, strong activity, ideal viscosity, long stencil life, thermal stability up to 300oC, and minimal residue. NC-560-LF is also low beading, low voiding, and anti-tombstoning to reduce scrap and rework.	REL0
SynTECH-LF Lead-Free	SynTECH-LF has been formulated to work with all lead-free formulations, including lead-free tin/silver/copper alloys without compromising SIR values. It is compatible with many lead-free board finishes and delivers excellent wetting with a light colored residue. Residues can be removed using traditional solvents or Kyzen's Aquanox with semi-aqueous systems. Kyzen's Aquanox saponifiers can be used to remove flux residues.	REL0
LF-4300	A revolutionary new lead-free solder paste, LF-4300 offers true multi-process capabilities, a no-clean formula that is also water washable without saponification. Highly versatile and forgiving, LF-4300 uses synthetic materials for unparalleled lot-to-lot consistency and ideal printing characteristics (no mid-chip beading, low voiding and anti-tombstoning). LF-4300 is also compatible with high temperature alloys. It's also VOC and halide-free, and features 12-hour stencil life and 24-hour abandonment time.	REL0
4300	A revolutionary new solder paste designed for tin-lead alloys. 4300 offers true multi-process capabilities, a no-clean formula that is also water washable without saponification. Highly versatile and forgiving, 4300 uses synthetic materials for unparalleled lot-to-lot consistency and ideal printing characteristics (no mid-chip beading, low voiding and anti-tombstoning). This solder paste is VOC and halide-free, and features 12-hour stencil life and 24-hour abandonment time.	REL0

Water Soluble Solder Pastes		Class
WS-486	The WS-486 is a non-resin formula that was developed to replace earlier water-soluble creams, containing no insoluble components. Excellent printability and stencil life is obtained for the most demanding applications, including hard to solder metallization, and harsh operating environments.	ROL0
WS-488	This formulation is based on the popular WS-486, with slight modifications to increase the production window. Excellent printability and stencil life is obtained for the most demanding applications, including hard to solder metallization, and harsh operating environments.	ROL0
NWS-4100	The AMTECH NWS-4100 series is a new class of water washable formulations. Scientists at AMTECH have developed a water-soluble version of the innovative polymer-dendrimer activator system. This activator system, coupled with a highly stable, clean rinsing binder, provides the excellent activity, working life, and cleaning needed for today's demanding applications. Excellent in reducing voiding with BGA packages. Residues can be removed with de-ionized or soft tap water at 130-150°F..	REM0
NWS-4200	The AMTECH NWS-4200 series is a water washable formulation. This formulation uses the innovative polymer-dendrimer activator system. This activator system, coupled with a highly stable, clean rinsing binder, provides an increased activity. Excellent in reducing voiding with BGA packages. Residues can be removed with de-ionized or soft tap water at 130-150° F.	REM0
NWS-4200-4	The AMTECH NWS-4200-4 series is a new class of water washable formulations designed for difficult/oxidized pads and parts as well as OSP surfaces. This activator system, coupled with a highly stable, clean rinsing binder, provides excellent activity and working life. This formulation is not designed for BGA packages.	REH0
NWS-4200-6	The AMTECH NWS-4200-6 series is a new class of water washable formulations designed for difficult/oxidized pads and parts as well as OSP surfaces. This activator system, coupled with a highly stable, clean rinsing binder, provides excellent activity and working life. This formulation is not designed for BGA packages. Also designed for the use of lead-free parts on a tin-lead process.	REH1
NWS-4200-4P3	The AMTECH NWS-4200-4P3 series is a water washable formulation designed for difficult/oxidized pads and parts as well as OSP surfaces. AMTECH developed this water-soluble version to be used in a very dry environment. This product will maintain its tack time and stencil life as it is coupled with a highly stable, clean rinsing binder that provides excellent activity. This product is not recommended for BGA packages.	REH0
NWS-4200-LF	The AMTECH NWS-4200-LF is a water washable formulation that is formulated and designed to meet the reflow temperatures for lead-free alloys. The NWS-4200-LF exhibits exceptional print, long stencil life, and a wide reflow window. This Pb-free solder paste can maintain excellent cleanability even at elevated reflow temperatures.	REH1
LF-4300	A revolutionary new lead-free solder paste, LF-4300 offers true multi-process capabilities, a no-clean formula that is also water washable without saponification. Highly versatile and forgiving, LF-4300 uses synthetic materials for unparalleled lot-to-lot consistency and ideal printing characteristics (no mid-chip beading, low voiding and anti-tombstoning). LF-4300 is compatible with high temperature alloys. It's also VOC and halide-free, and features 12-hour stencil life and 24-hour abandonment time.	REL0
4300	A revolutionary new solder paste designed for tin-lead alloys. 4300 offers true multi-process capabilities, a no-clean formula that is also water washable without saponification. Highly versatile and forgiving, 4300 uses synthetic materials for unparalleled lot-to-lot consistency and ideal printing characteristics (no mid-chip beading, low voiding and anti-tombstoning). This solder paste is VOC and halide-free, and features 12-hour stencil life and 24-hour abandonment time.	REL0

