

Diagnostic Validation

Traditionally, designs have been developed with little attention to discovering the design's diagnostic integrity. Engineers are overwhelmed with many tasks while Program Management hasn't really understood the widespread value of diagnostic engineering.

Designing for Test (DFT), Health Management (PHM, ISHM, etc.) or multiple sustainment levels, is a more complex task today. It ultimately embodies a more integrated systems' understanding of the "Test Coverage" sophistication when considering the incorporation of many designs across a complex hierarchical design architecture.

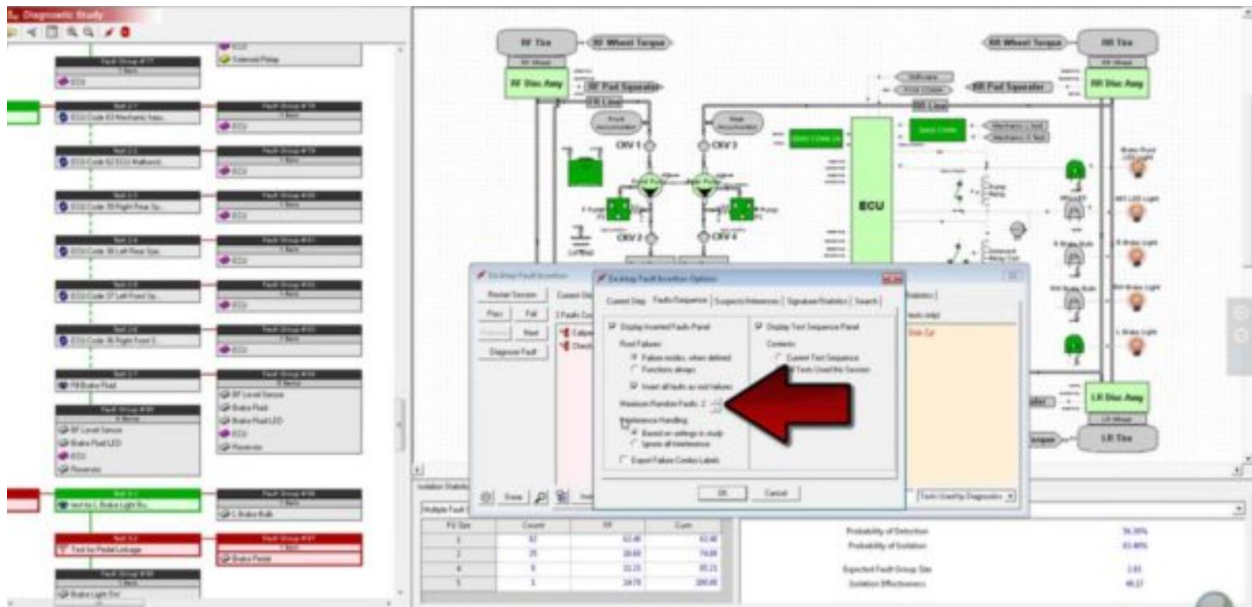
Likewise, Designing for Test on medium to complex CCU's, such traditional DFT or any independent Test Coverage analysis fails to provide Diagnostic conclusions – at any level or in consideration of the fully fielded product application. . Once integrated with other designs and fielded, any test results obtained for use with any on-board BIT or for any continued, secondary level (Depot or ground maintenance) will be dependent on the diagnostics integrity of the "integrated systems' design – regardless of the "test coverage" specs described in the static DFT analysis.

This is where we experience and rely on the "Diagnostic Integrity" of our design(s). The diagnostic integrity is dependent on the design domain mix involved, its complexity and the ability to evolve as the operational environment or implementation changes. Fortunately, DSI Diagnostic Validation capability using the DFI feature in eXpress has no difficulty in considering all of these complexities to exhaustively determine the diagnostic effectiveness of any complex or large-scale (integrated systems') design(s).

