

Shore Power Tester (II)

Project Lead Organization: D'Angelo Technologies, LLC

Project Team Members: HII - Ingalls, Penn State Applied Research Laboratory, NAVSEA 05Z3



Concept/Idea

Issue: Dec. 2014 NSWCCD-SSES reports a significant number of 450V 400A surface ship shore power connection plug and receptacle failures. Feb. 2018, a pin failure in a 450V shore power connector on a DDG-51 class destroyer led to an Arc Flash Event in which the connector exploded. The Fleet reported similar issues. In response, a Maintenance Requirement Card (MRC) requires megohmmeter testing from each pin in the receptacle to every other pin and ground before connection to shore power. The number of permutations for the MCR tests results in a significant increase in the time to perform these tests and opportunity for human error. Total tests per ship = 2016 tests, approximately 3 hours.

Proposed Solution(s): Plug and Play Shore Power Connector Tester - The product is an automated tester that performs all tests, provides a pass/fail indication and has the capability to records the test data.
- <30 minutes automated test time, data recorded automatically

Benefits/Justification

Benefits of the Project:

Benefits include a significant savings in labor and reduction in potential for human error. Tool to augment workforce capabilities.

Project Approach

High Level Statement of Work: Transition the NSRP demonstration tester to a Prototype Tester. Ruggedize, fine tune and repackage. *Deliver a hardware prototype tester for hands on evaluation. Tasking: Requirements Document, Preliminary Design, Hardware Design, Software Architecture, Build and Test Prototypes, Shipyard/Fleet Testing*



Metric(s) of Success: *Approved preliminary design review, approved final design review, successful testing at shipyards, prototype testing and acceptance*

Cost/Images/Relevant Information

Project Estimated Cost: \$200k

Duration \$12 Months

This is a follow on of the NSRP Panel Project that conducted On-board DDG 121 Field Demonstration October 2020 at Huntington Ingalls (Pascagoula, MS)

Transition: To be successful the team requires arduous support of the Navy during project and final testing including access to shore power connectors. This will allow fleet and shipyard personnel to conduct comprehensive testing of the final prototype before acquisition.



Shore Power – Existing System



- Project performed in 2020
- Utilizes a modified CAMI CableEye Hi-Pot tester
- Currently configured for MIL-C-24368 connector
- Utilizes touchscreen and miniature PC in portable format
- Works well in lab environment
- During site visit, experienced higher than expected capacitance and induced voltage, experienced some faults
- System needs configured for capacitance and hardened against noise & induced voltage

Shore Power 2.0



- Primary goal is to modify system for proof of operation and accurate measurements in shipyard environment
 - Capacitance
 - Noise and Induced Voltage
 - Intend to do so with newer CableEye HVX-21 tester
 - Otherwise utilize megohmmeter with RS-232 interface, custom relay matrix, and Arduino controller
 - Testing cable & configuration for pigtail side
 - Design/configuration and prototype for functional shipboard 450V tester in a Pelican case can be provided
- Provide system layout, WBS, and detailed plan for new production version with following characteristics:
 - Capability of testing pigtail side and ship side of 450V and 2160V systems
 - Miniaturized and battery powered
 - Simple GO/NOGO interface
 - Detailed data log for fault analysis
 - Fully custom controller, eliminate HVX-21



Shore Power 2.0



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Q&A

Design Considerations