

CIRCUIT CELLAR **ONLINE**

THE MAGAZINE FOR COMPUTER APPLICATIONS

Circuit Cellar Online offers articles illustrating creative solutions and unique applications through complete projects, practical tutorials, and useful design techniques.

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RESOURCE PAGES

RESOURCE LINKS

A Guide to online information about:

Solder Making the Connection

by [Bob Paddock](#)

If you are like me, you like to sit at your workbench, or maybe even kitchen table, and build a circuit to see what it *really* does, compared to what the spice models, and datasheets say it *should* do.

The problem today is that all manufacturers left those of us who like to play with electronics behind when it comes to parts you can get your hands around. They switched to offering only surface-mount parts.

I thought it was time to get myself some equipment that would allow me to solder SMT/SMD parts at home (at [work](#), I plead my case with the process technicians to do it for me, because they have all the cool kilo-buck tools for dealing with such things).

The most important part of any electronic assembly is a part that is usually completely ignored, unless you're working on the assembly/production line. That part is the solder that connects everything. Without low-tech solder, our high-tech world would stop.

So this month's [Resource Page](#) deals with solder and some of the equipment to apply it.

An [Ask Us](#) question put me on the track of figuring out how to work on SMT

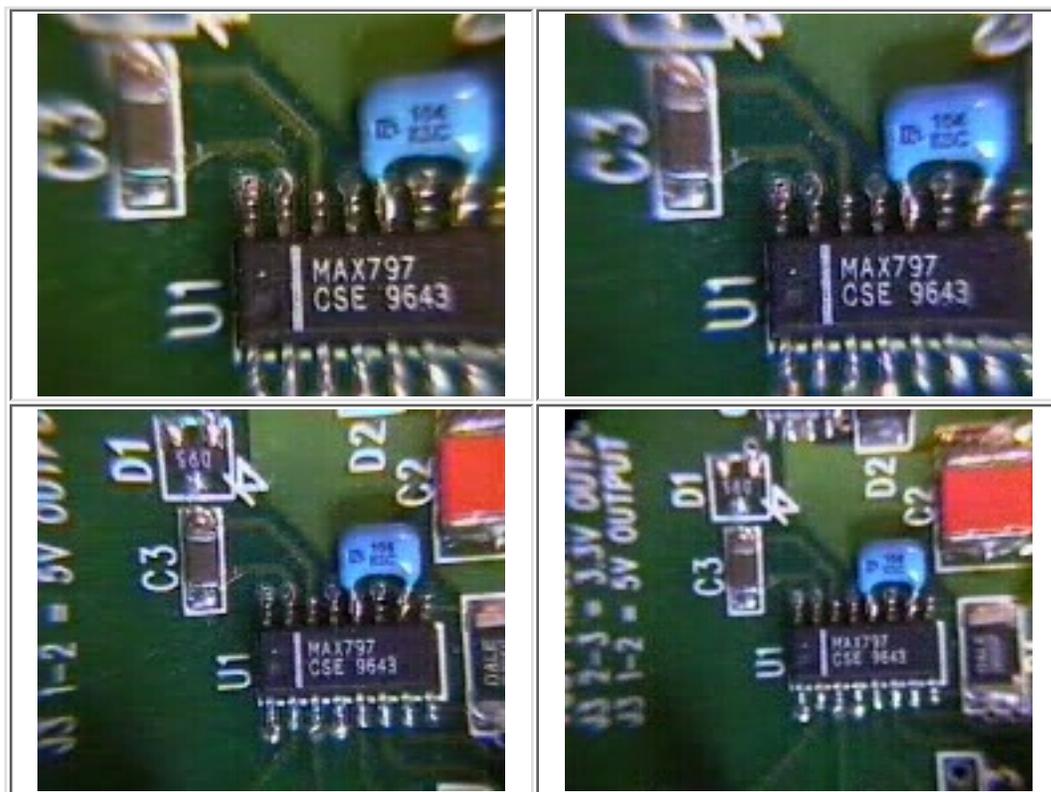
parts without going blind.



Following advice given, I took my wife's camcorder to a nearby camera shop where I had them measure the lense size. It was 37mm. After discussing my application with them, I bought an "adapter ring" to use the odd 37mm lense with a standard 49mm lense. While I was there, I also picked up a copy stand, so now I had the makings of a microscope. The Copy Stand is cheaper via a number of e-biz sites, but the shipping is a killer. Someday we will have a working transporter or teleporter so we can have virtual shipping.



Shown here are images of a [Maxim](#) Evaluation Board.



