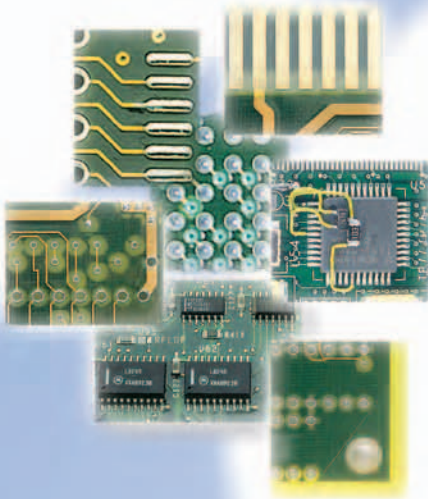


# Circuit Technology Center

circuit board repair & rework services,  
skills training programs,  
repair kits & materials



## S E R V I C E S



# Is There An Alternative to Scrap?

It's tough to watch as your company's potential profit is tossed away, but that's what happens when you scrap damaged or outdated circuit boards. It's money thrown away, and the more complex and expensive the boards, the bigger the loss.

The fact is, you simply can't eliminate the need for circuit board repair and rework. If you're struggling with the expense and demands of maintaining a modern repair and rework operation, there is an alternative, and it is Circuit Technology Center.

We are specialists in all aspects of circuit board repair and rework and we have saved our customers millions of dollars.

Whether you need help with one thousand boards or just a few, we can complete the job and get your boards back to you for a charge that's generally just a fraction of the board's value. Furthermore, every project is backed by our unconditional guarantee of reliability and top-quality workmanship.

The electronics marketplace is more competitive than ever, so before you send your circuit boards to the scrap barrel, call Circuit Technology Center, because today no company can afford to throw money away.



## Here's What a Few of Our Customers Have to Say:

*"Your repair service saved us \$128,460 but your cost was only \$2,031. More important, your quick turn around allowed us to meet a tight schedule. Thanks for a job well done."*

*"Whether we send you just one or two boards for repair, or 500, we always get the same high level of service and attention. We know that when we're looking for a solution to a tough problem, we can turn to Circuit Technology Center."*

*"You have been incredible responding to our demands for quick turns. You've helped us make shipments we never thought possible. We greatly appreciate it."*

# Circuit Technology Center ...

## Your Solutions Company

978.374.5000

www.circuittechctr.com

*Thanks for taking a few moments to review our latest brochure. Circuit Technology Center continues to be recognized as the country's most innovative circuit board repair and rework company. With the advancement of today's modern circuit board technology, it is more important than ever to have specialists available to help you at a moment's notice. We're excited about the opportunity to offer our services to you. Rest assured, we will continue to move ahead, hone our skills and maintain the industry's best equipped rework and repair center.*

*We're also continuing our advancement in training. We now offer IPC certified courses for soldering, rework and repair, for both operators and instructors. Over twenty years of experience is poured into each and every class.*

*If you decide to make your own repairs, we can provide the kits and materials you need backed up by the most comprehensive circuit board repair guide anywhere.*

*Our mission is to save you money, save you time, and make your company more profitable. Circuit Technology Center is the company you can turn to for solutions across the board.*

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# Rework, Repair and Modification Services, Just a Call Away!

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**Circuit Technology Center** is the country's largest and most experienced company providing repair and rework services for assembled and bare circuit boards. We have been offering these services since 1979 at our impressive 30,000 square foot facility in Haverhill, Massachusetts.

Our rework services include removal and replacement of surface mount, BGA, and through hole components. We also install jumper wires, cut circuits, offer BGA X-ray inspection, and a wide variety of other rework and upgrade services.

Repair services include correcting damage to surface mount pads, through hole circuits and pads, plated through holes, edge contacts, base board material, and coatings on assembled or bare circuit boards. Circuit Technology Center is unequalled at repair and rework on circuit boards; there is simply no other company with our level of knowledge and experience.

## **Superior Quality**

The complexity and sophistication of modern circuit board assemblies require highly skilled technicians to work on them. These skills can be gained only through years of hands-on experience. Our technicians are experts. They use only the most sophisticated tools available, following time-tested IPC recommended procedures.

## **Proven Reliability**

For twenty years we've dedicated ourselves to the repair and rework of circuit boards. We have the most sophisticated repair facilities in the country. Our work is consistent, reliable, and of the highest quality. It has helped us win and keep the business of companies like Nortel Networks, Solectron Corporation, Lucent Technologies and hundreds more.

## **Time Savings**

We know the importance of deadlines. You need it yesterday! If the nature of the repairs allows it, we can get your boards back to you in 24 to 48 hours. We do everything we can to meet your schedules.

