THE INSTITUTE FOR
INTERCONNECTING
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ELECTRONIC CIRCUITS

IPC-7711

Rework of Electronic Assemblies

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February 1998

A standard developed by the Institute for Interconnecting and Packaging Electronic Circuits

Supersedes IPC-R-700C
January 1988

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Rework of Electronic Assemblies

Developed by the Electronic Assembly Rework Task Group (7-34b)
of the Institute for Interconnecting and Packaging Electronic Circuits

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

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The Principles of Standardization

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

Standards Should:

- Show relationship to DFM & DFE
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feed back 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

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Foreword

IPC's documentation strategy is to provide distinct documents that focus on specific aspects of electronic packaging issues. In this regard document sets are used to provide the total information related to a particular electronic packaging topic. A document set is identified by a four digit number that ends in zero (0) (i.e., IPC-7710).

This standard is intended to provide information on the rework, repair and modification of printed boards and electronic assemblies. This information must also be supplemented by a performance specification that contains the requirements for the chosen technology. When used together, these documents should lead both manufacturer and customer to consistent terms of acceptability.

These documents supersede the following:

IPC-7711 supersedes IPC-R-700C
IPC-7721 supersedes IPC-R-700C

As technology changes, a performance specification will be updated, or new focus specifications will be added to the document set. The IPC invites input on the effectiveness of the documentation and encourages user response through completion of "Suggestions for Improvement" forms at the end of each document.

Acknowledgment

Any Standard involving a complex technology draws material from a vast number of sources. While the principal members of the IPC Electronic Assembly Rework Task Group (7-34b) of the Product Assurance Committee 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.

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Chairman
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NSWC Crane

Technical Liaison of the IPC Board of Directors

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A Special Note of Appreciation

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

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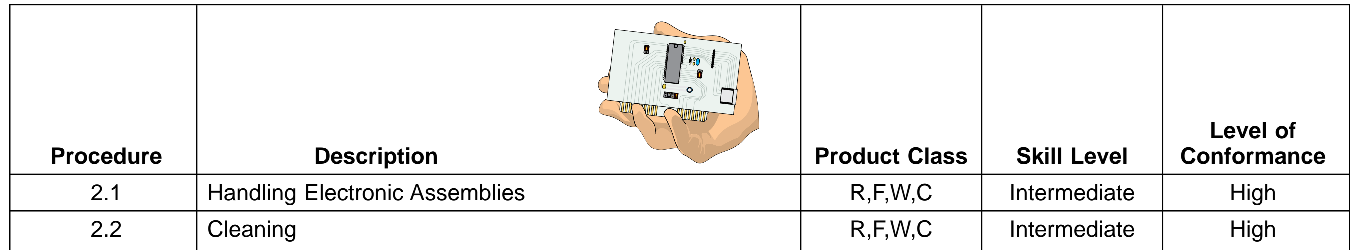
2 Handling/Cleaning

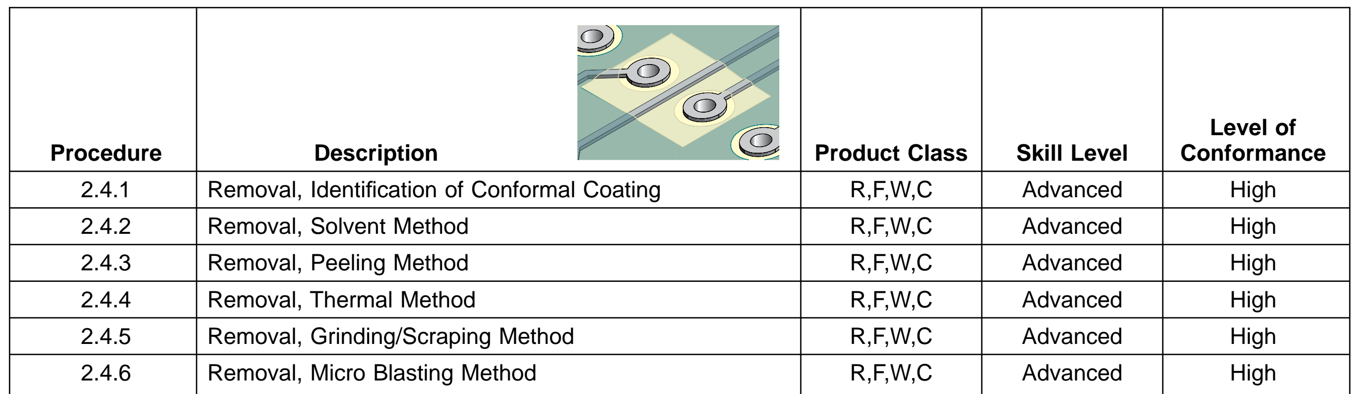


Procedure	Description	Product Class	Skill Level	Level of Conformance
2.1	Handling Electronic Assemblies	R,F,W,C	Intermediate	High
2.2	Cleaning	R,F,W,C	Intermediate	High

2.3 Conditioning

Procedure	Description	Product Class	Skill Level	Level of Conformance
2.3.1	Baking and Preheating	R,F,W,C	Intermediate	High