"If you have a camcorder, you know most of them will focus down to < 1". However, they usually lose their ability to zoom when focused that close, and consequently don't have enough magnification for SMD use. However...your local camera shop can sell you closeup kits that screw onto the front of your camcorder just like standard optical filters do. Most of these closeup kits contain three lenses...(one, two, and four diopters, typically. The lenses are marked +1, +2, +4, etc.) These are far too weak for the job. To get a camcorder to focus up close with zoom for high magnification, you need 16 to 20 diopters of correction. I have found most camcorders work well at +18. You can special order +10 diopter closeup lenses (often called a marco closeup lens) and stack a pair of +4's on top." - [Bill Mohat, Ask Us follow-up](#).

According to the Dictionary of Contemporary Photography, a *Diopter* is:

"A measure of lens power equal to the reciprocal of the focal length in meters. Plus and minus signs are used to denote positive and negative lenses respectively. A +2 lens, for example, is a converging (positive) lens with a focal length of 1/2 meter. To a first approximation, the power of a lens combination is the sum of the powers of the components."

I could not find 10 or above diopter lenses, but www.porters.com carries a +8 lense and the normal +1, +2, +4 kit, with an addition of one of the +8 lense. I figured this would be expensive but it came to less than \$50, the copy stand cost than that. So, with the total of five lenses, I can reach 23 diopters, but I've found that 18 or 20 seems to work well.

"4-Lens Close-Up Set consists of +1, +2 and +4 lenses and a hard-to-find +8 macro adapter that lets you move in as close as 4 (with 50mm lenes). Just screw it onto the lenes like a filter and take great close-ups of flowers, jewelry, (IC's, resistors

and such). It includes storage box.”



One thing I plan on doing differently after using this unit for a while is that the camera needs to have a manual focus control. The RCA Camcorder's auto focus that I'm using gets confused by the extra lense making the zoom function all but useless. Off to find a different camera...

[Bill](#) also recommended using a SMD Flow Tip from [Plato Products](#). They manufacture replacement soldering and de-soldering tips and a variety of electronic production accessories used in the manufacture and repair of electronic assemblies. Alas, they didn't have one that fit my soldering iron.



For Christmas 1999, Santa Claus brought me a 971 Loner high-performance soldering station with temperature controller made by [EDSYN Inc.](#), which came from www.radioshack.com.

The model 971 is the soldering iron I've been using for my adventures. Next time, I'm going to buy one with the fume (smoke) extractor option. Setting muffin fans that I had around the copy stand does not do an adequate job.

[EDSYN](#) has an excellent [Glossary of Technical Terms](#) that you will find helpful then you study this [Resource Page](#).

Maybe one from [EDSYN](#), [Pace](#),

Fume Extraction Tip-Evac Systems



or from [Xytronic's](#):



The most important aspect of photography work is lighting. Even before my adventures in home SMT, used full spectrum Ott-Lite's above my workbench from [Environmental Lighting Concepts Inc.](#) I feel better and have been able to see what I am working on under them better .



[Electronic Goldmine](#) has three styles of Basic SMD Learn to Solder Kits. The idea is to practice the basics of soldering of SMT/SMD parts. The kits are nonfunctional when completed, but it is a tremendous way to sharpen your skills before you try to solder that 208-pin monster part you want to use in your latest project.



[Practical Components](#) offers Solder Practice Boards and Kits and Dummy Components.

Dummy Components are exact, nonelectrical mechanical packages used for pick-and-place machine setup and calibration, process testing, solder training, education and rework practice. Users benefit from the exact sizing, shape and soldering characteristics of dummy components by saving up to 80% off the cost of fully-functional components.

[Everyday Practical Electronics' Basic Soldering Guide](#) by Alan Winstanley, covers:

- how to solder
 - types of soldering
 - irons
 - desoldering
-

The most fascinating thing I came across while working on this [Resource Page](#) was the application of the element Bismuth. "Bismuth combines with one or several elements such as antimony, cadmium, indium, gallium, lead or tin to form alloys melting as low as at 20°C." according to the [Bismuth Institute](#).

The [Bismuth Institute](#) is a nonprofit International Association of companies engaged in the mining, smelting and refining of the element. Each member company is represented by directors making up a group of individuals dedicated to improve the knowledge of Bismuth metal and its derivatives, world-wide.

How does that relate to our topic of solder? That can be answered in the article from [Nuts & Volts](#) magazine by TJ Byers "[Safe and Sane SMD Repair: How To Successfully Remove And Replace SMD Chips](#)". and in US Patent 5,326,016.