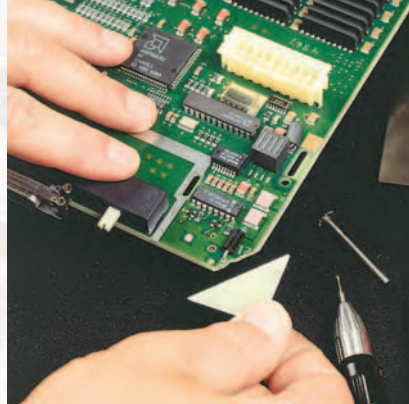
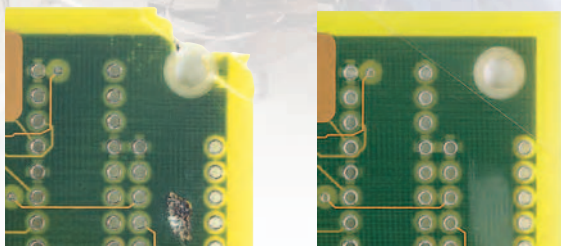
## **Cost Savings**

We start by analyzing each project and then confirm to you the exact cost before we do any work. There will be no surprises; you will know in advance how much you will save by sending us your circuit boards for repair and rework.

## **100% Satisfaction Guaranteed**

Our work is unconditionally guaranteed. If you're not completely satisfied, we'll provide a full refund.



**Before****After**

*Base board defects are routinely repaired using IPC approved methods.*

### **Base Board Repair**

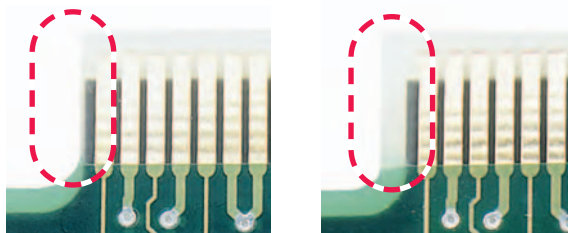
What happens to an assembled circuit board with a broken corner? Can it be repaired reliably? It certainly can if you have technicians who are trained and experienced. At Circuit Technology Center, we can reliably repair nearly any type of base board defect including impact damage, burns, delamination, blistering, measing, warp, routing errors and more. We can repair defects in coatings, solder mask and legend. For most minor repairs, we use high strength, thermoset epoxy, blended with color agents to match surface colors and textures. We replace severely damaged base board material by bonding in replacement material using a tongue-and-groove joint. These types of circuit board repairs may seem exotic, but they're documented, proven and recommended by the IPC. The team of highly qualified technicians at Circuit Technology Center has truly perfected these procedures.

### **Base Board Rework**

Removing excess base board material due to errors or modifications is normally completed using milling machines. The circuit board assembly is carefully and precisely clamped in place. Carbide cutters are used to machine away the excess material to meet new dimensions, or to add holes, slots or grooves. More challenging than removing base board material is the process of adding base board material due to design changes or fabrication errors. This is done by machining a groove in the circuit board edge and then bonding in replacement material, using a tongue and groove joining technique. Final trimming may be completed using the precision and accuracy of milling machines. This tongue and groove joining method was pioneered by Circuit Technology Center and is now an IPC recommended method for base board rework.

Non-plated mounting and tooling holes are reworked using another technique. Here we use a dowel shaped replacement section of matching base board material that is bonded in place, machined flush, and finally drilled as needed.

Slot modification is a type of base board repair used to modify or repair a key slot, or other cutout in a printed board or assembly. A replacement piece of matching board material is bonded into the area needing repair. A new cut is then machined into the repaired area if needed.

**Before****After**

*Board material added using a tongue and groove joining method to meet new dimensional requirement.*





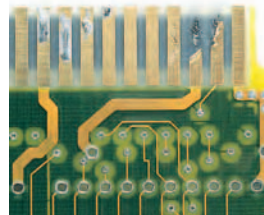
# High Reliability

## Repair Operations

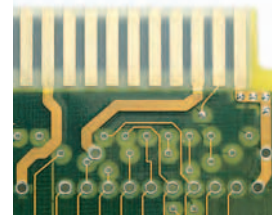
### Gold Edge Contact Repair

Gold edge contacts are particularly sensitive and prone to damage. When edge contacts on your circuit boards become scratched, torn or damaged, you can count on our staff with over two decades of experience to come to the rescue. We replace damaged contacts with new ones that have a dry film adhesive backing and are thermally bonded in place. The new nickel and gold plated contacts are the same size and shape as the original. This IPC recommended method will restore your boards to their original level of performance and reliability. When gold edge contacts become contaminated with solder or if the plating is worn or does not conform to the specification, a multi-step brush plating process is used. The contaminated contacts are stripped down to the base metal and replated to meet the original thickness specification. Our electroplating process will restore damaged contacts to "like new" condition with full functional conductivity and durability.