RMA Solder Pastes		Class
RMA-223	The RMA-223 solder paste is a homogeneous mixture of the highest quality pre-alloyed solder powders and mildly activated resin paste flux. With a special blend of gelling additives in this formulation, it prevents segregation of solder cream and provides a creamy mixture ready for application. The residue from RMA-223 is light amber and clear of solder balls. RMA-223 is a cream conforming to ANSI/J-STD-004-006.	ROL0
RMA-223-AS	RMA-223-AS is specially designed for today's SMT applications. It is a homogeneous mixture of the highest quality pre-alloyed solder powders and mildly activated resin paste flux. The RMA-223-AS has an increased activity over the RMA-223. The residue from RMA-223-AS can be removed using traditional solvents or Kyzen's Aquanox® with semi-aqueous systems. The residue from the RMA-223-AS is light amber in color.	ROM0
RMA-223-LF	RMA-223-LF is a solder paste designed to meet the requirements of lead-free. It delivers excellent wetting and spread with Sn96.5/Ag3.5 alloy. It was designed for this alloy only. The 223-LF residue is light amber in color and is non-corrosive. The residue can be removed with solvent or Kyzen's Aquanox with semi-aqueous systems.	ROM1
RMA-259-HT	The RMA-259-HT is designed with a higher activity than the RMA-223-AS. This product is designed for high temperature alloys, such as Sn10/Pb88/Ag2. This formula is classified as an RMA and the residues can be left on the board or removed using traditional solvents or Kyzen's Aquanox® with semi-aqueous systems.	REL0

Fresh Mix™

FreshMix solder paste kits are the ideal answer to tough production questions. Each FreshMix kit contains 5 jars of pre-measured paste flux, 5 bags of UniSphere™ powder packed in an inert atmosphere, gloves, work surface covers and a mixing tool. Available in a variety of formulations, each kit makes 2,500g of fresh solder paste. Keep FreshMix kits on your shelf and mix fresh solder paste as you need it. No refrigeration is necessary.

Powder Distribution

AMT's powders are produced using only the highest quality virgin materials. AMT's proprietary separation process ensures perfectly sized powder without surface damage. The particle size distributions exceed the J-STD-006 specification and contain no fines below 20 microns (Types 2,2A,3,4).

Powder Size Distribution (Weight %)

Powder Type	Less than 1% larger than	At least 90% between	10% maximum less than
Type 2	75 microns	75-45 microns	45 microns
Type 2A	53 microns	53-38 microns	38 microns
Type 3	45 microns	45-25 microns	25 microns
Type 4	38 microns	38-25 microns	25 microns
Type 5	32 microns	25-15 microns	15 microns
Type 6	25 microns	20-5 microns	5 microns

Oxygen Content

Powder Type	Oxygen Content
Type 2	<100 ppm
Type 2A	<110 ppm
Type 3	<120 ppm
Type 4	<130 ppm
Type 5	<200 ppm
Type 6	<200 ppm

All AMT solder powders are atomized in a controlled atmosphere to minimize oxygen content. Typical values for 63Sn/37Pb are listed here.