[United States Patent 5,326,016 by Cohen, et al. July 5, 1994.](#)
[Method for removing electrical components from printed circuit boards](#)

Abstract:

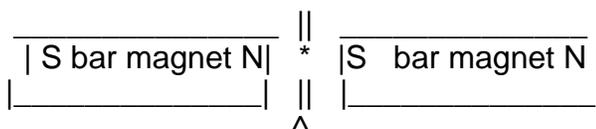
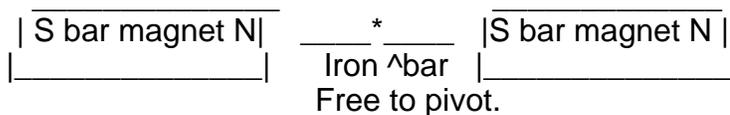
A method for removing an individual surface mounted electrical component from a printed circuit board retaining a plurality of other components. The individual component has a plurality of leads connected to circuitry on said board by a connection alloy comprising at least two constituent metals and having a given melting point less than that of either of said constituent metals. The method includes the steps of obtaining a removal alloy composed of a plurality of constituent metals and having a particular melting point below the given melting point; heating the removal alloy to a temperature greater than the particular melting point but below the given melting point so as to produce a molten state thereof; contacting the connection alloy on all of the leads with the molten removal alloy and causing thereby a reaction producing a molten state for the connection alloy; and separating the individual component from the printed circuit board while retaining thereon the other components.

You can find many patents that never make it to market, but fortunately is in the form of [ChipQuik](#). ChipQuik gets the temperature down to under 300 degrees Fahrenheit to allow for rapid de-soldering of SMD parts without the need for complex expensive equipment.

Before we leave Bismuth behind I thought I'd mention that if you want to find some of the really out-there applications of Bismuth, look at the [Keelynet](#)

[Archives.](#)

Most of these center around the fact that Bismuth is one of the few diamagnetic elements. Diamagnetism is best explained with a simple drawing:



A normal iron bar placed between two bar magnets will line up with the magnets, but a Bismuth bar would line up perpendicular to the magnets. For a more scientific explanation, check out *The Feynman Lectures on Physics*, Addison Wesley Longman, New York, Vol. 2 by Richard P. Feynman, Robert B. Leighton, and Matthew Sands.

What if you don't want solder on some areas of the board? In that case, you use [solder wave tapes and dots for your masking needs.](#)



What if you got solder where you don't want it?

[Solder Stripper 2200-DIP](#) from [J.A.M. Technology, Inc.](#), is a stabilized nitric acid-based solution formulated to strip tin/lead (solder) and tin electroplating. The product offers extremely short strip times and long bath life in both spray and immersion applications. Solder Stripper 2200-DIP's formulation includes special inhibitors in order to minimize copper attack while leaving the copper surface bright and residue free. Typical copper attack is less than 5 micro inches per minute after copper has been exposed.



[Alpha Metals, Inc.](#) manufactures materials used in the electronic assembly process. Alpha is a full line supplier of Solder Paste, Stencils, Squeegee Blades, Stencil & PCB Cleaners, Solder, Cored Wire Solder, Soldering Fluxes, SMD Adhesives, Microelectronic Packaging Materials and Sphere's for BGA and Chipscale Applications.

They have been around for more than 100 years, since founding in 1872 as a metals smelter and refiner.

The thing I like about Alphas's site are prominently placed links to their Material Safety Data Sheets. MSDS's covers in a standardized format such things as:

- Hazards identification
- first aid measures
- fire fighting measures

Make sure you have a material safety datasheet for any chemical, even a small sample, that comes in your door. Preferably, get the MSDS before you get the sample in your door. This is a requirement where I [work](#), because proper disposal of some items costs far more than a small free sample. If your supplier can't supply you with the MSDS, then you don't need their product, its that simple.



[Health and Safety](#)

Planning Design & Construction

[Toxic Substance Control Act \(TSCA\)](#)

Inventory of 60,000+ chemicals

[Material Safety Data Sheets](#)

DOD Hazardous Materials Information System

There is movement afoot in the industry to move to "green" solder, solder that does not contain lead, because of its effect on the environment. Alpha has a line of [lead-free products](#). For both political and economic reasons, no mater what science has to say, getting the lead out is inevitable.



The intent of [this area](#) of their web site is to present a brief introduction to the lead-free soldering process, examine some of technical issues involved and

provide an overview of the lead-free soldering products offered by Alpha Metals.