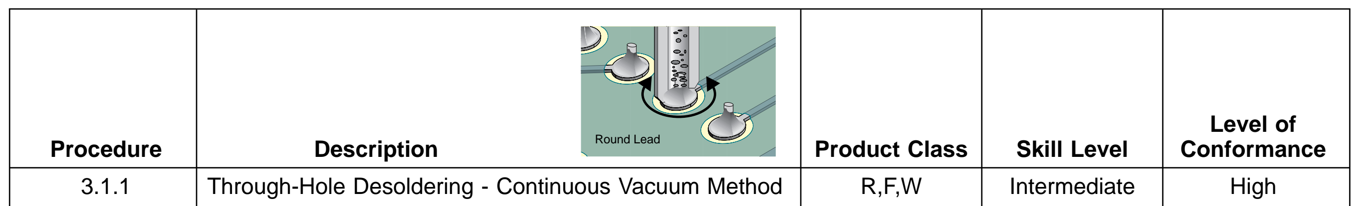
2.4 Coating



Procedure	Description	Product Class	Skill Level	Level of Conformance
2.4.1	Removal, Identification of Conformal Coating	R,F,W,C	Advanced	High
2.4.2	Removal, Solvent Method	R,F,W,C	Advanced	High
2.4.3	Removal, Peeling Method	R,F,W,C	Advanced	High
2.4.4	Removal, Thermal Method	R,F,W,C	Advanced	High
2.4.5	Removal, Grinding/Scraping Method	R,F,W,C	Advanced	High
2.4.6	Removal, Micro Blasting Method	R,F,W,C	Advanced	High

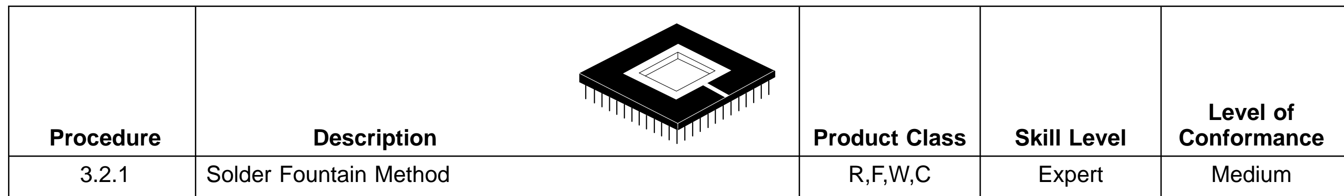
3 Removal

3.1 Through-Hole Removal



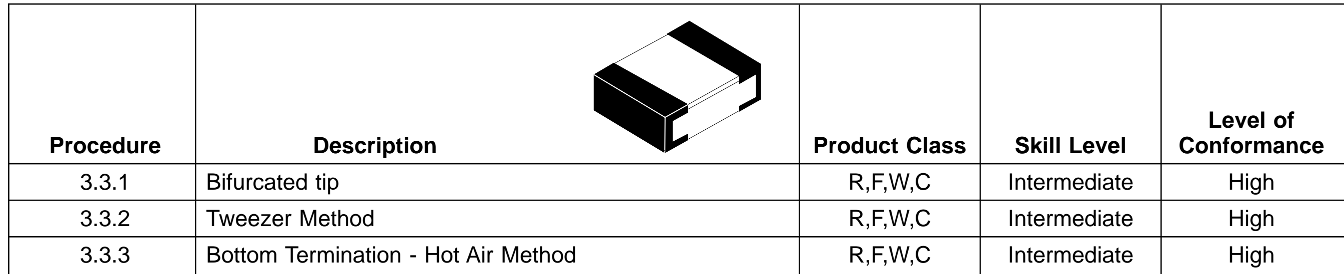
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.1.1	Through-Hole Desoldering - Continuous Vacuum Method	R,F,W	Intermediate	High

3.2 PGA and Connector Removal



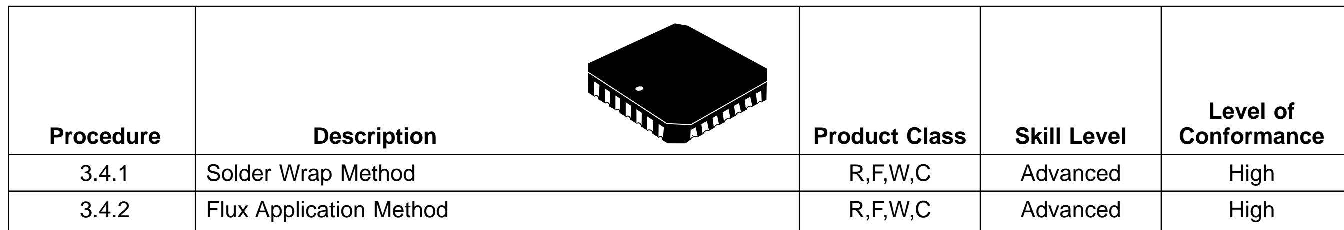
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.2.1	Solder Fountain Method	R,F,W,C	Expert	Medium