Featured Product

SynTECH™ and SynTECH-LF™

SynTECH™ and SynTECH-LF™ (lead-free) are innovative no-clean solder pastes that offer superior wetting, strong activity, printability and shelf life with both lead-based and lead-free alloys. These formulas not require refrigeration because 100% synthetic poly adduct components are substitued for organic compounds, resulting in a superior solder paste that increases hourly throughput with less scrap and rework. Benefits include:

- higher production yields
- synthetic, not organic, for unparalleled lot-to-lot and stencil printing consistency
- wider process windows (12-18 hour stencil life, 18-24 hour tack time)
- passes BONO mirror test
- no refrigeration needed
- RELO flux designation
- ICT friendly, and compatible with organic solderability preservatives (OSPs)

Tacky Paste Fluxes

AMTECH's Tacky Paste Fluxes (TF) are designed to meet and exceed industry standards. TFs are used for general touch-up and rework of PCBs, and for the attachment of spheres to BGA and mBGA packages. Operations such as soldering Flip Chip components to various PCB substrates also use TFs, which are available in water soluble, no-clean and RMA formulations and can be dot dispensed, screen printed or stencil printed. Tacky paste fluxes are available in 10cc and 30cc syringes; 75g and 150g jars; and 6oz. cartridge, with other sizes available upon request.

Tacky Paste Fluxes		Class
LF-4300-TF	The LF-4300-TF is a medium viscosity water-washable, no-clean flux designed for tin-lead and lead-free alloys. LF-4300-TF is ideal for BGA, PGA and CSP sphere or pin attachment. Can be dot dispensed or screen printed. LF-4300-TF can be used with either tin-lead or lead-free alloys.	REL0
WS-4200-TF	The WS-4200-TF is a low viscosity water soluble flux. Ideal for BGA, PGA and CSP sphere or pin attachment. Can be Dot dispensed or Screen printed.	REM0
WS-4100-TF	WS-4100-TF is a low viscosity, low voiding flux that can be exposed to multiple reflow processes prior to washing. The WS-4100-TF is ideal for sphere or pin attachment to BGA or PGA packages.	REM0
SynTECH-TF	The SynTECH-TF is a low viscosity no-clean flux that can be used for rework, sphere attachment to BGA packages and assembly operations such as Flip Chip attachment to PWB substrates.	REL0
NC-559-TF Lead-Free	The NC-559-TF is a high viscosity no-clean flux that can be used for rework, sphere or pin attachment to BGA, CGA and CSP packages, and assembly operations such as Flip Chip attachment to PWB substrates.	REL0
RMA-223-TF	The RMA-223-TF is an RMA flux that can be used for rework, sphere attachment to BGA, CGA and CSP packages. It can be dot dispensed, screen printed and stencil printed.	ROL0
WS-4200-LFTF	The NWS-4200-LFTF is a water washable tacky flux formulated and designed to meet the reflow temperatures for lead-free alloys. This Pb-free tacky flux can maintain excellent cleanability even at elevated reflow temperatures. It can be used for rework, sphere attachment to BGA packages and assembly operations such as Flip Chip attachment.	REH1
SynTECH-LFTF	The SynTECH-LFTF is a no-clean tacky flux designed to meet the reflow temperatures for Pb-free alloys, while maintaining a clear flux residue. Used for rework, BGA, CGA, and CSP packages.	REL0
RMA-223-LFTF	The RMA-223-LFTF tacky flux is designed to meet the requirements of Pb-free alloys. It delivers excellent wetting and spread on many lead-free board finishes. Used for rework, BGA, CGA, and CSP packages.	ROM1

Packaging: 10cc and 30cc Syringes and 75 and 150g jars.

Superior Flux & Mfg. Co.

AMTECH is a distributor for Superior Flux & Mfg. Co., a leading manufacturer of fluxes for the electronic assembly market. Listed below are nine popular Superior products stocked by AMTECH. Available in 1-gallon container; 5-gallon pails; and 55-gallon drums. All Superior liquid fluxes are available in Flux-Righters for rework and touch-up. Additional products and custom formulations are also available upon request. All fluxes listed below are RoHS-compliant.