[National Center for Manufacturing Sciences Lead Free Solder Project.](#)

NCMS sells a CD that contains the results of a four-year, \$10.5 million collaborative R&D program aimed at identifying and evaluating alternatives to eutectic tin/lead solder. The project was initiated in response to potential legislation that would ban or restrict the use of lead, legislation of considerable concern to the electronics industry where use of tin/lead solder in the manufacture of circuit boards is widespread. Conducted under the aegis of the National Center for Manufacturing Sciences by a consortium of 11 industrial corporations, academic institutions, and national laboratories, the project focused on determining whether safe, reliable, nontoxic, and cost-effective substitutes exist for lead-bearing solders in electronics manufacturing.

The Soldering Technology Center sponsors the [Lead-Free Soldering Buyer's Guide](#). This directory lists companies manufacturing lead-free solders and associated products. The [Lead-Free Soldering Buyer's Guide](#) lists companies manufacturing lead-free soldering products for the electronics industry.

As a side note, as I have personally suffered the effects of heavy metal poisoning from mercury (officially [Wilson's Syndrome](#)) and tin (that forgotten part of solder when it comes to health effects). I can tell you it is no fun feeling like every cell in your body aches individually, or having a chronic lack of energy. Also iron overload disease, Hemochromatosis, has similar symptoms, it is another type of heavy metal poisoning that is often overlooked and misdiagnosed. If you have symptoms like that, go see a *competent* allergist to test for heavy-metal poisoning.

LYCOS Health with [WebMD](#)

Check out what [Lycos Health](#) has to say about [solder](#).

[AIM's](#) product line includes solder paste, cored wire, liquid fluxes, and specialty alloys for the growing electronics market.



They have a number of technical articles, for example:

A Comparison of Lead-Free:

Abstract: Based on recent market developments, it appears the choice of suitable lead-free alloys to replace tin-lead for electronics assembly is narrowing. Three candidates have emerged as potential standards for the industry. They are the tin-copper eutectic (Sn99.3/Cu0.7), the tin-silver eutectic (Sn96.5/Ag3.5), and CASTIN (Sn96.2/Ag2.5/Cu0.8/Sb0.5). This paper details extensive testing covering several variables that was conducted in order to make objective comparisons between the three alloys.

Alchemetal Corporation

[Alchemetal Corporation](#) is a polymer coating manufacturer that developed a coating which transforms practically any substrate into a conductive surface that can be electroplated and easily soldered.



[AMTech](#) has solder creams bar solder, flux, BGA spheres, SMT stencil wipes, benchtop hand cleaner, and powder among other product lines.



[AMT](#) has developed a patented gas treatment process that allows the soldering of parts, particularly today's electronic and optical assemblies without the use of any flux.



[APTTechnology](#) specializes in custom soldering and tinning fixtures.

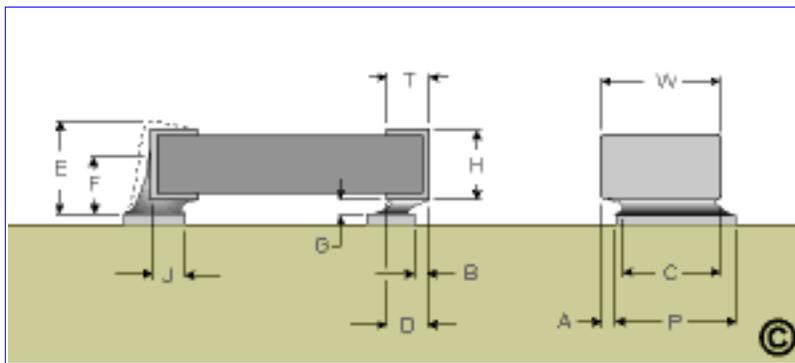
If your PCB has gold plated edge card connection, you certainly don't want to get solder on it.

APT has slide-on masks for gold fingers, that quickly allow for wave soldering. This eliminates tapes, messy cleanups, and saves time. Long life titanium alloy construction repels solder and eliminates PCB diving during wave soldering.

[Bow Electronic Solders](#) supplies core and fine wire solders, high-purity bar solders, solder pastes and creams, BGA spheres, preforms, ribbons, lead-free, and other products for the electronic, computer, and semiconductor industries.



Circuit Technology Center specializes in circuit board repair, rework, and training. Look at their document on [solder joint acceptability](#) to get a feel for their work.



[DMI International](#) makes a number of products related to wave and selective solder placement. Wave solder, component hold-down, pallets, lexan cover, screenprint, pic and place, specialty tooling, rotating adjustable, wash baskets, and special PCB support are included.



[Earth Tronics solder recovery system](#) turns solder dross into dollars.