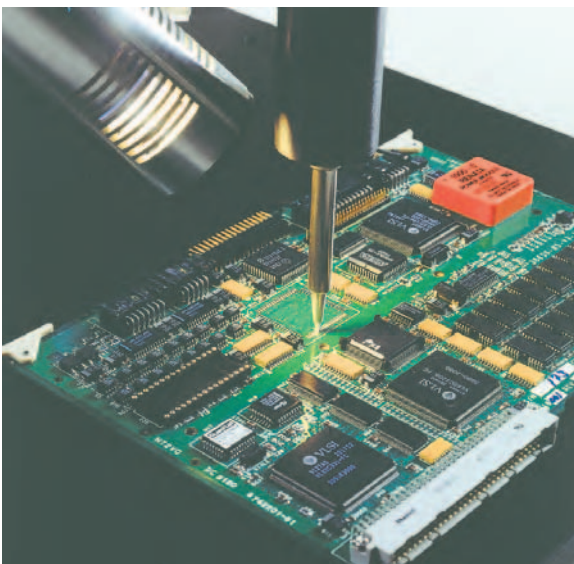
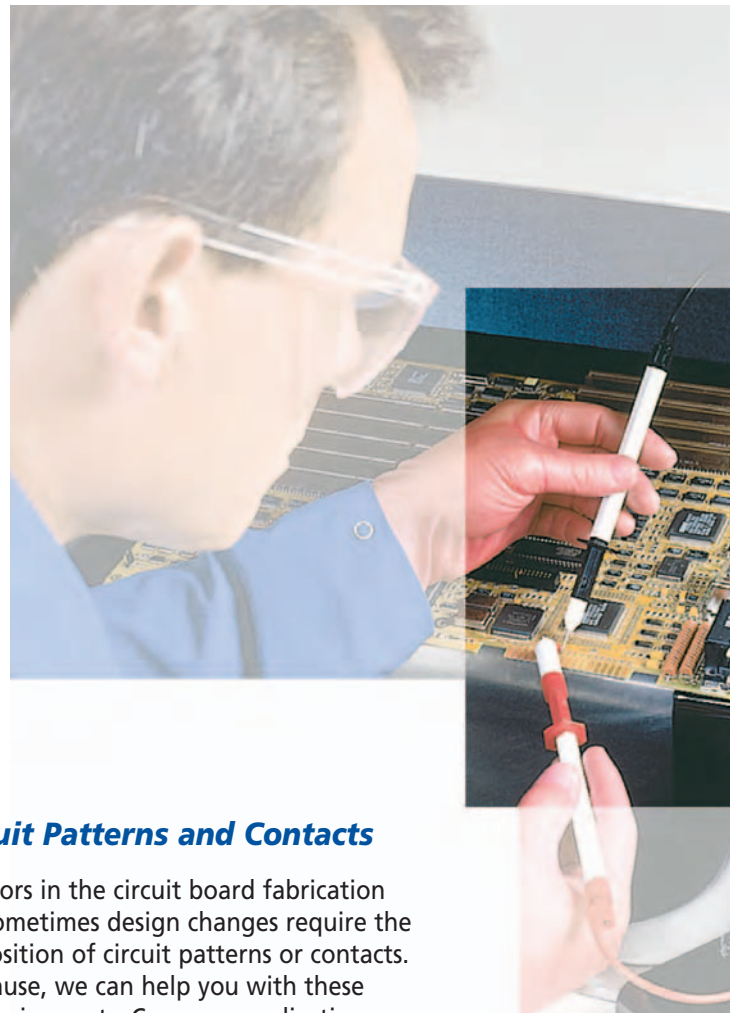
#### Before



#### After



*Whether contaminated with solder, or damaged, gold edge contacts are restored to original condition.*



### Adding Circuit Patterns and Contacts

Occasionally, errors in the circuit board fabrication process occur. Sometimes design changes require the addition or reposition of circuit patterns or contacts. Whatever the cause, we can help you with these modification requirements. Common applications include adding gold edge contacts, rerouting signal connections, isolating vias and pads, or adding an entire component footprint.

# Rework Repair Modification

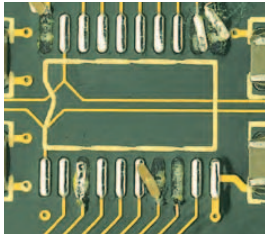
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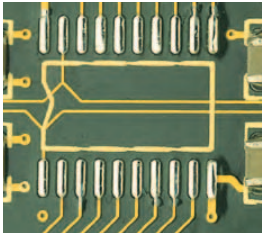
## Surface Mount and BGA Pad Repair

Surface mount and BGA pad repair are routine operations performed daily at Circuit Technology Center. Damaged pads are replaced with specially fabricated, adhesive backed pads that are thermally bonded to the board surface. This reliable IPC recommended method eliminates the need for using messy liquid epoxies to bond replacement pads in place. We stock thousands of different sizes and shapes of replacement pads.

**Before**



**After**

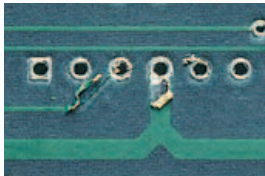


*Specially fabricated pads are thermally bonded in place to reliably repair damaged surface mount and BGA pads.*

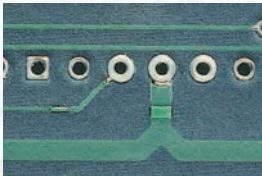
## Circuitry and Plated Hole Repair

One method for repairing damaged circuitry is the Foil Jumper Method. This method uses pure copper ribbon for the replacement conductor. The new circuits are the same size as the original circuits. This IPC recommended technique is preferred to making circuit pattern repairs using jumper wires because it more closely duplicates the original fabrication process. Damaged plated through holes are repaired using eyelets. The experts at Circuit Technology Center have also refined an IPC recommended method for repairing damaged plated holes on multilayer circuit boards that have inner layer connections.

