

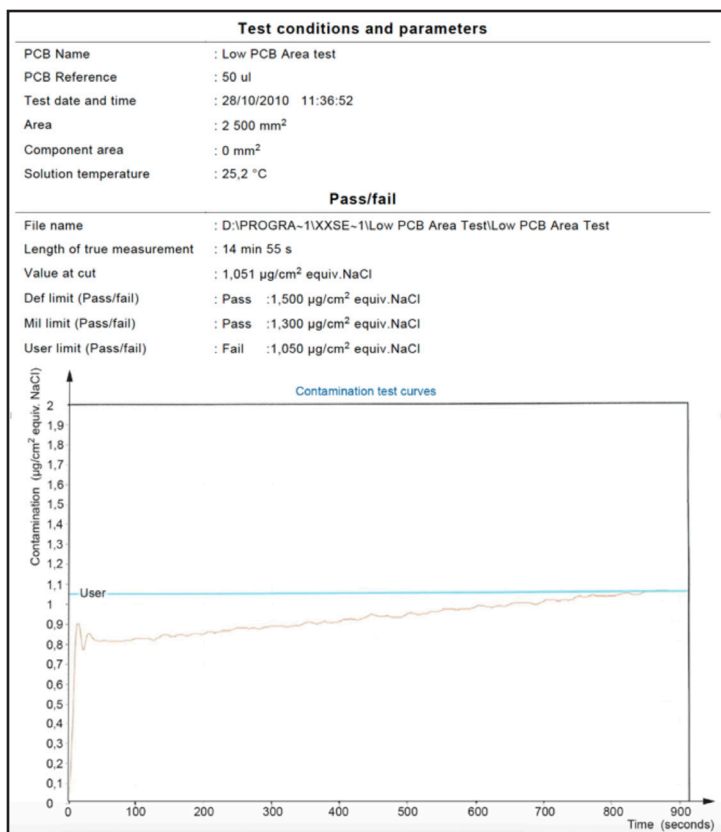
PICT Roundtable Discussion Q&A

What if the reflow process does not work?

If you put something to cook into a cold oven, it won't be fit to eat. The same answer applies with respect to electronic circuits. However, I am assuming that the reader is referring to some incorrect reflow where the solder paste is insufficiently reacted. This would mean excess unreacted residues, and yes, a PICT tester will detect this.

Is the equipment safe to operate and maintain?

As with a ROSE tester, this is a simple, easy-to-operate instrument. To maintain optimum performance, the de-ionising resin filter will require periodic replacement. The period of use is influenced by the amount of ionic "dirt" being removed. Keep in mind that it is not designed to be used as a cleaner.



Can an existing ROSE tester be retrofitted or upgraded to perform PICT testing?

It depends. To use the instrument to its performance optimum, it needs high sensitivity, an efficient test solution circulation/flow rate, and be capable of delivering reliable and repeatable test results. The ability to achieve 6 Sigma, as required by most high-volume manufacturers, is the ultimate expression of capability.

Any de-ionised solution hates being in that condition and will aggressively attempt to scavenge ionic matter wherever it can. This applies to CO₂ in the air above the tank (test chamber). Chemically, the de-ionised water and alcohol test solution—whether 75:25 or 50:50—will exchange with CO₂ and convert itself, over time, to carbonic acid. This is why the surface area of the tank and keeping a lid on it is essential.

The diagram to the left shows the influence of CO₂ over time.

Should PICT testing not be applied throughout the whole process all the way to client final box build? Testing only shows a reading for that day, not forever.

That is entirely dependent upon the manufacturing process and where such testing would be desirable. However, the instrument is only required to detect measurable levels of ionic matter that could compromise the end-product reliability.

ability of the circuit assembly at the completion of its assembly process. Every individual production line will have differing levels of ionic contamination. This level will also be sensitive to its environmental location.

Establishing the user upper control limit for each process line is determined from a process characterisation test using surface insulation resistance (SIR) testing.

Refining the assembly process to maintain acceptable production controls will determine, case-by-case, the test frequency that is required. High-volume producers might determine that a sampling level of one assembly per month is acceptable. Others might determine one test per assembly is necessary.

Can PICT testing be carried out economically?

Yes. The test instrument requires unskilled operators. The test solution is an inexpensive mixture of IPA and de-ionised water. The mixed resin filter is readily available from water treatment suppliers.

Are there issues with the ICT?

No, as long as any tested assembly has been thoroughly dried following the test.

What are the process equipment/purchasing options?

No additional process equipment is required unless the intention is to automatically divert a sample for test from the production line. Most commonly, this is simply a manual pick from the line.

The most important purchasing option is to determine the correct tank size for the instrument. To help with this, it is important to determine tank size by using the ratio of 10 ml per cm² to be individually tested.

This might mean having more than one instrument. By example, a back-plane circuit of say 250 mm x 500 mm (10" x 20") might suggest a tank containing >20 litres of test solution, whereas the majority of assemblies might only measure 100 mm x 150 mm (4" x 6") and require a tank containing <10 litres.

If existing equipment can be upgraded, who can provide parts and perform the upgrade?

The user needs to determine whether their existing instrument is capable of meeting their process requirements.

Some testers can switch use between 75% or 50% IPA/DI water mix. Where would you use the lower 50% mix?

A closed-loop tester (static) is a better option than an open-loop tester (dynamic.)

Extracted from the IEC 61189-5-504 PICT Test:

- » Ionic soils can be dissociated in water, and the conductance measured to give an indication of the contaminate level. The test solution, however, is more than just water; it contains propan-2-ol (IPA), a non-polar liquid that aids the dissolution of the soil and, as a non-ionic hydrophilic solvent, its presence does not influence the reading except insofar as it "dilutes" the water bearing the dissociated ions.
- » The test employs a test solution that comprises a specific ratio of 50 % V/V propan-2-ol and 50 % V/V de-ionised water or 75 % V/V propan-2-ol and 25 % V/V de-ionised water.
- » The 50:50 mixed solution is an optimal compromise between the sensitivity and the solvency when using immersion test methods.
- » The 75:25 mixed solution with the higher alcohol content will reduce sensitivity but increase solvency and vice versa with respect to water.

Is it realistic, and can the result really reflect the reliability of an assembly as an indicator?

It depends. The user is expected to know the maximum upper ionic contamination level permitted to be left on the individual circuit assembly surface. Clearly, if that level is exceeded, then the risk of electrochemical failure increases. That needs to be determined by the manufacturer.

Are there issues with the AOI?

No. This is a test conducted offline.

What are the environmental impact and safety procedures?

PICT and ROSE testers have been in use since the 1970s. They use a mixture of IPA and de-ionised water.

If the upgrade path is not available, how costly is a new machine? \$10K - \$50K - \$100K?

Responding as the manufacturer of the Contaminometer, aka CM Series instruments, the start price of the CM11+ is ~USD10K, the price of our CM33L+ is ~USD25K. Our top of the range CM60 instrument, widely used by the space industry, employs a volumetric measurement cell, which is ~USD50K.

Confidence in the repeatability of the testing is an important factor in choosing a measuring process.

How would this be verified?

The Contaminometer CM Series instruments uniquely meet 6 Sigma criteria as determined by Robert Bosch of Germany. A full explanation of what was done to achieve this is shown in the free micro e-book, [*The Printed Circuit Assembler's Guide to... Process Verification*](#). It is also available as a technical paper that was presented jointly by Robert Bosch and GEN3 at IPC APEX EXPO in 2017.

Can it be carried out in series production on reference modules (test coupons), or does it refer explicitly to the individual electronics module?

Sampling is to be done on the product itself—not representative coupons.