“The solder recovery process is initiated by raising the temperature of the solder dross to 310°C, then applying an external pressure of approximately six bar, whilst maintaining constant pressure and heat. The spirally wound heater bands create a small magnetic field of energy. This encourages the iron oxide in the dross to adhere into a matrix whilst allowing the molten solder to flow into the ingot tray.”



[EDSYN Inc.](#) is a manufacturer of soldering de-soldering and SMT products. Established in 1961, EDSYN, Inc. invented the industry's first patented de-soldering hand tool known as the Soldapullt.

Today, EDSYN's general product line includes a wide variety of hand tools, stations, systems, and accessories used in the assembly, rework, and repair of all types of electronic assemblies particularly those that incorporate the use of surface-mount technology.

You can download a catalog of their tips and other products in PDF format.



[EFD](#) manufactures useful, productive, cost-saving products from precision fluid dispensing systems to SMT advanced technology solder creams. Solder creams in no-clean, low-residue, rosin mildly activated (RMA), and water soluble flux systems are available.



Here is a tip from the been there, made that mistake category. If you're buying a new pick and place machine don't let the sales person talk you into a laser-based co-planarity tester. This senses if your leads are not exactly right, which sounds like a good thing, and would increase production. The reality is that it ends up rejecting parts that you just waited 52 weeks to get, you are going to use them no matter what the machine says about lead perfection.

[Fancort](#) has some tools to help in this regard.

SMT lead forming-low- to moderate-volume machines and tooling for most surface-mount applications, and a unique, manual lead reconditioning machine to correct rejected SMDs for immediate use.

[Fancort](#) sells solder recovery systems, and other useful tools such as a depaneller.

Depaneling-machines to separate boards from prescored or routed panels, for low to high production requirements.

I've not seen their depaneller, but I saw one from another company that looked like it was hungry for fingers. I sent it back. Keep safety in mind when buying any equipment.



[Heller Industries](#), the market's oven technology, supplies solutions for electronics manufacturers and assemblers world-wide.

Several [magazine articles and white papers](#) are available, for example "[Challenging Conventional Wisdom Can Optimize Solder Reflow](#)" by Marc Peo, president, Heller Industries.

"Even though surface mount assembly has a relatively short history as a manufacturing technology, it has acquired a 'heritage' of widely accepted assumptions about various stages

of the process. However, advances occur so rapidly in this field that yesterday's assumptions are continually subjected to the challenges posed by shifting paradigms on today's production line. In solder reflow, relying on commonly accepted practices can lead engineers to overlook some relatively simple factors that are critical to optimizing the solder reflow process. An examination of six of these situations reveals that challenging the conventional wisdom about solder reflow can contribute significantly to improved yields."

[Are you ready for lead-free reflow?](#)



[Howard Electronic Instruments Inc](#), has stuff that I didn't know existed when it came to de-soldering, but now I want to have it. Like their [3 GHz RF probe](#).

HEI also sells BGA and reflow/rework equipment.

[Articles of interest for repair technicians and engineers:](#)

- "Instructions for using CHIP QUIK the Low Temperature Rework Alloy"
 - "Tips for Your Desoldering Tips that Won't Leave You Plugged"
-



[Indium Corporation of America](#) is a developer, manufacturer, and global supplier of: specialty solders (including solder paste, preforms, spheres, columns, wire, tubing, ribbon, and foil), fluxes, electrically-conductive adhesives, inorganic indium compounds (including indium oxide, indium-tin oxide, indium hydroxide, and indium chloride), fusible alloys, indium-containing fabrications of all types, and pure indium (from commercial grade through high-purity grade).

[INTERFLUX USA, Inc.](#) manufactures and distributes a wide range of high-quality fluxes and solders. The company is known as "The Experts in No-Residue™ Technology."

They have a link, www.solderingclinic.com, that sounded promising for application notes, but all I found was an "800" number to call, and a "ask the expert" 'mailto:' link, not that there is anything wrong with that. It just didn't seem 'clinic' like to me.



Dispensing made simple

After you've found your ideal solder, how are you going to apply it?

- [key things to consider](#)
- [choosing a dispensing system](#)

Controllers and accessories, complete systems, valves wands, needles, syringes, syringe adapters, cartridge systems, batch mixers, reservoirs gloves, finger cots, bottles...



[Kapco Technologies](#) is an innovative manufacturer of soldering fluxes for the electronic assembly and wave soldering market.

All fluxes are formulated by Kapco and manufactured in the U.S.. They offer a full line of no clean, no wash, water soluble, rosin, resin, and VOC free fluxes. They also offer custom formulation and private licensing/private labeling services.



Kester Solder, a division of Litton Industries Inc., has been recognized by Intel Corporation as an outstanding supplier of soldering and solder related materials. Kester has earned Intel's top honor: Supplier Continuous Quality Improvement Award (SCQI) along with two other suppliers.