Superior Water Washable No-Clean Soldering Fluxes		Solids %
Superior #4300-2% Superior #4300-4%	Available in two versions, with either 2% or 4% solids, 4300 Liquid Flux is compatible with AMTECH's 4300 solder pastes and is specially formulated for Tin-Lead and Lead-Free soldering high quality electronic printed circuit boards (PCBs), such as, through-hole, mixed technology, and surface mount assembles. Eliminates the need for post cleaning operation. If post cleaning is required, 4300 liquid flux can be cleaned using water at 130°F. Flux may be applied using foam or spray applications as supplied. RoHS-compliant.	2.0% or 4.0% ORLO
Superior #315-LF	Compatible with AMTECH's LF-4300 solder paste, 315-LF Liquid Flux is a water-washable, no-clean formula designed for Lead-Free soldering of high quality electronic printed circuit boards (PCBs), including through-hole, mixed technology, and surface mount assembles. Use of 315-LF eliminates the need for post cleaning operation. If post cleaning is required, this liquid flux can be cleaned using water. Flux may be applied using foam or spray applications as supplied. RoHS-Compliant.	4.0% ORLO
Superior #312-AM2	Superior No. 312-AM2 flux is a specially formulated low-solids flux free of any halides, resin, or rosin. This flux was designed for soldering high quality electronic printed circuit boards (PCBs), such as, through-hole, mixed technology, and surface mount assemblies. Eliminates the need for a post cleaning operation. If post cleaning is required, the #312-AM2 liquid flux can be cleaned using water at 130°F. Flux may be applied using foam or spray applications as supplied. RoHS-compliant.	2.0% ORLO

Superior Water-Soluble Fluxes		Solids %
Superior #84	Superior No. 84 is a high activity, organic acid (OA) foam or spray flux formulated for difficult-to-solder surfaces where activated rosin-fluxes and less active OA fluxes cannot be used. This flux combines a unique activation system with a special no-polyol base that is compatible with all solder masks, does not leave post-solder white residue, and is an ideal choice for high volume soldering operations. RoHS-compliant.	17% ORM1

Superior No-Clean Fluxes		Solids %
Superior #317 Pb-Free compatible	Superior No. 317 Low-Residue flux is a specially formulated low-solids flux free of any halides, resin, or rosin. This flux was designed for soldering high quality electronic printed circuit board (PCB's), such as, through-hole, mixed technology, and surface mount assemblies while eliminating the need for a post cleaning operation, if required. The No. 317 flux is excellent with lead-free alloys. RoHS-compliant.	4.6% ORM0
Superior #312	Compatible with lead-free solder, Superior # 312 No-Clean flux is a specially formulated with low-solids content, free of any halides, resin, or rosin. 312 flux was designed for soldering high quality electronic printed circuit boards (PCBs), including through-hole, mixed technology, and surface mount assemblies. This flux eliminates the need for post-cleaning operations as the residue can be left on or removed using water. #312 flux is formulated for foam or spray applications as supplied. RoHS-compliant.	2.0% ROL0

Superior RA Flux		Solids %
Superior #100	Superior No. 100 RA Flux consists of a homogenous solution of WW rosin in a multi-component solvent system with a chloride activator. It is used in electronics applications requiring high soldering activity. The flux becomes active above 175°C/340°F, attaining peak activity in the temperature range 200-260°C/390-500°F. For applications such as mag-wire tinning, Superior No. 100 is an excellent flux for temperatures as high as 400°C/750°F. Meets all the requirements of Mil-F-14256, Type RA. RoHS-compliant.	42% ROH1

Superior RMA Fluxes		Solids %
Superior #99	A mildly activated, chloride-free RMA flux with 45.5% solids content, Superior No. 99 offers excellent soldering activity, yielding residues with water-extract resistivities. This RMA flux is ideal for automated and manual soldering operations involving a variety of metals, including copper, nickel alloys, gold, silver and tin. RoHS-compliant.	45.5% ROL1
Superior #99-20	A mildly activated, chloride-free RMA flux with 20% solids content, Superior No. 99-20 offers excellent soldering activity, yielding residues with water-extract resistivities. This RMA flux is ideal for automated and manual soldering operations involving a variety of metals, including copper, nickel alloys, gold, silver and tin. RoHS-compliant.	20% ROL1