3.3 Chip Component Removal



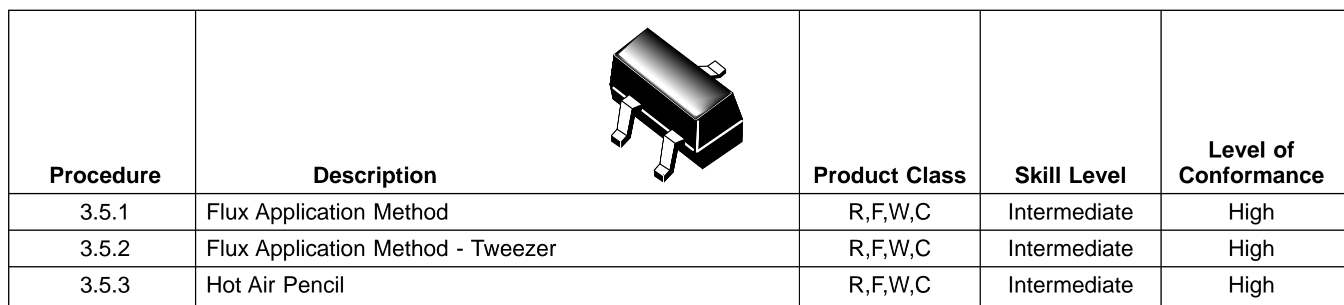
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.3.1	Bifurcated tip	R,F,W,C	Intermediate	High
3.3.2	Tweezer Method	R,F,W,C	Intermediate	High
3.3.3	Bottom Termination - Hot Air Method	R,F,W,C	Intermediate	High

3.4 Leadless Component Removal



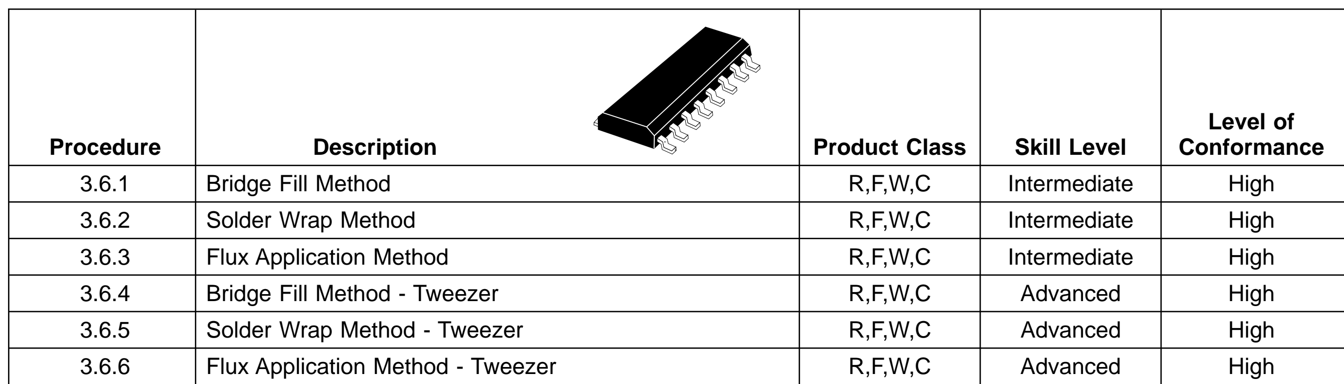
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.4.1	Solder Wrap Method	R,F,W,C	Advanced	High
3.4.2	Flux Application Method	R,F,W,C	Advanced	High

3.5 SOT Removal



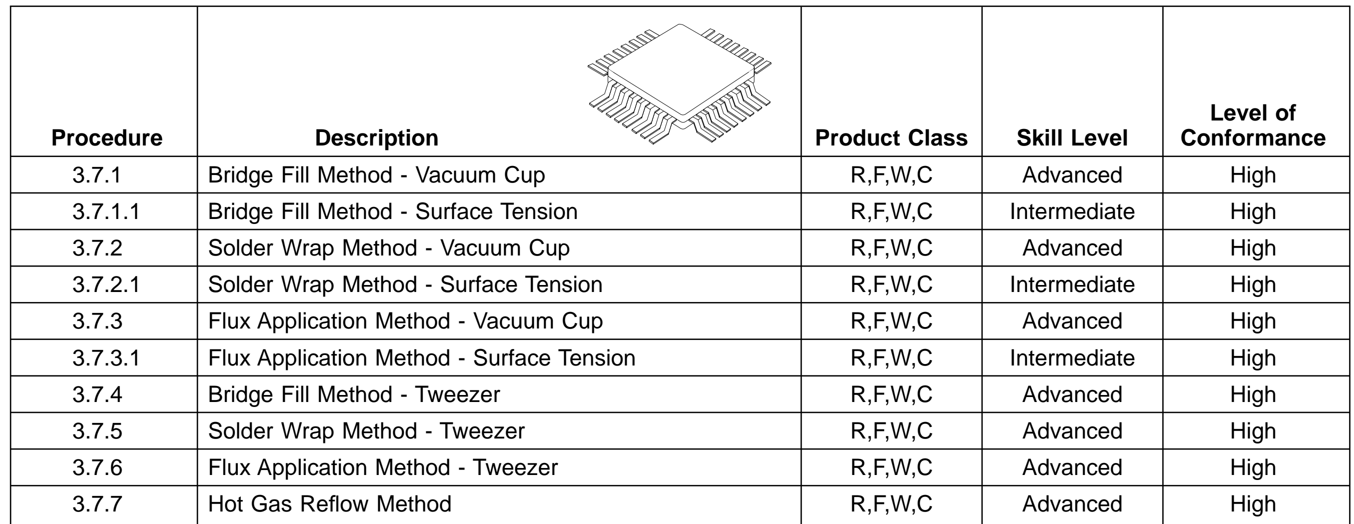
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.5.1	Flux Application Method	R,F,W,C	Intermediate	High
3.5.2	Flux Application Method - Tweezer	R,F,W,C	Intermediate	High
3.5.3	Hot Air Pencil	R,F,W,C	Intermediate	High