Kester covers the political and economic reasons for going lead-free in their [Lead-Free Soldering Issue Today](#) page.



[Metcal](#) makes products such as the self-contained pencil grip desoldering system and soldering/desoldering and SMT rework systems literature.

Metal also has several technical notes:

- Basics of Hand Soldering
- Jand Soldering, Electrical Overstress, and Electrostatic Discharge
- Reduced Cycle Times and Lower Temperatures
- Direct Power Applied to SMT Conduction Rework

- High Throughput Soldering and Rework at Lower Temperatures with Smartheat Technology
-



[Multicore Solders](#) was founded in 1939 in England and is now part of the Loctite Electronics division www.loctite.com, of Henkel, the international chemicals group www.henkel.com.

Multicore became a household name as a result of their unique method of making solder wires with discrete multiple cores of flux. This manufacturing process continues to ensure consistent flux continuity throughout the entire length of our solder wires. Despite numerous attempts by others to compete in this field, our patented process remains unmatched by any other manufacturer.

Multicore Solders Company has several technical articles which are available in PDF format:

- Wave Soldering
 - Reflow Soldering
 - Hand Soldering and Rework
 - Process Control
 - Advanced Products
 - Ecological Soldering
-

 [Center for Theoretical and Computational Materials Science.](#)



A center of expertise in computational materials research that develops tools and techniques, and fosters collaborations.

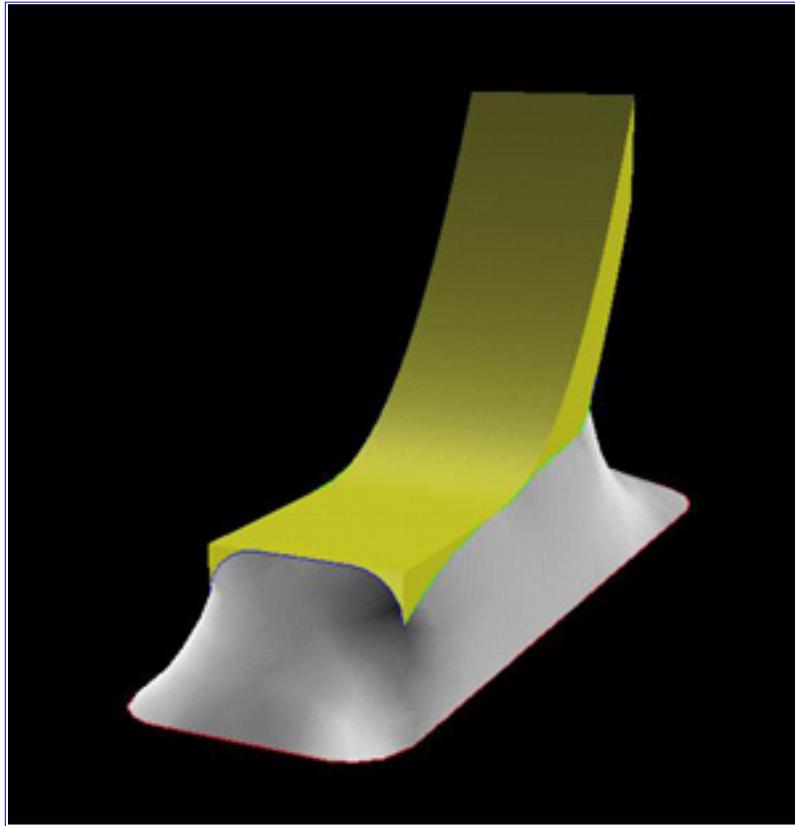
[Check out this 3D rotation \(400K\) of a gull wing lead solder joint.](#)

The [Solder Interconnect Design Group](#) is developing and evaluating several methods for modeling the geometries which arise in solder interconnects. Improved modeling of these systems will allow for more efficient development and implementation of industrial electronic packaging processes.

You can download Surface Evolver and other related programs:

The Surface Evolver is an interactive program for the study of surfaces shaped by surface tension and other energies, and subject to various constraints. [Archive of solder shape](#) related Surface Evolver code can be downloaded, as well.

The Surface Evolver gull wing solder joint is shown here:



Several other interesting items can be found at [Ken Brakke's](#) site.

I can't say I understand what "[Modeling of Multi-phase Polymer/Liquid Crystal Blends](#)" is about yet, but it has some interesting pictures to look at. What does our world look like when magnified 10,000 times?