Superior Flux Thinners		Solids %
Superior #95T Thinner	A flux thinner for use with a number of different alcohol-based fluxes. Superior No. 95T should be added to maintain specific gravity of these fluxes without impairing soldering quality, or it may be added in greater quantities where dilution is desired. RoHS-compliant.	N/A
Superior #96T Thinner	Designed for use with Superior 99 Series RMA and 100 RA type fluxes, Superior No. 96T flux thinner is added to maintain specific gravity of these fluxes without impairing soldering quality. Superior No. 96T flux thinner can also be added in greater quantities where dilution is desired. RoHS-compliant.	N/A
Superior #367T Thinner	Designed for use with Superior 4300-2%, 312-AM2, 312 and 317 fluxes, Superior No. 367T flux thinner is added to maintain specific gravity of the flux, which helps yield consistent performance. Superior No. 367T flux thinner can also be added in greater quantities where dilution is desired. RoHS-compliant.	N/A

Superior Specialty Fluxes		Solids %
Superior #435 3:1	Superior No. 435 3:1 is a water-soluble, organic acid, non-halide tinning flux that is entirely free of chlorides, bromides and phosphates. 435 3:1 employs unique organic activators to strip off metal oxides and tarnish without attacking the underlying metals. This flux features many of the beneficial features of halide-containing organic fluxes while being much less corrosive. RoHS-compliant.	13.5% ORM0
Superior #30	Superior Supersafe No. 30 is a general purpose, VOC-free organic flux used for PCBs, semiconductor cable and wire assemblies. Supersafe No. 30 contains an amino acid-halide activator which starts to clean metals at room temperature, reaching peak fluxing activity at 260°C/500°F, where it promotes excellent solder ability. The broad range of activity makes it ideal for high production rates and difficult metal surface conditions, where an active (but safe) flux is required. RoHS-compliant.	12.5% ORM1
Superior #45	Superior No. 45 is an organic-acid (OA) flux that contains a unique amino acid-chloride activator, specially formulated especially for tinning Nickel/Copper semiconductor and component leads in automated soldering systems. Promotes excellent solderability of electroless Nickel (EN), Alloy 42, Alloy 51, Beryllium Copper, and other difficult-to-solder metals. The flux removes oxides at room temperature, reaching peak activity in a temperature range of 240-270°C/460-520°F. Contains little water, and does not pop or spatter during normal soldering processes, including pre-heating prior to solder dipping. RoHS-compliant.	16% ORM1
HAL Flux	AMTECH's HAL-776 flux is used in hot air leveling machines. HAL-776 flux material exhibits high temperature stability and thermal conductivity with complete solubility of residue. The flux is designed for direct use from the container and needs no dilution by any other solvents. AMTECH HAL-776 flux can be used on both vertical and horizontal machines. RoHS-compliant.	75%

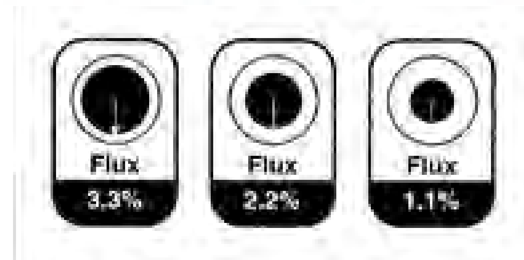
Superior VOC-Free Flux		Solids %
#420-S/F LF VOC free Pb-Free compatible	Superior No. 420-S/F LF VOC free, No-Clean flux is a halide-free, rosin-free, no-residue flux specifically developed for spray or foam fluxing in wave soldering applications. It meets the requirements for the different high temperature Lead-Free solder alloys used in wave soldering processes on surface mount, mixed technology, and through-hole electronics assemblies. No. 420-S/F LF is a water-based, non-flammable formulation that eliminates the need for special storage requirements, while dramatically reducing emissions from plants engaged in wave soldering. RoHS-compliant.	4.0% ORL0
Superior #425 VOC-Free	Superior No. 425 VOC-Free, No-Clean flux is a specially formulated low-solids flux free of any halides, resin, or rosin. This flux may be conformal coated without post solder cleaning. The No. 425 conforms to ANSI-J-STD-004, and is classified as ORL0. RoHS-compliant.	2.2% ORL0

AMTECH Flux-Righter™

All AMTECH liquid fluxes are available in Flux-Righter™, a unique tool for rework and touch-up soldering. Flux-Righter™ allows a controlled amount of flux to be applied, thus eliminating the mess from conventional flux bottles. Flux-Righter™ is ideal for surface mount rework or manual assembly. Packaged and sold in boxes of 12.