**Before**



**After**



*Eyelets are used to repair damaged plated through holes on both double sided and multi-layer circuit boards.*





# Leading the Way in BGA Services

## BGA Services

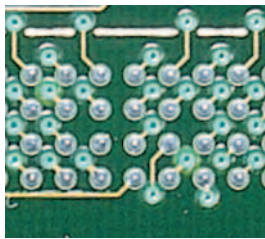
Circuit Technology Center has the solution to all of your BGA rework and repair applications. Our facility is equipped with the latest BGA rework systems, and our staff of engineers and operators possess the knowledge and skills needed in the intricate world of BGA technology. A wide variety of services are offered, including: BGA component removal, replacement and salvage; x-ray inspection services; circuit pattern design changes at BGA footprints; sealing or isolating adjacent vias with solder mask; repairing lifted or missing BGA pads; and the repair of solder mask breakdown at the BGA site. Training and technical support is also offered to provide you with one stop shopping for all of your BGA repair and rework needs.



### Before



### After



*Improper BGA rework can result in damage to pads and solder mask. Correcting these defects requires the highest degree of operator skill and experience.*

## BGA Pad and Solder Mask Repair

Damaged or missing pads are replaced with specially fabricated adhesive backed pads that are thermally bonded to the board surface. Solder mask damage is corrected with high strength, high temperature epoxy that seals the surface while maintaining a low profile. These IPC recommended processes demand the highest level of operator skill, and that's what we deliver at Circuit Technology Center.

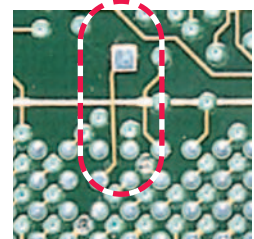
## BGA Site Modification

We can rework BGA sites by adding new pads and circuits to the board surface. The pads and circuits are bonded to the board and encapsulated with high strength epoxy. Whether it's rerouting a signal, or isolating a BGA pad, our expert operators routinely accomplish the task.

### Before



### After



*BGA signal modification is now possible using a new technique pioneered by Circuit Technology Center.*

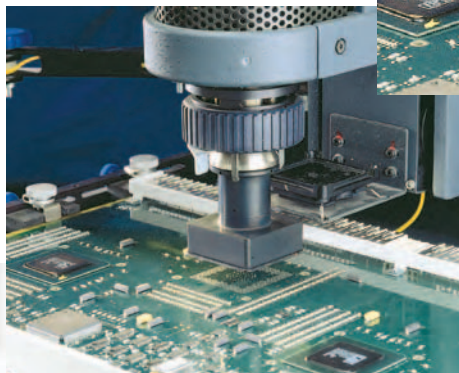
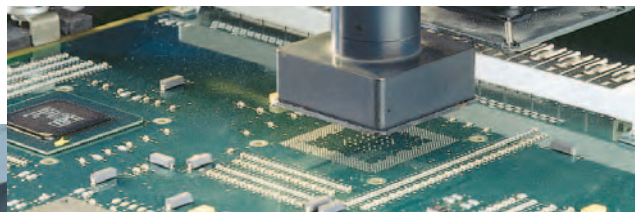




### ***BGA Component Removal and Replacement***

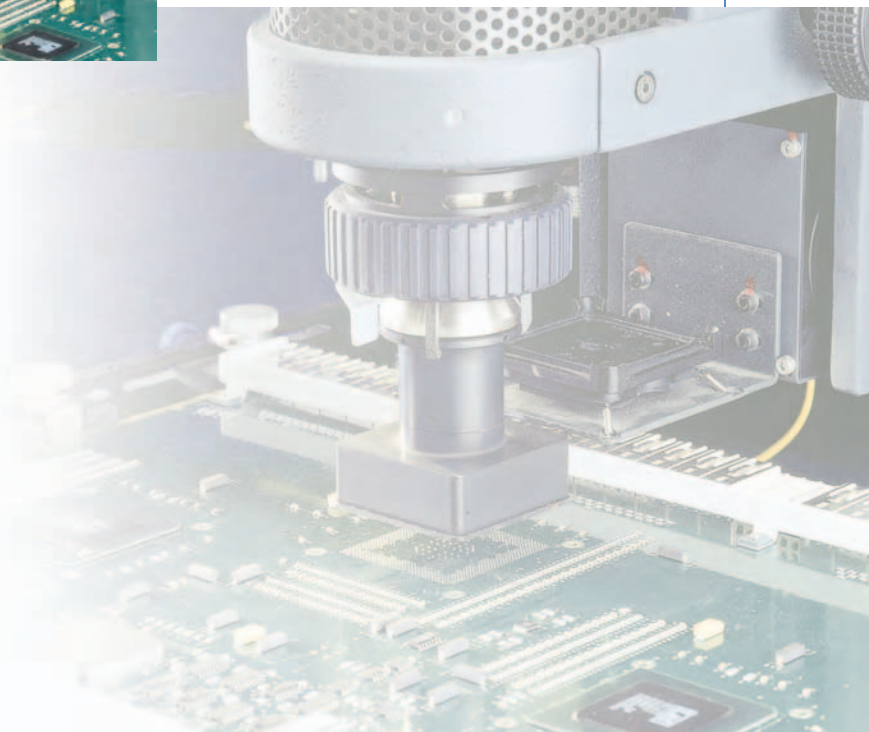
We have several top of the line BGA rework systems, and a fully trained staff of engineers and operators to support you. This combination ensures a repeatable process and high reliability. We're recognized as an industry leader in BGA services and have been qualified by companies across the US. If you have one board or one thousand boards for rework, we're the company to turn to for BGA rework services.