3.6 Gull Wing Removal (two sided)



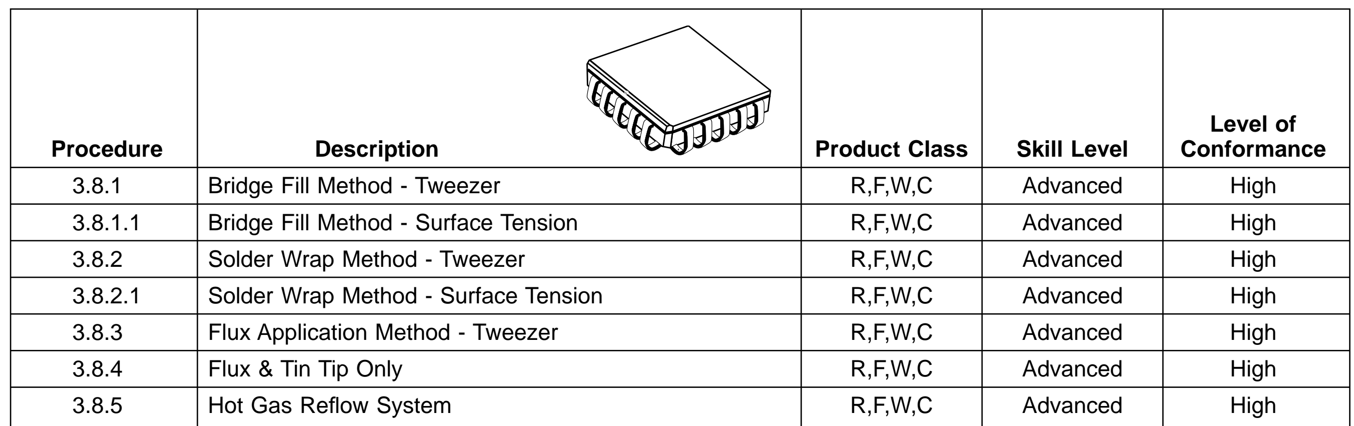
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.6.1	Bridge Fill Method	R,F,W,C	Intermediate	High
3.6.2	Solder Wrap Method	R,F,W,C	Intermediate	High
3.6.3	Flux Application Method	R,F,W,C	Intermediate	High
3.6.4	Bridge Fill Method - Tweezer	R,F,W,C	Advanced	High
3.6.5	Solder Wrap Method - Tweezer	R,F,W,C	Advanced	High
3.6.6	Flux Application Method - Tweezer	R,F,W,C	Advanced	High

3.7 Gull Wing Removal (four sided)



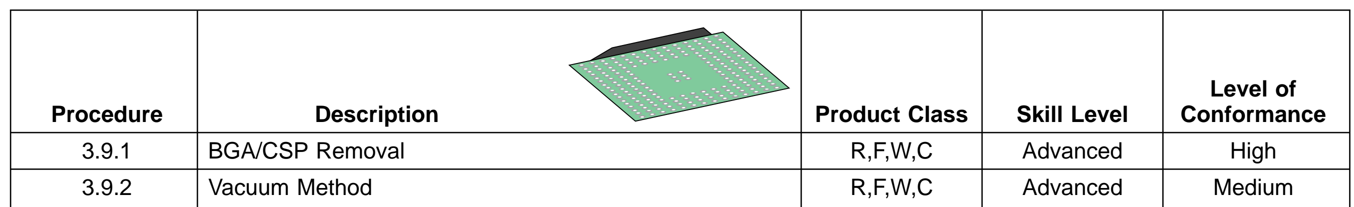
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.7.1	Bridge Fill Method - Vacuum Cup	R,F,W,C	Advanced	High
3.7.1.1	Bridge Fill Method - Surface Tension	R,F,W,C	Intermediate	High
3.7.2	Solder Wrap Method - Vacuum Cup	R,F,W,C	Advanced	High
3.7.2.1	Solder Wrap Method - Surface Tension	R,F,W,C	Intermediate	High
3.7.3	Flux Application Method - Vacuum Cup	R,F,W,C	Advanced	High
3.7.3.1	Flux Application Method - Surface Tension	R,F,W,C	Intermediate	High
3.7.4	Bridge Fill Method - Tweezer	R,F,W,C	Advanced	High
3.7.5	Solder Wrap Method - Tweezer	R,F,W,C	Advanced	High
3.7.6	Flux Application Method - Tweezer	R,F,W,C	Advanced	High
3.7.7	Hot Gas Reflow Method	R,F,W,C	Advanced	High

