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IPC 7711/7721 Worker Proficiency Course Overview

General:

The IPC 7711 is the latest IPC document detailing various procedures to perform rework on electronic assemblies and supersedes IPC-R-700C.

The IPC 7721 is details various repair and modification procedures and again supersedes the IPC-R-700C.

Both of these documents were released in January 2000.

Rework is defined as 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. Probably 90% of the post assembly soldering processes fall into this category.

Repair is defined as 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. These procedures include the repair of damaged laminate material caused by thermal excursions, replacement of damaged SMT pads or traces, replacement of damaged PTH barrels, etc.

Modification is defined as the revision of the functional capability of a product in order to satisfy new acceptance criteria. These are generally a result of engineering change orders and include the installation of jumper wires and other related procedures.

The course is modularized at the worker proficiency level into sessions, the first of which is entitled **Common Procedures**. All 7711/21 certification candidates must attend this session and pass an end of session written test (multiple choice) of 20 questions. The candidate must achieve a score of 70% or better to advance to the other modules. The session is entitled common procedures because these basic issues are common to the IPC 7711 and 7721.

The common procedures module includes information on:

- Scope and Purpose or the standards
- Explanation of the standard layout
- Definitions of terms used in the standard
- Basic considerations for any soldering process
- Process goals and guidelines
- Discussion of primary heating methods
- Use of preheating and auxiliary heating methods

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- Vision System considerations (microscope basics)
- Selecting the appropriate rework/repair/modification procedures
- Basics of a time/temperature profile
- Handling Electronic Assemblies
- Electrostatic discharge and electrical overstress
- ESD protective materials
- ESD workstations
- Discussion on cleaning assemblies
- Need for baking and preheating PCB's

After the candidate has successfully passed the Common Procedures module any of the remaining 8 modules may be taught in any order. The successful student will be issued an official IPC certification on the completed modules good for two years from the date of completion. Details on individual modules follow:

Module Two – Wire Splicing

This module discusses the four IPC recognized wire splices (Mesh, Wrap, Hook, and Lap) along with a discussions of feasibility of repairing damaged wires and demonstration of wire stripping along with all of the abovementioned wire splices. The session also covers wire tinning using a soldering iron and a solder pot. The students must show proficiency in the above and demonstrate the ability to perform at least two of the splices to an IPC Class 3 criteria.

Module Three – Through-Hole Rework

This module covers the various ways to install and remove PTH type components. Students are graded on the IPC Class 3 criteria on installations of various axial and radial leaded devices using conductive applications. The student will watch the IPC video VT-41, Through Hole Rework, instructed on proper stress relief bends and the proper use of vacuum extraction handpieces. The student will also have the opportunity to use a solder flow fountain to remove and install multi-leaded PTH devices. Lastly the student will be instructed in the workmanship standards associated with PTH configurations.

Module Four – SMT chip component and MELF installation and removal

This module instructs the student on various ways to install SMT chips and MELF using both conductive and convective techniques. Students install components ranging from 1206's down to 0402's. Students remove components using various conductive tips and focused hot air. Appropriate workmanship standards are reviewed and students must install and remove components to the IPC Class 3 criteria. Pad releveling and tinning is also covered.

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Module Five - SMT SOT's and SOIC's installation and removal

This module covers various procedures for the installation of small outline transistors and small outline integrated circuits utilizing both conductive and convective techniques. Students will also discuss component polarity and orientation issues associated with multi-leaded SMT devices. Surface mount land preparation is also discussed. Workmanship standards for gull wing devices are presented and the student must install and remove devices to the IPC Class 3 criteria.

Module Six – SMT PLCC's and QFP's

This module covers the various procedures for installing and removing surface mount J-leaded devices (Plastic Leaded Chip Carriers) and Quad Flat Packs. Device pitch ranges from 50 mils down to 20 mils. Students will use both conductive (point-to-point and drag soldering) and convective (hot-air and solder paste) techniques. Students will also be taught various ways to remove shorts between leads of PLCC's and QFP's. Appropriate workmanship standards are reviewed and, again, students are graded to the IPC Class 3 criteria.

Module Seven – Conformal Coating Identification, Removal, and Replacement

This module takes the students though the conformal coating identification process using a truth table and the various characteristics of different coating types. Students are also exposed to various methods or removing conformal coatings (solvents, grinding, scraping, thermal, etc.), methods to protect adjacent components, and methods to recoat assemblies. The student will also be introduced to various equipment micro-milling and drilling equipment.

Module Eight – Printed Circuit Board Repair

In this module the student will be introduced to various methods used to perform repair on PCB's including replacement of damaged PTH barrels via the use of replacement eyelets and fullelets, replacement of damaged surface mount pads, replacement of damaged circuits (traces), and installation of jumper wires on PCB's. The student will be introduced to 'thermo-bond' (dry-film adhesive backed pads/circuits) technology.

Module Nine – Laminate Repair

This module covers the repair of damaged laminate material. Students will repair a burn on a PCB by excavating the damaged material, mixing two-part epoxy, using the epoxy to fill the damaged area, and the use of coloring agents to match the PCB color. Other repair techniques will also be discussed such as tooling hole repair, repair of broken corners, etc.

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