**Why Clean ‘No Clean’ Flux Residues**

For best in class reliability, particularly if the reliability of an assembly is critical, the PCBA

should be be cleaned. Not only to remove flux residues from the PCB surface and solder joints, but also from underneath all the components. Every Manufacturer of PCBA’s has

their own commercial parameters for a specific job, often specified by the end customer.

The assembler should decide early whether to clean, and if so adapt the various processes

available to achieve an assembly that is clean enough to indicate very low levels of ionic

contamination when tested in an Ionograph system. This is the key quality control par-ameter. The level of ionic contamination remains the best indicator of likely long term

reliability of an assembly. One good starting point for making the decision of whether to

clean or not, is to Ionograph test an uncleaned assembly. If significant ionic contamination is

indicated by the test, then cleaning should be considered.

**What Contaminants are being removed by cleaning**

The contaminants on a PCBA are principally organic in nature, ie natural and /or synthetic

resins, ions, Organic and in some cases small amounts of Halidic acids, solder balls, finger

prints and substrate particulates. The move to lead free alloys has required significant

changes in fluxes and solder pastes to support the necessary higher process temperatures.

The fluxes are usually more active to respond to higher reflow temperatures, which also

presents increased risks. Residues may remain after soldering which have not correctly

decomposed , and can therefore initiate corrosion. If the assembly is to be considered

correctly cleaned, no flux residues or acids, no finger prints, particulates, dust, or cleaning

chemistry residues must remain, including under all components. At the same time, the

whole assembly, including, components, any codings, underfills, adhesive, and the substrate

must not be damaged by the cleaning process or any cleaning chemistry used. The assembly

should be dried and ready for immediate use or test at the end of the cleaning cycle, and

any ink legends must remain untouched and legible.

**Why clean ‘No Clean’ Flux residues from PCBA’s**

current market statistics indicate that upwards of 70% of all PCBA’s are soldered using products specified as no clean types. This class of flux was developed of course to eliminate

the requirement for further cleaning after soldering. However many assemblers still require

the removal of no clean residues. This can be for a number of reasons. The end use appli-

cation of the PCBA can be the decisive factor. Very high impedence or precision analogue

circuits can have signals affected by the presence of flux residues, even low solids no clean

types. If correctly and consistently heated, the organic acids used in modern no clean fluxes

will completely decompose into harmless components. However any residues may still be

hygroscopic. If these residues absorb moisture from the ambient environment, leakages can

occur between signal pathways. Any flux residues which have been trapped or shielded in

such a way as to cause them not to reach the required temperature for decomposition will

remain a prime source of signal leakage and ultimately corrosion. The risk increases as the

assembly is put under power and over time. One particular source of this problem is flux

residue entrapment between a PCBA and a conveyer transport pallet during wave soldering

operations. Another reason for cleaning can be the requirement for ATE testing of the

finished assembly. No clean fluxes specified as ‘ATE Testable’ tend to leave softer residues to allow the test pins to penetrate and make electrical contact. These residues can accumulate on the test pins which can then in turn require cleaning between test cycles.

The harder residues of newer low solids no clean fluxes are an improvement, but can still

interfere with ATE signal transmission in many instances. It was the problems with ATE

testing which provided the first major requirement for cleaning of no clean fluxes. A further

requirement arises from the requirement to conformal coat PCBA’s. The residues can inhibit

correct adhesion of conformal coatings and may absorb ambient moisture during the manu-

facturing cycle. If the conformal coating is subject to a subsequent curing process, the absorbed moisture can be released causing localized areas of unsatisfactory adhesion and

even separation of the coating from the board. This can allow corrosive materials, conductive particulate or additional moisture to gain penetration into the assembly causing

failures in service,signal transmission problems or component failure. Therefore it is import-

ant to resolve issues concerned with the choice of no clean solder materials and subsequent specification of the cleaning process early in the product definition, particularly with high

reliability assemblies. The correct response can prevent premature PCBA failures in critical

service environments such as defence, aerospace and medical applications.