3.8 J-Lead Removal



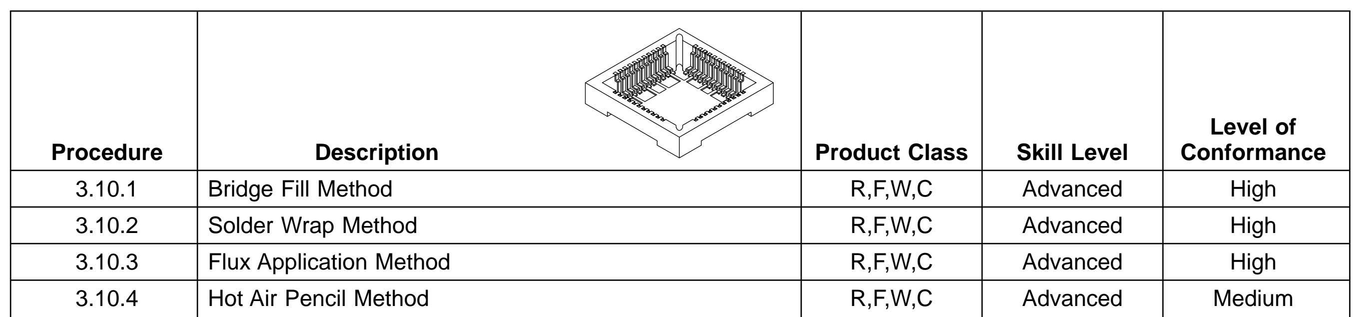
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.8.1	Bridge Fill Method - Tweezer	R,F,W,C	Advanced	High
3.8.1.1	Bridge Fill Method - Surface Tension	R,F,W,C	Advanced	High
3.8.2	Solder Wrap Method - Tweezer	R,F,W,C	Advanced	High
3.8.2.1	Solder Wrap Method - Surface Tension	R,F,W,C	Advanced	High
3.8.3	Flux Application Method - Tweezer	R,F,W,C	Advanced	High
3.8.4	Flux & Tin Tip Only	R,F,W,C	Advanced	High
3.8.5	Hot Gas Reflow System	R,F,W,C	Advanced	High

3.9 BGA/CSP Removal



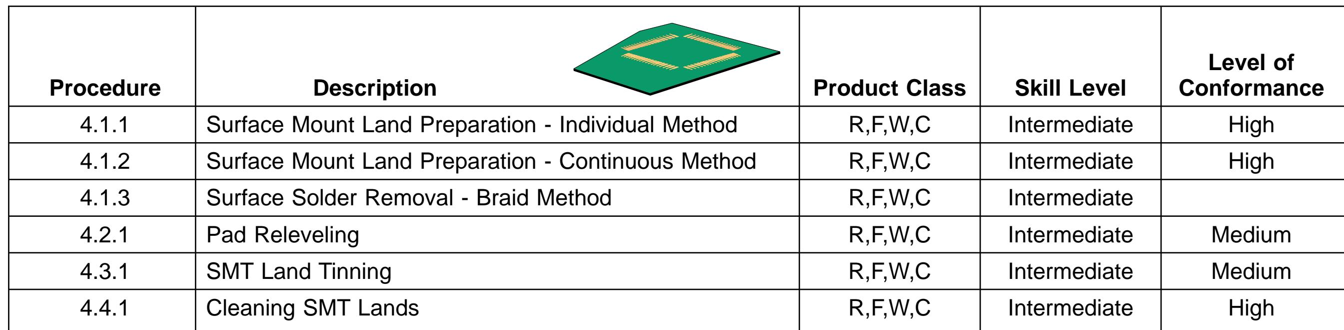
Procedure	Description	Product Class	Skill Level	Level of Conformance
3.9.1	BGA/CSP Removal	R,F,W,C	Advanced	High
3.9.2	Vacuum Method	R,F,W,C	Advanced	Medium

3.10 PLCC Socket Removal



Procedure	Description	Product Class	Skill Level	Level of Conformance
3.10.1	Bridge Fill Method	R,F,W,C	Advanced	High
3.10.2	Solder Wrap Method	R,F,W,C	Advanced	High
3.10.3	Flux Application Method	R,F,W,C	Advanced	High
3.10.4	Hot Air Pencil Method	R,F,W,C	Advanced	Medium