Also [SRI International](#) has used three-dimensional nonlinear finite element analyses to [analyze the response of solder joints to various types of mechanical and thermal loading](#).



[PACE, Inc.](#) is a recognized world leader in the development of solutions for the assembly and repair of highly advanced electronics. Their expertise extends back to the dawn of the modern electronics industry. In 1958, PACE introduced training programs for the repair of the printed wire assemblies, and soon after, revolutionized the industry by creating the first self-contained

vacuum desoldering system.

Today, PACE continues to provide innovative solutions, products and training for the rework, repair and testing of printed circuit assemblies. Their unique capabilities and evolving vision have provided universal solutions to though hole and surface-mount assembly and rework problems for the most advanced electronics.



Solder preforms made with dieless process
Increased chip/die mounting yield



Small orders and small dimensions are welcome, which I always like to see. Unique features include:

- no expensive stamping tool
- never a cutting burr
- precise dimensions
- ingenious state-of-the-art

This revolutionary dieless process has been consistently supplying U.S. industry's high-quality solder perform needs for more than 10 years. PREFORM EXPRESS claims they are the only company to use this process in solder preform manufacturing. They can provide you standard shape solder performs in any commercial available alloy.

They also offer the unique ultra-thin solder performs reduce production rejects, which gives trouble free, longer die life. When constructing the solder layer assembly, less pressure is required at the die-melt stage. You get a uniform positive die/substrate bond. You get better contact, the best possible appearance and reliability for your product. You can have performs as thin as .00015" +/- .00003".

A trial kit is available that can help you eliminate production errors. With the trial kit, you can determine the right size perform to get the correct solder cover. Here's your deal in two ways, order 180 pieces in three sizes or 250 pieces in one size.



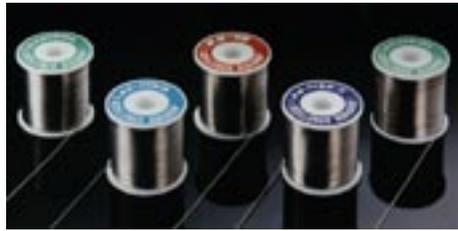
Soldering can become a bit tedious, so I think I let one of [Primatronic's](#) high-speed soldering robot provided with six-axis capability for soldering in vertical, lateral, circular and oblique directions do it for me. They do offer some of the less mundane items like solder and flux spray systems.



[RD Chemical Company](#) is an other supplier of solder stripping equipment.

RedringSolder

[Redring Solder](#) uses virgin Malaysian tin and high-purity Australian lead to produce an extensive line of tin and solder products which includes bar, wire, powder, paste, ingot, anodes, balls, and performs.



[Solder-It Co.](#) manufactures and distributes specialty low-temperature solder pastes, butane powered torches, tools, and a few other amazing products.



The Solder-It Kit will allow you to solder almost any metal as well as join dissimilar metals like aluminum to copper, or brass to pot metal. Because all

of their solder pastes flow at low temperature, you will be able to solder delicate pieces without distortion, or in the case of electronics, without damaging insulation or delicate components. Similarly, for heavier work, you will not have to apply as much heat. Solder-It Pastes produce solder joints that are five to 10 times stronger than conventional solder. That is 5000 to 28,000 psi depending on the metals you are joining.



[Seastrom manufactures](#) a wide selection of [solder lugs](#) in many different styles and configurations .

[SMT plus](#)
[computer based training:](#)
[practicing SMT soldering techniques](#)



[Teka Interconnection Systems](#) solder-flux bearing lead technology, winner of the SMT Vision and Milton S. Kiver Awards, mechanically attaches to each lead a slug containing a precise and predetermined amount of solder and flux that can easily be reflowed and directed to the conductor pads. After the connector is placed on the PCB, application of general or localized heat reflows each lead, forming a 100% reliable, re-work free solder joint, without adding solder, solder paste, or flux.

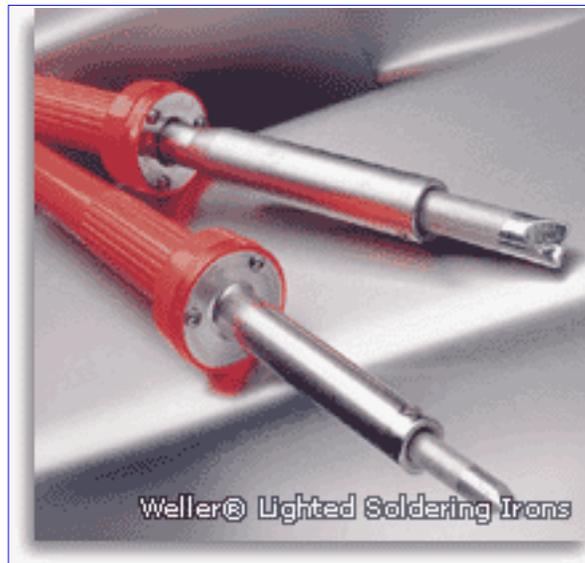


[Welco](#) claims to make the world's finest solder powder at 10 micro meters.