Core Wire

AMTECH Core Wire is manufactured from grade-A virgin metals that meet or exceed IPC, ANSI/J-STD-006 and ASTM B32 standards. Wire solder is available with 1.1, 2.2 & 3.3% flux core. AMTECH core wire solder is available in many alloys, including lead-free formulations. Our core wire is packaged in one pound rolls. Other packaging is available upon request.



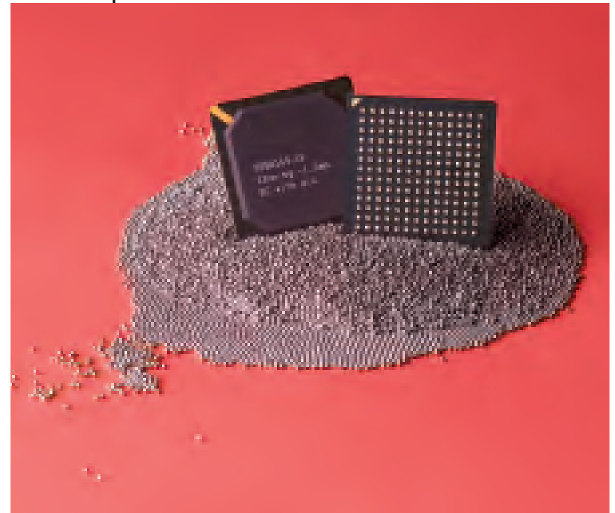
Standard Wire Diameter

Diameters (inch)	.062	.040	.031	.025	.020	.015	.010
Diameters (mm)	1.57	1.01	0.81	0.63	0.50	0.38	0.25
Std. Wire Gauge	16	19	21	23	25	28	31

Premium Core Wire

LF-4300 Wire WS & NC	AMTECH's water-washable, no-clean LF-4300 solder wire is a low residue flux core solder designed for Lead-Free hand soldering and re-work applications. The flux core provides sufficient activity to successfully solder bare copper, tin, silver, gold and other hard-to-solder surfaces. The flux is classified as REL0.
4300 Wire WS & NC	AMTECH's water-washable, no-clean 4300 solder wire is a low residue flux core solder designed for tin-lead hand soldering and re-work applications. The flux core provides sufficient activity to successfully solder bare copper, tin, silver, gold and other hard-to-solder surfaces. The flux is classified as REL0.
No-Clean Wire NC-61	AMTECH NC-61 No-Clean solder wire is a low residue flux core solder designed for hand soldering and re-work applications. The core provides sufficient activity to successfully solder bare copper and other hard-to-solder surfaces. The blend of resin and polymer dendrimer activator provides rapid wetting, with a clear non-corrosive residue.
Water-Soluble Wire WS-231	AMTECH WS-231 water-soluble core wire is a halide-free, water-soluble flux cored solder. Its post-soldering residue is water-soluble and can be easily cleaned with DI water. AMTECH water-soluble core wire is recommended for use in any hand soldering application where high flux activity is desired.
RMA Wire (WRMAP)	AMTECH RMA core wire (WRMAP) is designed for hand soldering and re-work applications. The core provides sufficient activity for successful soldering to bare copper and other hard-to-solder surfaces. The residue is a light amber color.
Pb-free No-Clean Wire NC-61	AMTECH NC-61 No-clean solder wire is designed to meet the requirements of lead-free alloys. This RoHS-compliant core wire provides sufficient activity to successfully solder many lead-free components & board finishes. Available in many lead-free alloys.
Pb-free Water-Soluble Wire WS-231	AMTECH WS-231 Water-soluble solder wire is designed to meet the requirements of lead-free alloys. This RoHS-compliant core wire provides sufficient activity to successfully solder many lead-free components & board finishes. Available in many lead-free alloys.
Pb-free RMA Wire (WRMAP)	AMTECH RMA solder wire (WRMAP) is designed to meet the requirements of lead-free alloys. This RoHS-compliant core wire provides sufficient activity to successfully solder many lead-free components & board finishes. Available in many lead-free alloys.

BGA Solder Spheres and Preforms



AMTECH's BGA solder spheres are manufactured from virgin materials to meet or exceed the requirements of building or repairing BGA packages. AMTECH BGA solder spheres also exceed both the IPC and MIL standards for purity levels and size tolerances. Nominal sizes are available from 3 mil to 45 mil, and custom solder sphere sizes are also available upon request. Many alloys are available for use in solder spheres, including several lead-free alternatives. Solder spheres are packaged and sold in 250k bottles.