*Our team of expert BGA rework technicians is coupled with five top of the line BGA rework systems.*



### ***X-ray Inspection***

X-ray inspection services for BGA component and site inspection is completed on every board we process for BGA rework. The Nicolet, NXR-1410I X-ray system is ideal for inspection of BGA components and offers a wide selection of flexible features for detecting soldering defects, including shorts, opens and voids.



# We Can Update Your Circuit Boards Faster and For Less

978.374.5000

www.circuittechctr.com

The world of electronics manufacturing is certainly fast paced and deadline oriented. Engineering changes to board designs, and upgrading boards to the latest revision level are labor intensive, schedule threatening issues, facing OEMs and Contract Manufacturers alike. Unfortunately, there is a shortage of qualified rework technicians with the skills required to complete ECO work efficiently and reliably. The unpredictability of rework makes it impractical to always have the staff available to handle sudden bursts of work. It often makes sense to outsource the work to a qualified, experienced contractor. Circuit Technology Center has invested heavily to establish a world class rework and ECO service center. Our technicians are adept at difficult, time consuming procedures, including removing and replacing all types of component packages, adding jumper wires to fine pitch devices, cutting internal circuits and other intricate operations that require pinpoint accuracy. Few design changes are too difficult for us to make.



## *Jumper Wires*



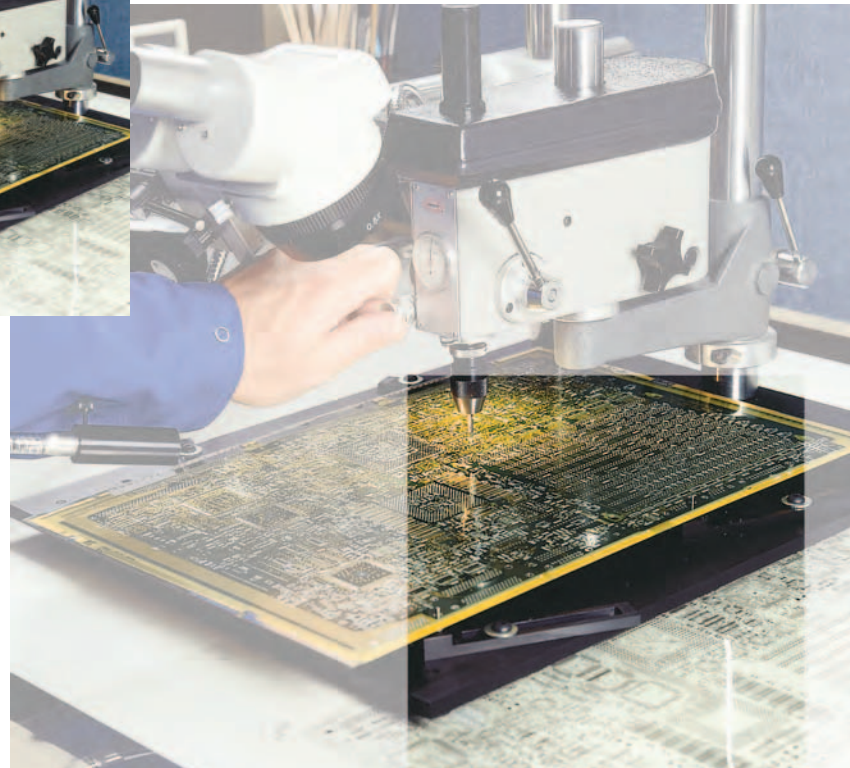
If your circuit board requires engineering changes calling for jumper wires, let us put our staff to work for you. We routinely add jumper wires, following a complete set of detailed illustrations covering the IPC recommended wire routing and termination methods. Our innovative techniques and experience ensure completion of the projects on time.