4 Pad/Land Preparation



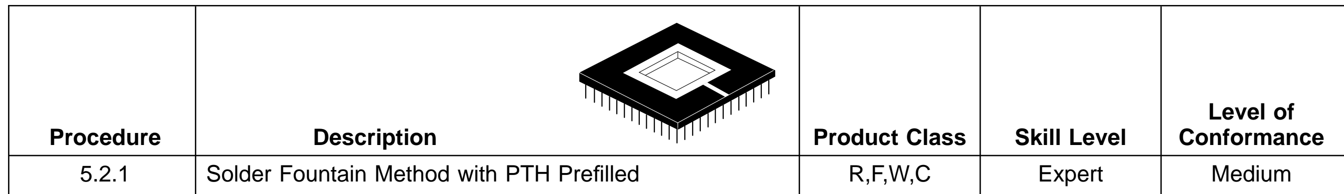
Procedure	Description	Product Class	Skill Level	Level of Conformance
4.1.1	Surface Mount Land Preparation - Individual Method	R,F,W,C	Intermediate	High
4.1.2	Surface Mount Land Preparation - Continuous Method	R,F,W,C	Intermediate	High
4.1.3	Surface Solder Removal - Braid Method	R,F,W,C	Intermediate	
4.2.1	Pad Releveling	R,F,W,C	Intermediate	Medium
4.3.1	SMT Land Tinning	R,F,W,C	Intermediate	Medium
4.4.1	Cleaning SMT Lands	R,F,W,C	Intermediate	High

5 Installation

5.1 Through-Hole Installation

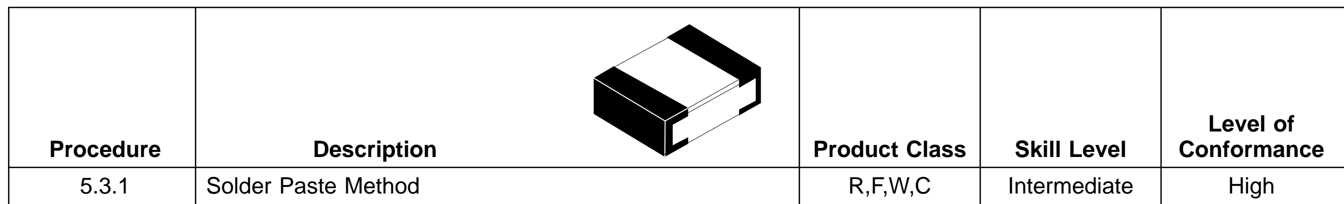
Procedure	Description	
	Install following the requirements of J-STD-001 and J-HDBK-001	

5.2 PGA and Connector Installation



Procedure	Description	Product Class	Skill Level	Level of Conformance
5.2.1	Solder Fountain Method with PTH Prefilled	R,F,W,C	Expert	Medium

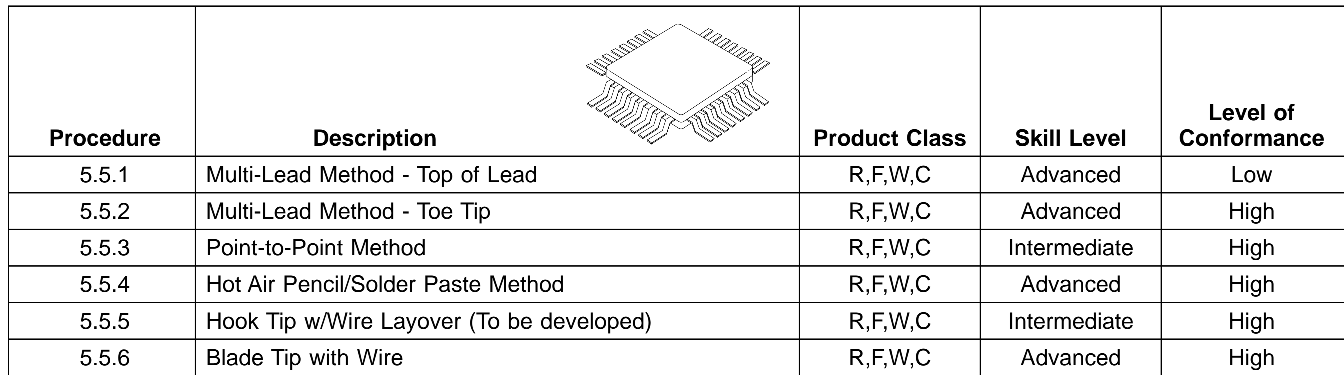
5.3 Chip Installation



Procedure	Description	Product Class	Skill Level	Level of Conformance
5.3.1	Solder Paste Method	R,F,W,C	Intermediate	High

