Association Connecting Electronics Industries

IPC-7711/7721

Revision B
November 2007
Supersedes Revision A
October 2003

REWORK, MODIFICATION AND REPAIR OF ELECTRONIC ASSEMBLIES

3000 Lakeside Drive, Suite 309 S, Bannockburn, IL 60015-1249
Tel. 847.615.7100 Fax 847.615.7105
www.ipc.org

Association Connecting Electronics Industries

IPC-7711B/7721B

Rework, Modification and Repair of Electronic Assemblies

Developed by the Repairability Subcommittee (7-34) of the Product Assurance Committee (7-30) of IPC

Supersedes:
IPC-7711A/7721A - October 2003
IPC-R-700C - January 1988

Users of this publication are encouraged to participate in the development of future revisions.

Contact:

IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105

The Principles of Standardization

In May 1995 the IPC's Technical Activities Executive Committee (TAEC) adopted Principles of Standardization as a guiding principle of IPC's standardization efforts.

Standards Should:

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

Notice

IPC Standards and Publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of IPC from manufacturing or selling products not conforming to such Standards and Publication, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than IPC members, whether the standard is to be used either domestically or internationally.

Recommended Standards and Publications are adopted by IPC without regard to whether their adoption may involve patents on articles, materials, or processes. By such action, IPC does not assume any liability to any patent owner, nor do they assume any obligation whatever to parties adopting the Recommended Standard or Publication. Users are also wholly responsible for protecting themselves against all claims of liabilities for patent infringement.

IPC Position Statement on Specification Revision Change

It is the position of IPC's Technical Activities Executive Committee that the use and implementation of IPC publications is voluntary and is part of a relationship entered into by customer and supplier. When an IPC publication is updated and a new revision is published, it is the opinion of the TAEC that the use of the new revision as part of an existing relationship is not automatic unless required by the contract. The TAEC recommends the use of the latest revision. Adopted October 6, 1998

Why is there a charge for this document?

Your purchase of this document contributes to the ongoing development of new and updated industry standards and publications. Standards allow manufacturers, customers, and suppliers to understand one another better. Standards allow manufacturers greater efficiencies when they can set up their processes to meet industry standards, allowing them to offer their customers lower costs.

IPC spends hundreds of thousands of dollars annually to support IPC's volunteers in the standards and publications development process. There are many rounds of drafts sent out for review and the committees spend hundreds of hours in review and development. IPC's staff attends and participates in committee activities, typesets and circulates document drafts, and follows all necessary procedures to qualify for ANSI approval.

IPC's membership dues have been kept low to allow as many companies as possible to participate. Therefore, the standards and publications revenue is necessary to complement dues revenue. The price schedule offers a 50% discount to IPC members. If your company buys IPC standards and publications, why not take advantage of this and the many other benefits of IPC membership as well? For more information on membership in IPC, please visit www.ipc.org or call 847/597-2872.

Thank you for your continued support.

Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the IPC Repairability Subcommittee (7-34) of the Product Assurance Committee (7-30) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Product Assurance Committee

Chair
Mel Parrish
STI Electronics

Repairability Subcommittee

Co-Chairs
Daniel L. Foster
STI Electronics

Peggi Blakley
NSWC Crane

Technical Liaisons of the IPC Board of Directors

Peter Bigelow
IMI Inc.

Sammy Yi
Flextronics International

A Special Note of Appreciation

The following core group has volunteered much of their time and have made significant contributions to this document.

Blakley, Peggi, NSWC Crane
Bogert, Gerald Leslie, Bechtel Plant Machinery, Inc.
Butman, William, AssemTech Skills Training Corp.
Chism, Nancy, Flextronics
Ferry, Jeff, Circuit Technology Center Inc.
Foster, Daniel, STI Electronics
Gonzalez, Constantino, ACME Training & Consulting
Hurst, Greg, BAE Systems
Lambert, Leo, EPTAC Corporation
McNutt, Randy, Northrop Grumman
Moffitt, James, Moffitt Consulting Services
Morris, Barry, Advanced Rework Technology-A.R.T
Rogers, Doug, Harris Corporation, GCSD
Talbot, Blen, L-3 Communications
Ventress, Sharon, U.S. Army Aviation & Missile Command