10



## *Circuit Cuts*

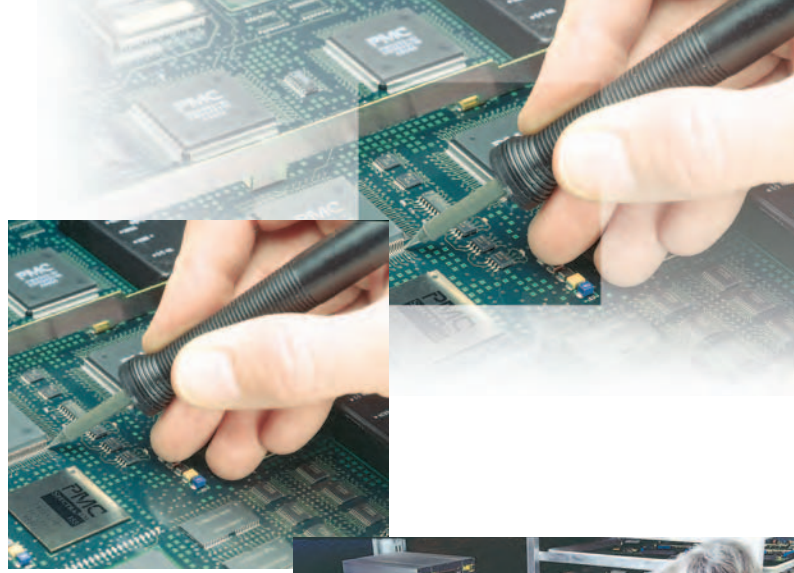
Engineering changes often require component leg lifts or the isolation of circuit patterns. Completing this task on today's dense and complex circuit board designs is challenging. Our team of technicians has become quite adept at these difficult rework processes. We have several precision milling systems that provide pinpoint accuracy and exact depth control when cutting surface and internal circuits in dense areas.





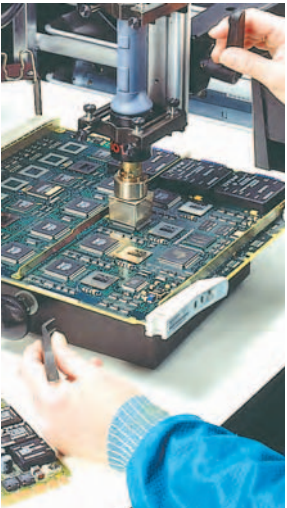
## Component Rework

Removal and replacement of surface mount and through hole components are some of the most common rework processes performed on assembled circuit boards. Although sometimes routine, today's component packages and board features present an array of difficult component rework challenges. We have over 100 pieces of equipment from Pace, Metcal, Air-Vac, and Electrovert to meet your needs for surface mount, BGA and through hole component rework. Our trained and qualified technicians are ready to tackle the toughest rework projects.



## Surface Mount Component Rework

We use a mix of convection and conduction techniques for surface mount component removal. Many factors are considered, but most often, conduction methods are used to remove smaller components, while convection techniques are used to remove larger, more sensitive components. Point to point soldering methods are normally used to solder surface mount components.

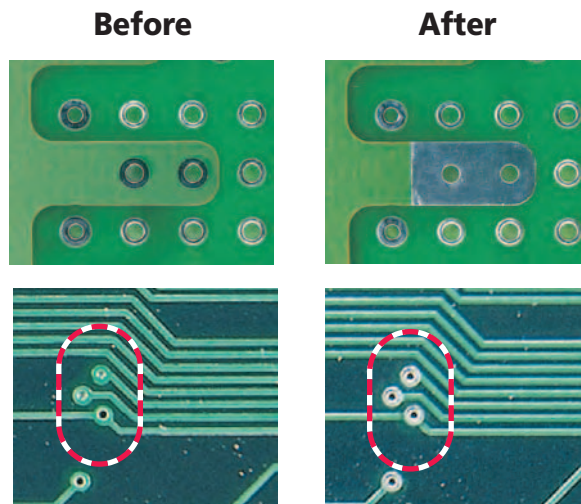


## Through Hole Component Rework

Selective solder reflow systems are used for demanding multi-lead rework projects. Reflow systems take great skill and experience to operate, but for high pin count through hole component rework, these systems can't be beat for reliability and efficiency. Vacuum desoldering systems are used for small through hole removal projects.

## Coating and Marking Rework

We can remove or add coatings and solder mask from selected areas. A variety of methods may be used for removal, from chemical stripping, to abrasion methods, to micro blasting. We can also add or remove legend marking and designations from the board surface.



*Solder mask removal from large surfaces (above), and test points (below), is completed with a variety of methods from micro-blasting (above) to machining (below).*



# Training ...

## The Future Is In Your Hands



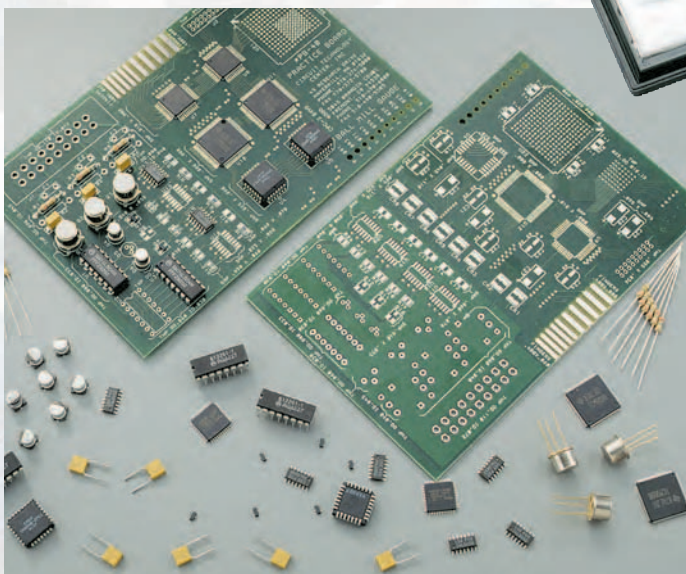
Learn from the masters! At Circuit Technology Center, we operate the largest, most advanced repair and rework center in the US. What we've learned in over 20 years is fed directly into our training courses to make them practical and effective. You already have good technicians, but we can train them to be even better. Our training center is equipped with the most advanced tools and teaching aids, enhancing the student's ability to learn new skills and refine existing ones. Training courses are available at our facility, or on-site; whichever is more convenient for you.