AMTECH preforms are custom manufactured to strict tolerances, consistently delivering a precise amount of solder to the right spot on the PC board. AMTECH preforms can be manufactured by stamping, compacting, extruding or forming pieces of pure soft solder alloy. AMTECH preforms are available with flux cores, solid metal, as well as with or without flux coatings. The flux core can also be fused for easier handling.

Premium Bar Solder

AMTECH's Premium Bar Solder is designed to meet today's sophisticated electronic manufacturing processes by providing a strong and reliable solder joint. All AMTECH bar solder is manufactured from a variety of high purity virgin metals that exceed the IPC standards (J-STD-006) regarding impurity levels. Premium bar solder is manufactured in 1-pound and 1kg bars and sold in 50-pound boxes. Lead-free bar solder is sold in 20kg boxes. Other bar sizes are available upon request. AMTECH can also provide solder pot analysis.

Kyzen Cleaning Chemistries

AMTECH is a distributor for Kyzen, the leading supplier of environmentally responsible cleaning solutions for high-reliability manufacturers of microelectronics, optics, semiconductor and metal substrates. Kyzen offers aqueous, semi aqueous and vapor phase technology for use in all commonly used cleaning systems. Kyzen products are also ideal for wafer level packaging flux and resist strip applications. For more information on Kyzen cleaning chemistries, go to www.kyzen.com

Cleaning	Product Description	Concentration	Temperature
I3400	The I3400 is formulated to effectively remove flux and paste in automated screen printers. It can be used in under stencil wipe systems or manually.	Full	Ambient
Lonox L5611	Kyzen's LONOX L5611 is an aqueous blend cleaning chemistry designed for optimum effectiveness in removing flux, solder paste and uncured adhesives from stencils and misprints. Easy-to-use L5611 is normally diluted with water at ambient temperature to provide an effective and economical cleaning solution. LONOX L5611 is compatible with most standard stencil cleaning equipment and can be used in immersion, spray-in-air, and ultrasonic systems.	Variable	Ambient
Cybersolv C8502	Kyzen's Cybersolv C8502 is specially formulated to quickly remove all types of flux residues from wave solder fingers, reflow oven surfaces, and general electronics production equipment. Even hard to remove lead-free materials are no challenge for this environmentally-friendly chemistry. Cybersolv C8502 is a non-flammable alternative to IPA while maintaining low VOC's and virtually no odor.	Full	Ambient
Cybersolv 141-R	Kyzen's Cybersolv 141-R is a precision cleaner blend of organic solvents designed for optimum effectiveness in electronic assembly and maintenance cleaning applications including flux, paste, inks, uncured adhesives, waxes, mill markings, greases, oils, finger prints, etc. Use Cybersolv 141-R as a replacement for HFC 141B precision cleaning applications. Also safe and effective for use in bench-top electronics cleaning.	N/A	N/A

Defoamer	Product Description	Concentration	Temperature
DF10	DF10 is a water-based de-foamer designed to eliminate the formation of air bubbles, thereby controlling the formation of foam on the surface of a wash bath.	N/A	N/A

Saponifiers*	Applications	Concentration	Temperature
Aquanox XJN-Plus	XJN-Plus is a water mixable concentrated electronic cleaning solvent designed for use in aqueous inline spray machines. XJN-Plus removes rosin-based flux, no-clean flux residues, mis-printed solder paste, and assembly residues from surface mount and through hole printed wire assemblies.	10 – 30%	120 – 160°F
Aquanox A4512	The A4512 is a concentrated cleaning solvent designed for use in aqueous batch or in-line spray machines. This product is used to remove rosin-based flux, tacky flux, uncured adhesive, mis-printed solder paste, and assembly residues from surface mount and through hole printed wire assemblies. The A4512 can also be used to clean stencils at 5-8% concentration.	5 – 20%	120. – 160°F
Aquanox A4520	Aquanox A4520 is specially designed for optimum effectiveness with reflowed pastes, tacky fluxes, uncured adhesives, rosin flux, no clean flux and lead-free flux. A4520 can be diluted with water as required, or applied full strength for more challenging cleaning situations.	5 – 30%	amb. – 160°F
Aquanox A4630	Aquanox A4630 is specially designed for cleaning lead-free materials. A4630 is MEA-free, and can be used at ambient temperatures without the use of sump side additives to remove lead-free flux, tacky flux, SMT additives, reflowed paste, no clean flux and RMA flux. Typically used at 10 – 20% concentration.	10– 25%	amb. – 160°F

