PXI Newsletter –Test Adapters/Test Fixtures to PXI Instrumentation

Submitted by MAC Panel

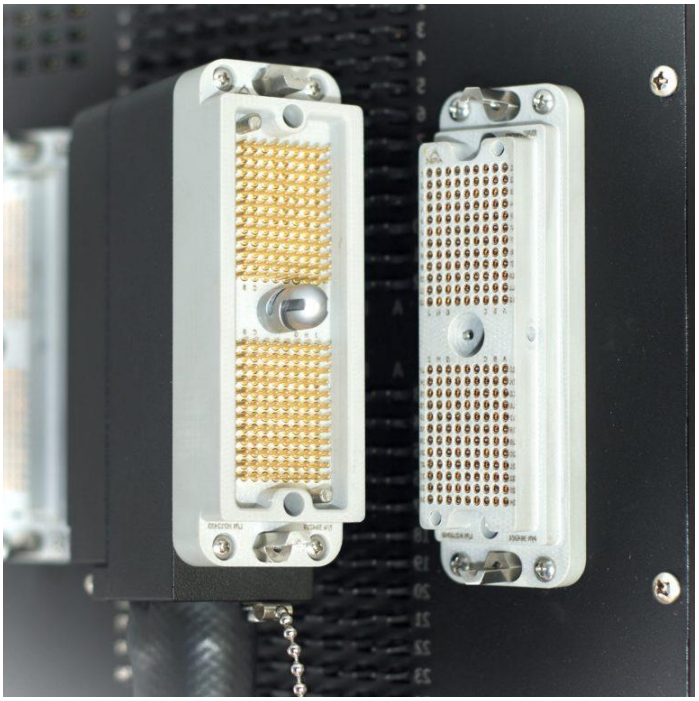
Functional testing of electronic assemblies typically involves three elements: the device under test, test equipment, and a form of mass interconnect to allow for interchangeability and reuse. It is imperative that the test adapter, commonly called a test fixture, mass interconnect and instrumentation signal performance capabilities match. In this article, we will review types of test fixtures commonly used for Functional Test systems.

Types of Test Fixtures:

There are various forms of fixture construction for PXI based test systems. Connection to the DUT may be made either using the connectors that are ordinarily present on the product or using test probes that make contact with identified test points.

Connector based Fixtures:

When the fixture includes connectors that mate with connectors on the DUT, the portion of the connector on the fixture must allow for repeated engagement to ensure long-life and measurement repeatability. The highly durable APEX cabled connector hosts male contacts that are 300% stronger than industry standard, while supporting 5 amp current with 20awg wire (Figure 2)



(Figure 2: APEX Connector 216 Signal Contacts)

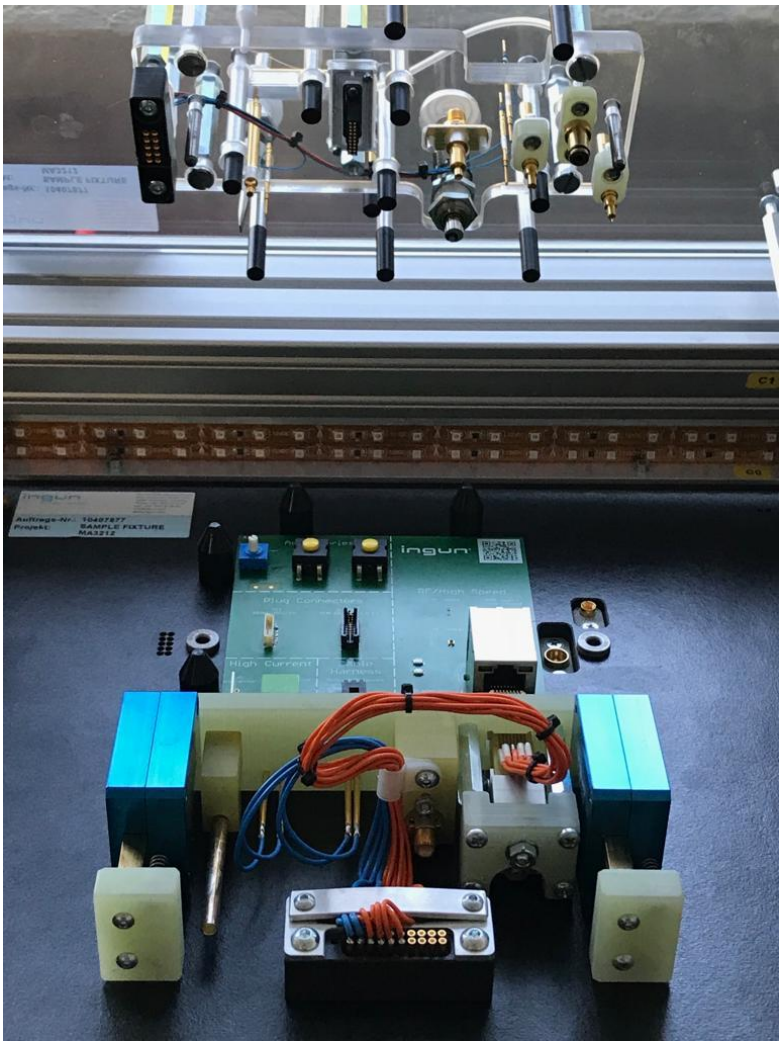
When wiring a connector-based fixture, it is very beneficial that the aluminum back shell allows wiring modification to be performed when the cable clamp is in position. The main cover should be easy to remove for easy access during build and maintenance. This is particularly important