We offer a variety of IPC certified courses. Certification classes for Instructor Training and Operator Training to IPC 7711 and IPC 7721 are available. Our Circuit Board Damage Repair and Solder Skills training courses cover the IPC requirements while providing students with a refreshing learning experience.

We have developed an extensive BGA Training Course that will teach students the process knowledge and hands-on skills needed to reliably remove and replace BGA components. This course also includes a comprehensive review of thermal profiling, preheat considerations and process techniques.

We also offer unique IPC certification kits so that your operators can attain IPC Certification. Your operators complete the projects in these kits at your facility, on your time schedule without costly instructor or travel expenses. These projects are returned to Circuit Technology Center and official IPC Certifications are sent to operators who successfully pass.

These new kits meet your time schedule and will save you money in the process.



*New Skills Training kits offer a unique way to obtain IPC Certifications.*

Visit our web site

[www.circuittechctr.com](http://www.circuittechctr.com)  
for more information.





## Training Courses

### Operator Skills Training

#### IPC 7711 Surface Mount Soldering/Rework Course

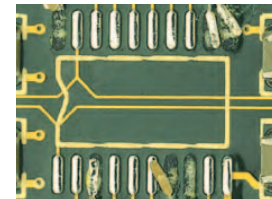
This IPC-7711 certified two day course covers the skills needed for surface mount component soldering, rework and inspection. Courses include, a review of handling procedures and soldering basics. Students learn what makes a solder joint acceptable according to IPC guidelines. Students practice methods for soldering and removal of chip, J leaded, and gull wing components.



Covers skills for soldering and rework of fine pitch components.

#### IPC 7721 Circuit Board Damage Repair Course

This IPC-7721 certified two day course covers the knowledge and skills needed to reliably restore damaged circuit boards. Course covers in detail the most common problems facing technicians who must repair physical damage found on modern circuit board assemblies. Includes in-depth review of base board repair, conductor repair, land repair, gold edge contact repair, and surface mount pad repair.



Covers skills to repair damaged SMT pads.



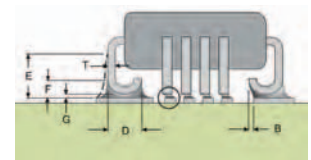
Course reviews thermal profiling, BGA rework, and more.

#### BGA Rework Course

This course is designed for students that require the hands-on skill and knowledge to reliably remove and replace a variety of BGA components. Students are taught a practical approach for safe BGA component processing. The course includes a review of thermal profiling, preheat considerations, process techniques, and a review and interpretation of x-rays results. A brief theoretical discussion is followed by hands-on board preparation and equipment processing time.

#### IPC-A-610-C Worker Proficiency Course

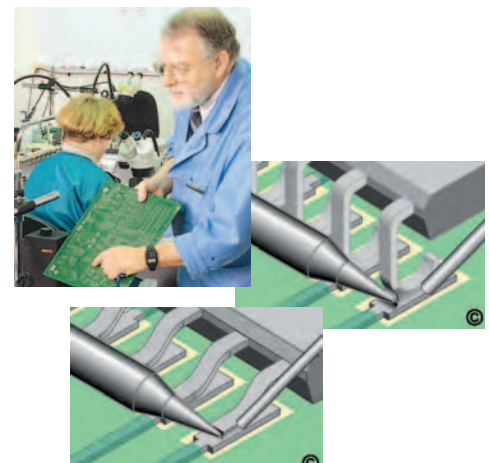
This course covers in detail the electronic industry's most widely recognized standard used for acceptance criteria of high reliability circuit board assemblies. This comprehensive 2 1/2 day course is designed for Inspectors, Engineers, Operators, or any individuals that require interpretation skills and a complete understanding of the IPC-A-610-C Acceptability of Electronic Assemblies Standard.



### Instructor Training

#### IPC-7711/7721 Rework & Repair Instructor Course

This IPC certified five day comprehensive course provides a consistent training program based on the technical guidelines of IPC-7711, Rework of Electronic Assemblies, and IPC-7721, Repair and Modification of Printed Boards and Electronic Assemblies. This in-depth course covers the procedures in both manuals. Upon completion of the course the IPC Registered Instructor will be certified to teach, and certify operators.