Repairability Subcommittee

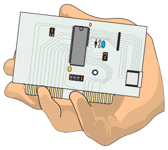
Adams, David, Rockwell Collins
Alvarez, Ximena, Flextronics
Amundsen, Becky, Northrop Grumman Corporation
Aoki, Masamitsu, Nokia Japan
Ashaolu, Peter, Cisco Systems Inc.
Auyeung, Gail, Celestica International Inc.
Blakley, Peggi, NSWC Crane
Boerdner, Richard, EJE Research
Bogert, Gerald Leslie, Bechtel Plant Machinery, Inc.
Butler, Mac, Northrop Grumman - ESSS
Butman, William, AssemTech Skills Training Corp.
Chism, Nancy, Flextronics
Cirimele, Ray, BEST Inc.
Clitheroe, Terry, Solder Technologies
Day, Jennifer, Sanmina-SCI
Ferry, Jeff, Circuit Technology Center Inc.
Foster, Daniel, STI Electronics
Freeman, Vicky (Fortunata), Flextronics Technology Inc.
Fribbins, Stephen, Fribbins Training Services
Fritz, Dennis, MacDermid, Inc.
Ganster, Andrew, NSWC Crane
Gillespie, Alan, Boeing Aircraft & Missiles
Gonzalez, Constantino, ACME Training & Consulting
Green, Michael, Lockheed Martin Space Systems Company
Herrberg, Steven, Raytheon Systems Company
Honyotski, Frank, STI Electronics
Hurst, Greg, BAE Systems
Icore, Bernard, Northrop Grumman - ESSS
James, Bryan, Rockwell Collins
Kong, Jukky, PCS Technology (Suzhou) Co. Ltd
Kumar, Vijay, Lockheed Martin Missile & Fire Control
Lambert, Leo, EPTAC Corporation
Langley, Brian, OK International
Liu, Zhe, ZTE Corporation
Maciolek, Lisa, Raytheon Company
Mari Paakkonen , Nokia Networks Oyj
Mastorides, John, Honeywell Aerospace Electronic Systems
May, William, NSWC Crane
McCain, Jack, Siemens VDO
McCormick, Becky, Benchmark Electronics Inc.
McNutt, Randy, Northrop Grumman
Mier, Norman, BEST Inc.
Moffitt, James, Moffitt Consulting Services
Moore, Ken, Omni Training Corp.
Morris, Barry, Advanced Rework Technology-A.R.T
Morris, Susan, Advanced Rework Technology-A.R.T

Moss, Norma, L-3 Communications
Muller, Mary, Crane Aerospace & Electronics
Norris, Wallace, NSWC Crane
Northam, Riley, ACI/EMPF
Nuppola, Seppo, Nokia Networks Oyj
Oliver, Bruce, Raytheon Company
Owens, Gregg, Cherry Aerospace
Parrish, Mel, STI Electronics
Perrington, Ron, Plexus Corp.
Pitsch, Timothy, Plexus Corp.
Price, Andrew, Circuit Technology Center Inc.
Ringqvist, Sheila, Scanditron Sverige AB
Rogers, Doug, Harris Corporation, GCSD
Rowe, Teresa, AAI Corporation
Scionti, Martin, Raytheon Missile Systems
Shibata, Akikazu, JPCA-Japan Electronics Packaging and
Spath, Sue, Flextronics Technology Inc.
Steele, David, Da-Tech Corp.
Talbot, Blen, L-3 Communications
Tucker, Linda, Blackfox Training Institute
Valianu, Zenaida, Celestica International Inc.
Ventress, Sharon, U.S. Army Aviation & Missile Command
Vigneau, Peter, Circuit Technology Center Inc.
Wade, Debbie, Advanced Rework Technology-A.R.T
Wang, Ge, Northrop Grumman Space Technology
Wettermann, Robert, BEST Inc.
Winslow, Russell, Winslow Automation aka Six Sigma
Woody, Linda, Lockheed Martin Missile & Fire Control
Wu, Fonda, Raytheon Company
Youngblood, Don, Honeywell Inc.
Zamborsky, Edward, OK International Inc.