during the debug process since it allows access to the cables and contacts, while the APEX connector is in-situ (Figure 3).

(Figure 3: APEX with Removed Back Shell)

Probes Based Fixtures:

The most straightforward probe-based fixture is to place all the test points on one side of the PCB device under test, usually the bottom. Typically the spring-loaded probes are fixed and the fixture applies hold-down force to the top of the board to lower it on to the probes (Figure 4). With double-sided probing the DUT is typically fixed and the probes move in from both sides when the fixture is operated.



(Figure 4: Bed of Nails Test Fixture. Photo Courtesy of iBtest)

There are several common approaches to applying force to the DUT to hold it against test probes. In a mechanical system, the probe plate and the DUT are brought together by a mechanical arrangement of cams, levers, linkages, or by hand. There are a wide variety of schemes in use, differing in complexity and cost.

Establishing contact between the product printed circuit board being tested using a probe based test fixture can be made using a “Wired” or “Wireless fixtures”. In a Wired fixture, the fixture supplier will hand wire each probe pin to a respective point on the fixture’s interconnect that feeds measurements to instrumentation. MAC Panel SCOUT is a fixture interconnect that allows each pin in the connector which mates to the test rack to be maintained easily with simple tools. The advantage is that each wire from the probe plate can be easily matched then inserted into the fixture interconnect socket (figures 5 and 6). This helps with simplified build and debug.

(Fig 5: Functional fixture with a manual top drive unit. This fixture accesses the DUT using a ramp driven side access unit which means that as the top is engaged by the operator the side access is automatically driven into the connector of the DUT. Image courtesy of Circuit Check Inc.)

(Fig 6: Same functional fixture as above. You can see the cabling from the fixture plate down to the mating modules. The mating modules are mounted onto a MAC Panel SCOUT ITA which then mounts onto a SCOUT Receiver with mating DAKs (direct access kit) mass interconnect technology. Image courtesy of Circuit Check Inc.)

With a Wireless fixture probe plate, a PCB-like plate is fabricated to hold the probe pins, a mating connector resides on the probe plate. This allows a simplified cabled connection between the probe-plate and fixture interconnect. MAC Panel SCOUT supports PCB mounted adapters on the back-side of the fixture interconnect. A designer can then easily fabricate a mating cable between the wireless probe-plate and the fixture interconnector. This ensures the best signal integrity throughout the signal path.

Summary:

Many different approaches are possible when considering an interconnect solution for test adapters. Advanced mass interconnect, small i/o connectors, and traditional mass interconnect are three possible approaches. Advanced mass interconnect offers the ability to eliminate or greatly reduce the cables from the PXI instrumentation to the test fixture. The MAC Panel solution is called SCOUT. The small i/o connector APEX is for the most demanding cabled test and measurement applications.