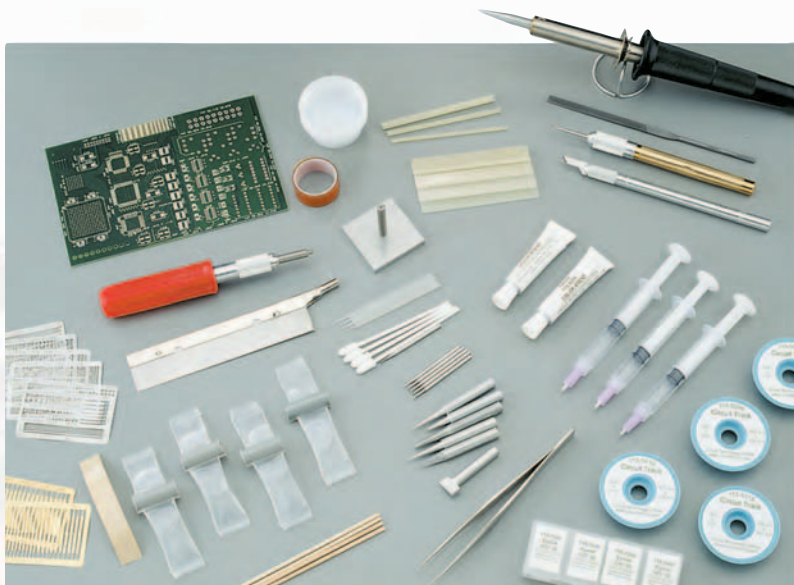
# Products ...

## *The Right Tool For All Your Circuit Board Rework and Repair*

Circuit Technology Center is the largest, most experienced company in the U.S. totally dedicated to providing repair and rework services for assembled and bare circuit boards.

During our 20-year-plus history, we have developed a wide variety of specialty products, materials, and procedures to make circuit board repairs easier and more efficient. Originally designed by our technical staff for in-house use, these products are now available in handy kit form for our customers who elect to do their own board repairs.

Among the products available are kits for repairing surface mount and BGA pads, gold contacts, lands, conductors, plated holes, base material, and many others. Each tool, material, and method has been time-tested and proven effective by our staff, and by companies worldwide who have used these convenient, economical kits in their daily circuit repair work.



Companion products include training, practice and certification kits designed to help your technicians achieve maximum proficiency and obtain official IPC Certification. These easy-to-use kits contain detailed, step-by-step instructions and provide an opportunity for your circuit board repair personnel to become certified without the need for travel and other associated expenses.



For the most comprehensive selection of circuit board repair and rework products available anywhere, request a copy of our Products Brochure, or visit our web site for kit descriptions and ordering information.



# Circuit Technology Center, Inc.



## General Information

### Prices

Prices for circuit board repair and rework services can be estimated over the phone, but exact prices are quoted after a full evaluation. If there are critical specifications, these should be noted on the purchase order. Call for the latest prices and discounts.

### Payment Terms

Net 30 days is available to qualified accounts. Master Card, Visa, American Express, company check and C.O.D. are accepted. Payment for training classes is due at time of registration.

### Minimum Order Size

Minimum order size is \$50.00 for repair or rework services.

### Shipping Information

Within the continental United States all orders are shipped F.O.B. origin. Orders will be shipped by UPS ground, unless otherwise specified. Large orders will be shipped by common carrier "best way collect" unless specific routing is required. Shipping and handling charges may be added to service orders if proper return packaging materials are not provided.

### How To Send Circuit Boards For Service

1. Clearly identify the location of the defect on each circuit board or include detailed instructions.
2. Call to receive an Order Tracking Number. Include this number on the shipping paperwork.
3. Properly package the circuit boards and ship them as directed.
4. Upon receipt of your circuit boards we will evaluate them and fax you an order confirmation listing the repair charge for each circuit board and the scheduled ship date. We will await your written authorization prior to repairing or reworking your circuit boards.
5. Upon completion, your circuit boards are inspected, packaged and shipped back to you.

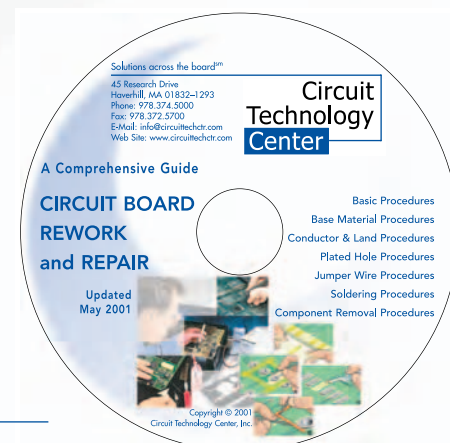
### Satisfaction Guaranteed

Circuit Technology Center guarantees 100% acceptance of any contract service work. Notify Circuit Technology Center of any discrepancy within 30 days after receipt.

## "Circuit Board Rework and Repair Encyclopedia"

*... provides solutions across the board*

Here is the ultimate "how to" reference tool for circuit board repair and rework. The "Circuit Board Rework and Repair" CD contains over 75 repair, rework and assembly procedures and more than 150 illustrations and photographs covering base materials, conductor and land, plated hole, soldering, and jumper wire repairs. Used industry-wide by repair personnel, this is one of the most highly regarded reference tools available anywhere. For solutions to your repair/rework problems, **send for this FREE CD.**





Solutions across the board<sup>sm</sup>

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Fax: 978.372.5700

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Web Site: [www.circuittechctr.com](http://www.circuittechctr.com)

Circuit  
Technology  
Center