*Concentrated organic aqueous solvents

Process Support Products

IPA/DI Stencil Wipes

AMTECH IPA/DI Stencil Wipes are saturated wipes that can be used for stencil cleaning or misprint cleaning of PCBs. IPA/DI stencil wipes are packaged in containers of 100 wipes.

SMT Clean Room Wipes

SMT Clean Room Wipes are used for cleaning PCBs and stencils, and are designed to meet Class 1,000 clean room requirements. SMT Clean Room Wipes are packaged in cases of 732 wipes.

Dross Inhibitor

AMTECH Dross Inhibitor #007 melts at soldering temperatures to form a protective layer that not only reduces solder dross but also cleans the solder pot. When spread overnight inside the solder nozzle, the #007 dross inhibitor will clean baffles and help eliminate removal and maintenance. Dross Inhibitor #007 is packaged and sold in 4-pound and 20-pound pails.

Surface Mount Technology Reference Information

Particle Size			
Mesh	Micron	mm	mils
80	180	0.18	7.09
100	150	0.15	5.91
170	90	0.09	3.54
200	75	0.075	2.95
250	63	0.063	2.48
270	53	0.053	2.09
325	45	0.045	1.77
400	38	0.038	1.50
500	25	0.025	0.98
635	20	0.020	0.78

Powder Distribution		
Mesh size	Micron size	Type
-200/+325	75 - 45	Type-2
-325/+500	45 - 25	Type-3
-400/+500	38 - 25	Type-4
-450/+635	32 - 20	Type-5
-635	<20	Type-6

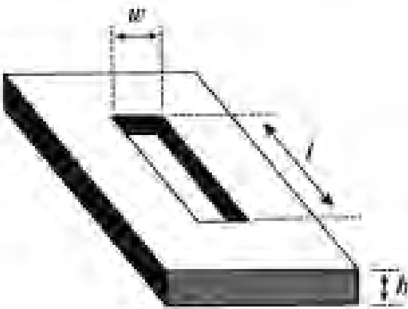
Conversion factors
°C = (°F-32) x 5/9
°F = (°C x 9/5)+32
mils x 0.0254 = mm
mm x 39.4 = mils
microns x 0.0394 = mils
mils x 25.4 = microns
mm x 1000 = microns
mils x 0.001 = inches

Solder Alloy Systems

(E) = Eutectic

ALLOY	Liquidus	Solidus	Lead-free
Sn42/Bi58	(E) 138°C	138°C	Yes
Sn43/Pb43/Bi14	163°C	144°C	
Sn62/Pb36/Ag2	179°C	179°C	
Sn63/Pb37	(E) 183°C	183°C	
Sn60/Pb40	191°C	183°C	
Sn95.5/Ag4.0/Cu.5	217°C	219°C	Yes
Sn96.5/Ag3.0/Cu.5	217°C	219°C	Yes
Sn96.5/Ag3.5	(E) 221°C	221°C	Yes
Sn99.3/Cu.7	(E) 227°C	227°C	Yes
Sn100	(E) 232°C	232°C	Yes
Sn95/Sb5	240°C	235°C	Yes
Sn95/Ag5	245°C	221°C	Yes
Sn5/Pb92.5/Ag2.5	284°C	280°C	
Sn10/Pb88/Ag2	290°C	268°C	
Sn5/Pb95	312°C	308°C	

Stencil Printing

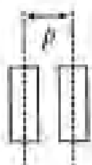


Stencil Thickness

Retaining force = R

Pulling force = P

$\frac{P}{R} > 0.80$



Pitch = P
Center to Center
Spacing

Sum of area of walls = A_w

$2 (w \times h) + 2 (l \times h) = A_w$

Area of pad = A_p

$(l \times w) = A_p$

For proper release

$\frac{Ap}{Aw} > 0.80$

or

$w > 1.5h$

To reduce A_w:
elminate corners —
round off aperatures