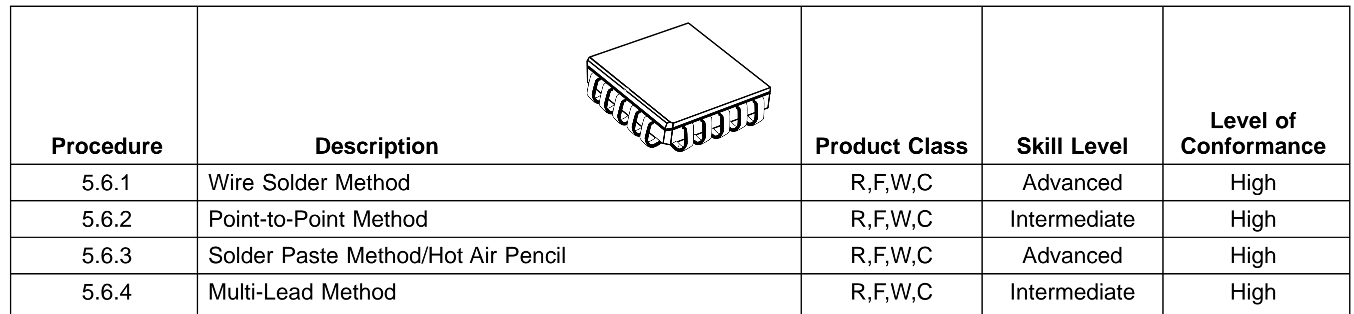
5.4 Leadless Component Installation (To Be Developed)

5.5 Gull Wing Installation



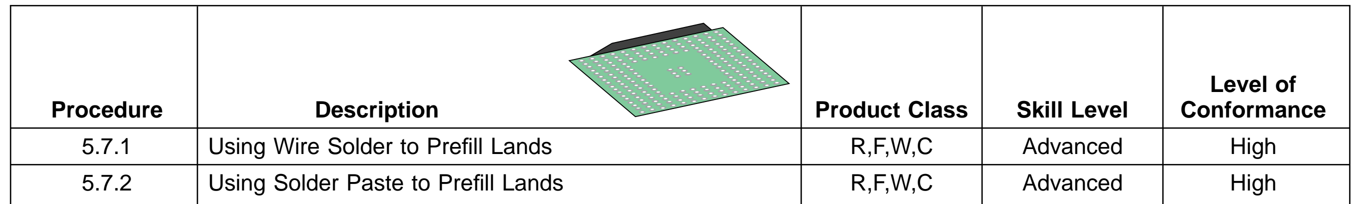
Procedure	Description	Product Class	Skill Level	Level of Conformance
5.5.1	Multi-Lead Method - Top of Lead	R,F,W,C	Advanced	Low
5.5.2	Multi-Lead Method - Toe Tip	R,F,W,C	Advanced	High
5.5.3	Point-to-Point Method	R,F,W,C	Intermediate	High
5.5.4	Hot Air Pencil/Solder Paste Method	R,F,W,C	Advanced	High
5.5.5	Hook Tip w/Wire Layover (To be developed)	R,F,W,C	Intermediate	High
5.5.6	Blade Tip with Wire	R,F,W,C	Advanced	High

5.6 J-Lead Installation



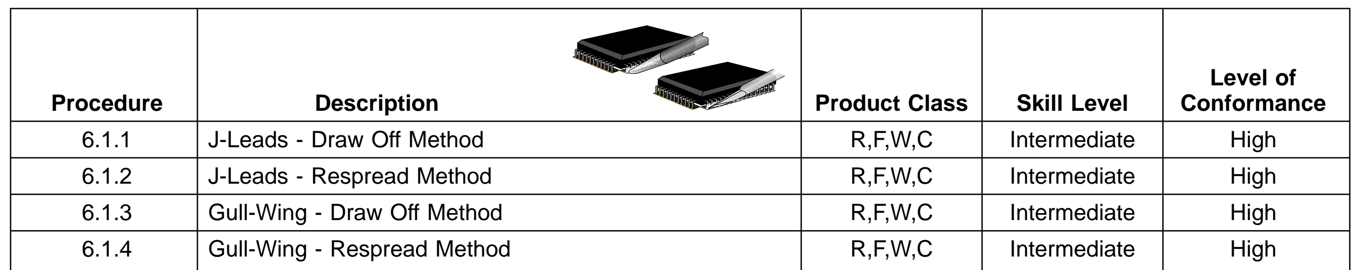
Procedure	Description	Product Class	Skill Level	Level of Conformance
5.6.1	Wire Solder Method	R,F,W,C	Advanced	High
5.6.2	Point-to-Point Method	R,F,W,C	Intermediate	High
5.6.3	Solder Paste Method/Hot Air Pencil	R,F,W,C	Advanced	High
5.6.4	Multi-Lead Method	R,F,W,C	Intermediate	High

5.7 BGA/CSP Installation



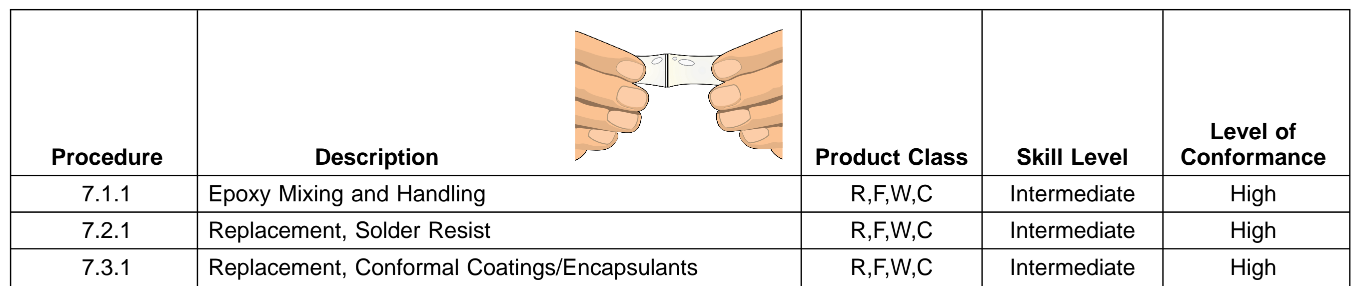
Procedure	Description	Product Class	Skill Level	Level of Conformance
5.7.1	Using Wire Solder to Prefill Lands	R,F,W,C	Advanced	High
5.7.2	Using Solder Paste to Prefill Lands	R,F,W,C	Advanced	High

