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Best Practices

Electrical Connector and Testing Fixture Design as it applies to reliable test results

The intention of this abstract is to outline the aspects of electrical connector and testing fixture designs that impact the quality and economy of test results in order to establish uniform standards and raise the bar of “Best Practices” in testing.

This information has been gleaned from nearly 40 years of first-hand experience as Hale Manufacturing has worked with its customers to provide them with reliable and economical cost-per-test solutions for over 6,000 connector designs.

Definitions for the purposes of this outline:

Connector- customer’s product part

Continuity Testing Fixtures- confirms the electrical transfer from one point to another typically through a conductor. These tests are best conducted on electrical connectors with standard or customized testing fixtures that typically utilize contact pins.

Push Testing – testing for terminal retention within the connector using an industry defined force of 1-2 or 3-5 lbs.

Presence Testing – testing connectors for the presence of their non-conductive components

Function Testing – utilizing test fixtures in place of mating connectors to simulate “powering-up” of components of sub-assemblies before being installed for end use.

Test Probe – compliant probe for contacting terminals

Latch – facilitates retention of test fixture to connector for the duration of test

Outline of Critical Topics:

1. Communication between designers of connectors, wire harnesses, end product assemblers and testing fixture manufacturers
2. Test fixture access to connector components to facilitate reliable test results
3. Consistent construction, dimensions and tolerances of connectors
4. Consistent construction, dimensions and tolerances of test fixtures
5. Ergonomic, one-handed test fixture features that facilitate quick and careful insertion of connector into test position, hold securely for duration of test (latch) and disengage quickly and easily without harm to connector or wires
6. Choosing the correct test probe in test fixture design
7. “Perfect” probe to terminal alignment
8. Connector retention during test
9. Limited pin travel during test
10. Terminal protection during test
11. Maintaining reliable contact for duration of test
12. Testing connectors during assembly, prior to installation and after installation
13. Testing wire harness connectors prior to taping
15. Presence testing for non-conductive components in connectors (i.e. gaskets, seals, locks)
16. Safely push-testing with defined force in the same axial plane as the terminal
17. Secure, consistent latch points designed into connector body
18. Tolerances of test fixtures and connector travel
19. Contact pin availability considered when designing connector terminal spacing
20. Terminal locks to have confirming test point specified by manufacturer
21. The advantages of Internal or attached (fixed) secondary locks
22. The advantages of including non-conductive component seating in test fixture design

23. Connector manufacturers, harness assembly companies and end users take joint responsibility for setting and enforcing testing standards, requirements and test fixture prototype approval.