No Resource Page about solder would be complete without a link to [Weller product offerings](#), services, literature, and links.

It is rare to go into any electronics shop and not find at least one Weller soldering iron.





A nice piece of equipment to have around is a solder pot. My typical use is to remove connectors from boards, but they have a lot more uses. By placing the leads of the connector on the top of the molten solder, you can heat all of the connections simultaneously.

[Wax & Adhesive Melting Systems](#) specializes in the custom design and engineering of melting equipment for industrial process applications.



[XYTRONIC](#) has a wide range of soldering equipment and accessories, from the basic iron to complete soldering/de-soldering rework stations.

Larger rework equipment is available in the form of solder/de-solder stations, SMD rework stations, and tweezers. In addition, XYTRONIC's portable 60-W desolder gun that is economically priced for use by the hobbyist or field repair technician has become the leader in its product class.

Two models of fume extractors are available that provide simple yet efficient removal of fumes from the immediate work area.



Other products include the Hot Air 626, which has the largest internal diaphragm pump in the industry with a range of focus hoods, a hot air pencil, as well as temperature-controlled tweezers.



[The world's first comprehensive low-Temperature approach to the electronic benchtop](#)

Check out "[Making High-Quality SMT Solder Joints at the Rework Bench.](#)"

[SMT magazine](#) probably covers everything that I've forgotten to cover, so check them out.

SMT magazine is devoted exclusively to surface-mount assembly of printed circuit boards. Each issue of *SMT* highlights an important step in the SMT assembly process, including design for manufacture, process control, solder materials, printing, adhesives, epoxies and dispensing, components placement, cleaning, test and inspection, and rework and repair. The online version of *SMT* provides daily international business and industry-related news, current issue articles, and access to years of searchable editorial archives.

SIAM WATER FLAME CO., LTD

I thought this was a bit of odd technology, so I thought I'd include it. I need heard of soldering or welding been done like this before. Feed it water and electricity and it produces hydrogen and oxygen to be using in welding of dissimilar materials.

"HO-1800A hydrogen gas generator is machine for use in a wide variety of applications in such diverse industries as semiconductor manufacturing , electric power generation, electronics, fiber optics, metals, chemicals and other hydrogen applications. HO-1800A are easy operate and maintain, combining the convenience of on-site hydrogen production with an economical method of generating high purity gas. Only electricity and water are required. Additional cost saving can be achieved by selecting only those options required to satisfy particular applications," [Siam Water, Flame CO., LTD.](#)

This device sounds a lot like the work of William A. Rhodes, a physicist (see his paper ["COMMON DUCT ELECTROLYTIC OXYHYDROGEN Parameters & Variables"](#)). I have no real idea if they are related or not.

"This concept was discovered in 1961 by request from a manufacturer for a new and novel means for producing torch flame temperatures beyond those of that era. Such system was conceived and developed involving electrolytic production of mixed hydrogen and oxygen. Prior to that time, literature on the subject focussed exclusively on separation of such gases and conducting them out of the electrolyzer for tank storage. Using hydrogen and oxygen immediately when generated through a common duct was not found in the literature and it appeared to be a new technology. The first patent (Apparatus For The Electrolytic Production of Hydrogen And Oxygen For The Safe Consumption patent # 3,262,872 issued July 26, 1966.) dealt with intermixing the gases in an electrolyzer, issuing through a common duct for instant use in a torch. 9 claims in the patent." ... "Flame tests in an argon atmosphere directed on several layers of carbon fiber fabric with its micron size filaments (Used on the stealth fighter & bomber.) melted carbon filaments into brilliant globules. This means *carbon's melting temperature 3550C/6422F is exceeded*, but its boiling point 4827C/8720F is not attained. Past that point no reference exists."

My knowledge of stoichiometry mixed gases is about zero. In my limited understanding you need to have a mixture of exactly %66.6:%33.3 hydrogen to oxygen (or vice versa?) to get these effects.

Wonder why your solder related site is not listed? I ran into a high number of sites "under construction" that told me nothing about the products they offer, or were so intense with graphics on the home page that they took forever to load, (even between 5 and 8 am).

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If you would like to add any information on this topic or request a specific topic to be covered, contact [Bob Paddock](#).

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