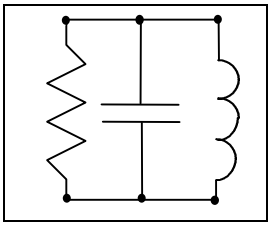
Testronics
a tester company with vision

Loaded Backplane Testing using Traditional Continuity Testers Partial Test Coverage and Damaged Components
A Case for the MDA

Over the past few years, loaded backplane testing has become more complex, often times requiring techniques commonly associated with traditional In-Circuit loaded board testing. Today, loaded backplanes are produced with not only resistor packs and capacitors, but with active devices such as diode arrays and Integrated Circuits present. To further complicate matters, the equipment used to test the old technology backplanes falls dramatically short in providing the capabilities needed to test the advanced backplane assemblies produced today.

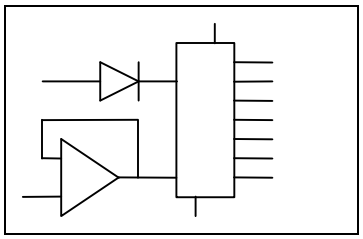
The test equipment in the past was typically a continuity analyzer, which could measure opens and shorts over a large amount of test points. Over the last several years, many suppliers of these test systems were able to keep up with the testing advances by modifying both the software and hardware. These modifications were enough to give their users the ability to perform some rudimentary test functions on passive components. But now, with the addition of active components and complex impedance circuits, the traditional continuity systems are not equipped anymore to perform reliable, stable, and damage free measurements.

Complex Impedances

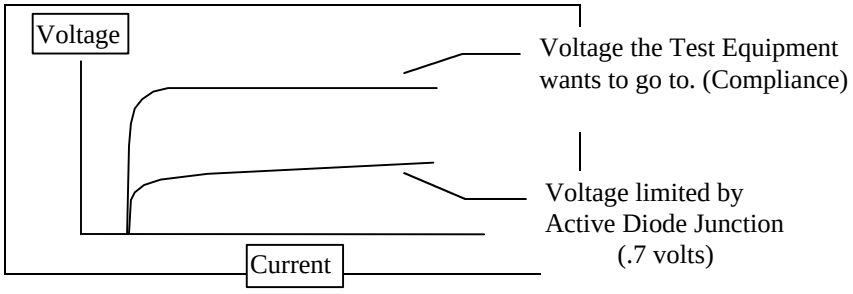


One of the more common areas creating testing difficulties is when there are resistors, capacitors, and inductors forming a complex impedance circuit. Typical DC methods are not capable of making complex impedance measurements. The only way to achieve precise and repeatable measurement is to use an AC stimulus along with some form of phase angle detection that measures the leading, lagging, and in-phase AC current. With the proper AC measurement techniques, the Real vs. Imaginary current can be measured and used to determine proper component values.

Active Components



An area just starting to cause problems during test is when there are active components present. Diodes, transistors, and ICs are all finding their way onto the loaded backplane. The problem arises when a typical continuity analyzer is used to learn the product, or just make open / short measurements. Many of the test systems in use today do not provide the ability to clamp their compliance voltage or current. To make a continuity measurement, most testers force current and measure the subsequent voltage drop across the conductor. The active



components will actually turn on between .6 - .7 volts. This means that when the tester is trying to learn or test, the active component is turned completely on. Not only does this cause incomplete and erroneous testing, but severe damage to the component can occur. To minimize the risk to the component and to insure accurate testing, the test compliance voltage must be clamped to less than the turn on voltage of the active semiconductor junction.

Test Equipment

In the recent past, the only test system that could guard against damaging the active semiconductor junctions as well as perform the complex impedance measurements was the In-Circuit tester. These systems work extremely well but the programming is very detailed and may require several weeks of program development time for a single part number. Also, these systems do not lend themselves to loaded backplane applications due to the limited pin counts. The high initial equipment cost is another factor limiting the use of an In-Circuit tester. Typical costs for only a few hundred test points can reach over $ 100,000. The high cost is mainly due to the digital testing capabilities as each test point has its own digital pin driver. However, this feature is not used for loaded backplane testing. Only analog measurements are typically made on the backplane.

An alternative to the In-Circuit tester is a Manufacturing Defects Analyzer. The architecture of the MDA reflects the industry's need for high pin count analog testing as opposed to the In-Circuit system that focuses more on the lower pin count digital tests. Because of this architectural difference, an MDA can be configured to provide several tens of thousands of test points at very modest prices. Also, the test program development time is typically hours instead of the weeks normally required with the In-Circuit systems.

Test Requirements

- Opens & Shorts
- Resistors
- Capacitors
- Inductors
- Complex Impedances
- Diodes & Zeners
- Active Components
- Integrated Circuits
- Applying Voltages
- Measuring Voltages
- Activating Relays
- Digital Output

These are just a few of the requirements that need to be met due to the advances in loaded backplane technology. The older continuity test systems addressed some functions, but not all. The In-Circuit testers can meet all the requirements, but the equipment and programming costs are prohibitive. But with a properly configured Manufacturing Defects Analyzer, all of these test requirements can be met as well as being accomplished economically.