

Locating faults on PCBs requires some practice to become successful. Polar Fault Locators allow you to take an alternative approach to the 'scope and DMM techniques you may be used to. However, don't be surprised if it takes you a few weeks to become accomplished.

Where do I start?

First, its useful if you can work on several boards of the same type, with a known good board as reference. Start by using Channel A and Channel B to compare, for example, the ASA signatures of all the edge connectors. First look for obvious faults, e.g. shorts and opens, which show up as vertical and horizontal straight line ASA signatures. If you have, say, five defective boards of one type test all the connectors first. The high number of nodes compared and the fact that connectors are often subject to external transients which may cause damage mean they are a good starting point. Don't spend too long on any one board though - its best to screen the five boards and perhaps find one or two faults rather than spend hours on the first board you encounter. If you cannot find any differences on the connectors then move onto the larger ICs testing ASA, ICT and links where appropriate and work progressively through the boards until you have reached the discrete components.

Hint: Try to avoid practising on boards which have defied all previous attempts at repairing! Those are best set aside until you are accomplished at using the fault locator.

Are all differences faults?

Most probably not - you need to remember that you do the faultfinding and the Fault Locator helps by pointing out differences. When a Fault Locator displays a FAIL result it simply means the comparison of ASA, ICT or Links has failed.

You then need to examine the difference displayed and decide if this comparison is failing because:

- Some switches are at different settings
- Pots are adjusted differently
- The board is a different revision
- There are ICs from different vendors on the good and faulty board (see AP101)
- You are probing an electrolytic capacitor which has a very high tolerance
- The node is faulty!

How do I determine the true fault cause?

To quickly determine whether the difference is due to a fault or one of the other above causes you need to do some detective work - check over board revision levels, look for wire straps, check switch settings and look at the vendor mix of the two boards you are comparing.

If you are working on microprocessor based boards and you have a good understanding of their operation (i.e. you are familiar with the principle of guarding and address and data bus operation) then use both ASA and ICT in combination.

If you are not too familiar with microprocessor principles then it is recommended you use the ASA and Links tests and disregard the ICT logic test. You will still find 50-80% of faults by using ASA and Links tests but you won't need to understand or use guarding.

Hint: When looking at the ASA signatures of data buses (or address buses) usually all lines should show similar signatures.

Whether you use ASA and Links test or ASA, ICT and Links test you need to remember that on a bus node faults appear to be on all the components attached to that bus node. Use the information in AP107 and AP108 to learn more about how to decide which component is actually faulty.

When using Quicktest it is important to understand the difference between AutoTest and Library compare.

AutoTest should be used on digital boards where you have *no good board* for comparison. AutoTest examines the links on a component and performs a design rules check (e.g., no shorts on outputs) then applies the links information to a mathematical model of the IC under test. If the result read from the board agrees with the math simulator the PFL will PASS the device.

Library Compare is used to compare good and faulty boards or a good and faulty channel on the same board. Library Compare makes no attempt to predict mathematically the IC's logical function. It simply drives the input with a valid set of test vectors for that device and records the output directly from the board under test.

Remember that the first time you clip and test in any of the Quicktest compare modes the test information is saved as a reference. Once you have finished comparing a given component on a good and faulty board use the Erase function to clear the reference data. The PFL is now ready to learn a new set of test data.

If you have a trouble-shooting technique (related to PFL or T-Series) or have a Polar Fault Locator application you would like to see published please fax or email Polar Instruments on the number below. Every 6 months we will give away a free SMD probe to the best solution.



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