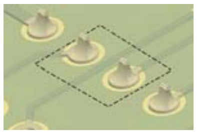
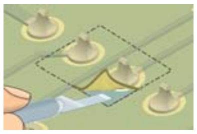
Table of Contents

PART 1 General Information and Common Procedures

Handling/Cleaning

Procedure	Description		Board Type	Skill Level	Level of Conformance
2.1	Handling Electronic Assemblies		N/A	N/A	N/A
2.2	Cleaning		N/A	N/A	N/A

Coating Removal

Procedure	Description	Illustration	Board Type	Skill Level	Level of Conformance
2.3.1	Coating Removal, Identification of Conformal Coating		R, F, W, C	Advanced	High
2.3.2	Coating Removal, Solvent Method		R, F, W, C	Advanced	High
2.3.3	Coating Removal, Peeling Method		R, F, W, C	Advanced	High
2.3.4	Coating Removal, Thermal Method		R, F, W, C	Advanced	High
2.3.5	Coating Removal, Grinding/Scraping Method		R, F, W, C	Advanced	High
2.3.6	Coating Removal, Micro Blasting Method		R, F, W, C	Advanced	High

General Information and Common Procedures

1 General

1.1 Scope This document covers procedures for repairing and reworking printed board assemblies. It is an aggregate of information collected, integrated and assembled by the Repairability Subcommittee (7-34) of the Product Assurance Committee of the IPC. This revision includes expanded coverage for lead free processes, and additional inspection guidelines for operations such as repair that may not have other published criteria.

This document does not limit the maximum number of rework, modification or repair actions to a Printed Circuit Assembly.

1.2 Purpose This document prescribes the procedural requirements, tools, materials and methods to be used in the modification, rework, repair, overhaul or restoration of electronic products. Although this document is based in large part on the Product Class definitions used in IPC documents such as J-STD-001 or IPC-A-610, this document should be considered applicable to any type of electronic equipment. When invoked by contract as the controlling document for the modification, rework, repair, overhaul or restoration of products, the requirements flowdown apply.

IPC has identified the most common equipment and process in order to make a specific repair or rework. It is possible that alternate equipment and processes can be used to make the same repair. If alternate equipment is used, it is up to the user to determine that the resultant assembly is good and undamaged.

1.2.1 Definition of Requirements This document is intended to be used as a guide and there are no specific requirements or criteria unless separately and specifically called out in a user's contractual or other documentation. When statements such as ''must,'' ''should'' or ''need to be'' are used, they are stressing an important point. If these strong recommendations are not followed the end result may not be satisfactory and additional damage could be caused.

1.3 Background Today's electronic assemblies are more complex and smaller than ever before. Despite this, they can be successfully modified, reworked or repaired if the proper techniques are followed. This manual is designed to help users repair, rework and modify electronic assemblies with minimum impact on end use function or reliability. The procedures in this document have been obtained from assemblers, printed board manufacturers and users who recognize the need for documenting commonly used rework, repair and modification techniques. These techniques have, in general, been proven to be acceptable for the class of product indicated through testing and extended field functionality. Procedures contained herein were submitted for inclusion by commercial and military organizations too numerous to list individually. The Repairability Subcommittee has, where appropriate, revised procedures to reflect improvements.

1.4 Terms and Definitions Definitions marked with an * are from IPC-T-50 and apply to the use of this document.

PCA – Printed Circuit Assembly

**Rework* – the act of reprocessing noncomplying articles, through the use of original or equivalent processing, in a manner that assures full compliance of the article with applicable drawings or specifications.

**Modification* – the revision of the functional capability of a product in order to satisfy new acceptance criteria. Modifications are usually required to incorporate design changes which can be controlled by drawings, change orders, etc. Modifications should only be performed when specifically authorized and described in detail on controlled documentation.

**Repair* – the act of restoring the functional capability of a defective article in a manner that does not assure compliance of the article with applicable drawings or specifications.

1.4.1 Class of Product The user of the product is responsible for identifying the Class of Product. The procedure selected for action to be taken (modification, rework, repair, overhaul etc.) must be consistent with the Class identified by the user. The three Classes of Product are:

Class 1 – General Electronic Products
Includes products for applications where the major requirement is the function of the completed assembly.

Class 2 – Dedicated Service Electronic Products
Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end use environment would not cause failures.

Class 3 – High Performance Electronic Products
Includes products where continued performance or performance-on-demand is critical. Equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function where required, such as life support and other critical systems.