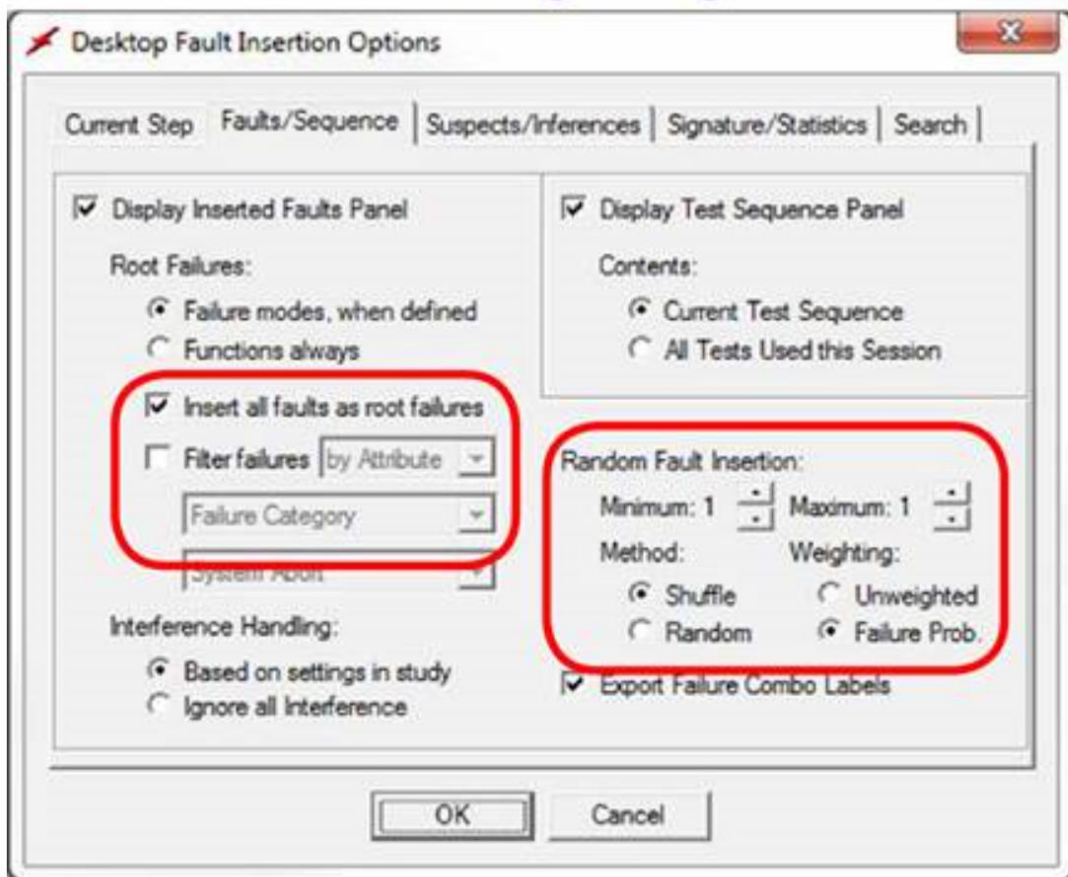
Validating the BIT Test Coverage and Create/Assign Fault Groups to the BIT

After the BIT is fully validated (using the advanced eXpress Diagnostic Validation, or Diagnostic Fault Insertion capability), the integrated designs will be capable of performing to the diagnostic precision at any level(s) of the diagnostic design hierarchy as validated in eXpress.

The following images shows a sneak peek at the robust eXpress "DFI" capability:



DFI Settings Dialog



In the image above, the eXpress DFI feature allows the user to fully trace the entire path and/or diagnostic inferences produced across all hierarchical levels of the diagnostic design architecture. This is how the full impact of the Test Coverage is observed both from a diagnostic sequencing perspective (diagnostic tree on the left) and the comprehensive visual perspective using the design window on the right.

This eXpress DFI Diagnostic Validation capability allows the filtering of inserted faults by severity (so that only failure modes that propagate to an end effect of a certain minimum severity are inserted) or by attribute (so that only failure modes with a given attribute value are inserted). This feature—which impacts both explicit faults selection and randomly-generated faults—allows you to focus diagnostic validation efforts on more critical failures, or failures of a certain type.

By default, random fault insertion works in “shuffle” mode, which prevents faults from being inserted more than once until all other faults have been inserted.

The *eXpress* DFI Diagnostic Validation facilitates the following during “Design Development” and before the design is frozen:

- **Diagnostic Sanity Checks**
- **Diagnostic Sequencing Deliverables**
- **In-House Design Reviews**
- **Guided Troubleshooting Integrity**
- **Customer or Maintenance Demos**
- **BIT or/to Fault Code Validation**
- **Validation of Diagnostic Procedures**
- **Multiple Design Domain Applicable**

While there are an infinite number of uses and benefits from the ability to validate that diagnostic quality of any design, or collection of integrated designs, the most valuable impact can be gained during design development characteristic is to enable an opportunity to facilitate the maximum diagnostic coverage.

DFI Report

Desktop Fault Insertion Report

Inserted Faults:

Failure combination from Desktop Fault Insertion dialog

Failure combinations provided in spreadsheet

Filename:

Column:

Include Failure Combo Labels

Random combinations of Root Failures

Number of failure combinations: Seed: New Seed

Minimum: Maximum: Weight random faults by failure rate

All Root Failures

Root Failures:

Failure modes, when defined

Functions always

Interference Handling:

Based on settings in study

Ignore all Interference

Filters:

Exclude non-detectable failure combinations

Exclude correctly isolated failure combinations

Filter failures

Columns:

Fault Signature (all failed tests)

Test Sequence

Entry Point (independent mode only)

Correctly Isolated (Yes/No)

Fault Group ID(s)

Fault Code(s)

Report Format:

The image above shows the versatility of allowing the user to generate reports that can be pushed off to a spreadsheet and then enable an interoperable capability to reimport from the spreadsheet to seed future diagnostic sessions as configured for any demo or any other purposes!

There are many uses of the selection of DFI Reports so that a comprehensive report can track the capability of any set or all sets of any inserted faults. This is a unique and interactive capability that can only be found within eXpress and DSI's ISDD !