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Guidelines for Cleaning of Printed Boards and Assemblies

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Guidelines for Cleaning of Printed Boards and Assemblies

1 BACKGROUND

This revision of IPC-CH-65 covers cleaning of both bare boards and assemblies. It is intended to be a road map to cleaning which covers both current and emerging technologies.

When the IPC-CH-65 guide was first published in December 1990, the world of electronics was quite different than it is today. At that time, through-hole was king and low residue flux used with a no-clean process was at a very early stage on the learning curve. Nothing much more difficult than 50-mil pitch was normally encountered and this pitch could hardly be imagined as being in the form of a package such as a Ball Grid Array (BGA). Similarly, board fabrication was a simpler process with fewer options.

Cleanliness requirements for both assemblies and board fabrication were not as demanding in 1990 as they are today. Relatively wide line traces on the boards and larger pitches on the components made the removal of troublesome residues less demanding and more forgiving. Importantly, less than adequate cleaning of bare boards prior to use by the assembler did not pose a significant problem, only because the completed assemblies were normally washed.

The choice of cleaning agents was much more limited when this manual was first published. Chlorinated solvents were still used widely and there were few, if any, new offerings from the cleaning agent vendors. Many of today's cleaning agent manufacturers had not yet started, or were just beginning, to research on cleaning products designed to meet the needs for cleaning electronic assemblies. Semi-aqueous, two step cleaning systems (e.g., solvent wash plus water rinse) had been introduced relatively recently. Aqueous, inorganic based saponifiers were not yet part of the electronics cleaning picture. Solvents such as hydrofluorocarbons (HFCs) hydrofluoroethers (HFEs), volatile methyl siloxanes (VMSs) and n-propyl bromide (nPB) were developed relatively recently.

With the exception of ozone depletion, environmental issues and worker safety were not nearly as fully understood or regulated as they are today. Volatile organic components (VOCs) regulations, for example, were just beginning to impact operations and, overall, were not as demanding as they are today. An analogous situation existed for waste disposal and close-looping, with the additional complication that treatment processes were in the process of being developed for this field.

While the world of assembly and fabrication cleaning needs has become significantly more challenging and complex during the decade of the 90s, it can safely be said that modern cleaning technology is up to the task. Much has been learned in recent years regarding assembly and bare board cleaning. Many papers have been written and/or published over the past few years regarding the cleaning needs for devices such as flip chips, BGAs, as well as the cleanliness requirements and risks associated with the low residue, no-clean approach. The '90s have also witnessed important improvements in the efficacy of cleaning equipment. Waste treatment and close-looping are fairly well understood technologies at this point in time.

1.1 Purpose The purpose of IPC-CH-65A is to serve as an updated, user-friendly road map for both fabrication and assembly cleaning. The key words are ''updated,'' ''user-friendly'' and ''road map.''

1.2 Scope This manual is a road map for current and developing cleaning issues, rather than to function as a highly detailed document for all areas touched on. In areas of cleaning where recent detailed IPC manuals already exist, the relevant sections in IPC-CH-65A will contain only sufficient information to make the reader reasonably knowledgeable. This guideline manual will refer the reader to appropriate existing IPC documents (where they exist) for in-depth information on the particular subject. An example of such a reference IPC manual is IPC-AC-62, *Aqueous Cleaning Handbook*. It is only where existing IPC documents are not available that IPC-CH-65A will expand information beyond the basics in order to cover what is currently known about the subject. A benefit of this approach is that the manual does not become unwieldy and tends to foster a user-friendly environment.

Both bare board fabrication and assembly cleanliness issues are addressed. The fabrication and assembly sections are separated for ease of access. In the original IPC-CH-65, these sections were very much intertwined. However, it was recognized that for a subject such as the required cleanliness of finished bare boards, basically redundant teachings are required for both the fabrication and assembly sections.

The fabrication section starts off by covering general issues, as well as the sources and nature of residues. It then covers various cleaning steps that occur during fabrication of printed circuit boards (or more correctly, substrates). Fabrication cleaning takes into consideration the specific needs associated with a number of new surface finishes. It is important to note that for bare boards destined for no-clean assembly, the cleanliness requirements for finished bare boards have increased dramatically in importance. This is particularly the situation for Hot Air Solder Leveling (HASL) processed boards.