6 Removing Shorts



Procedure	Description	Product Class	Skill Level	Level of Conformance
6.1.1	J-Leads - Draw Off Method	R,F,W,C	Intermediate	High
6.1.2	J-Leads - Respread Method	R,F,W,C	Intermediate	High
6.1.3	Gull-Wing - Draw Off Method	R,F,W,C	Intermediate	High
6.1.4	Gull-Wing - Respread Method	R,F,W,C	Intermediate	High

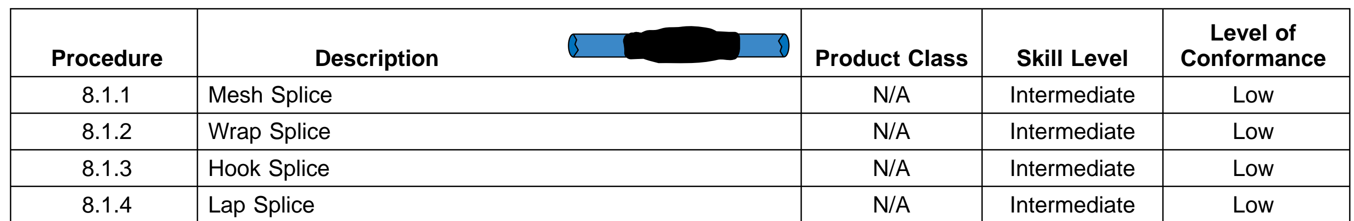
7 Bonding/Coating



Procedure	Description	Product Class	Skill Level	Level of Conformance
7.1.1	Epoxy Mixing and Handling	R,F,W,C	Intermediate	High
7.2.1	Replacement, Solder Resist	R,F,W,C	Intermediate	High
7.3.1	Replacement, Conformal Coatings/Encapsulants	R,F,W,C	Intermediate	High

8 Wires

8.1 Splicing



Procedure	Description	Product Class	Skill Level	Level of Conformance
8.1.1	Mesh Splice	N/A	Intermediate	Low
8.1.2	Wrap Splice	N/A	Intermediate	Low
8.1.3	Hook Splice	N/A	Intermediate	Low
8.1.4	Lap Splice	N/A	Intermediate	Low

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Rework of Electronic Assemblies

1.0 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.

1.2 Purpose This document prescribes the procedural requirements, tools and 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 of ANSI/J-STD-001, 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 affect 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 When the word *must* is used all requirements are mandatory for all product classes. When the word *shall* is used, the requirement is mandatory for class 3 products.

1.2.2 Requirements Flowdown The applicable requirements of this document must be imposed by each manufacturer or supplier on all applicable subcontracts and purchase orders. The manufacturer or supplier must not impose or allow any variation from these requirements on subcontracts or purchase orders other than those that have been approved by the user. Unless otherwise specified, the requirements of this document are not imposed on the procurement of off the shelf assemblies or subassemblies. However, the manufacturer of these items may comply as deemed appropriate.

1.3 Background Today's PC boards are more complex and microminiaturized 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 you repair, rework and modify PC boards reliably. The procedures in this document have been obtained from end product assemblers, printed board manufacturers and end product users who recognized 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.

Rework completed satisfactorily will meet the original specification and requirements of IPC-A-600 and IPC-A-610. But, by definition, modifications and repairs do not comply with the initial design or fabrication criteria. For modification and repair, the user must recognize that the criteria in IPC-A-600 Acceptability of Printed Boards and IPC-A-610 Acceptability of Printed Board Assemblies are not necessarily applicable to the procedures herein. Modifications and repairs should not compensate for the lack of proper processes and quality controls. Ultimate cost effectiveness is achieved using appropriate design, fabrication and assembly techniques that minimize the need for modification and repair.

1.4 Controls Although modification, rework and repair procedures may be very similar, the control of such procedures may not be the same, due to the conditions and objectives involved.

1. *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.

2. *Rework*

   The act of reprocessing non-complying articles, through the use of original or equivalent processing, in a manner that assures full compliance of the article with applicable drawings or specifications.

3. *Repair*

   The act of restoring the functional capability of a defective article in a manner that precludes compliance of the article with applicable drawings or specifications.

   Repairs are generally changes to an unacceptable end product to make it acceptable in accordance with original functional requirements. The control of repaired products should be by means of Material Review Board (MRB), or its equivalent, which may consist of