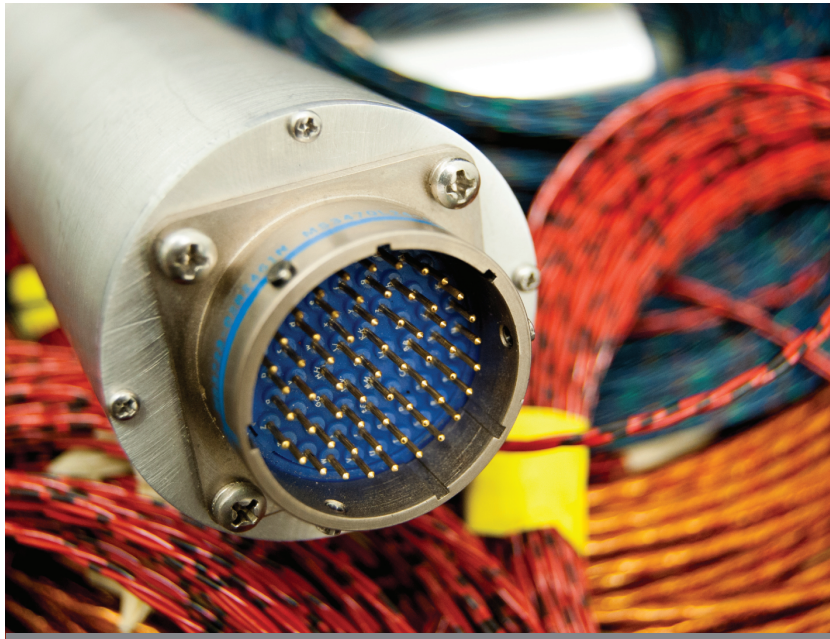




## TECHNOLOGY SOLUTION

### Electrical and Electronics



# In Situ Wire Damage Detection and Rerouting System

[A miniaturized and highly efficient wire damage detection system](#)

NASA Kennedy Space Center seeks partners interested in the commercial application of the In Situ Wire Damage Detection and Rerouting System. NASA is soliciting licensees for this innovative technology. The In Situ Wire Damage Detection and Rerouting System consists of a miniaturized inline connector containing self-monitoring electronics that use time domain reflectometry (TDR) to detect wire faults and determine fault type and fault location on powered electrical wiring. When a damaged or defective wire is identified, the system is capable of autonomously transferring electrical power and data connectivity to an alternate wire path. When used in conjunction with NASA's wire constructions that use a conductive detection layer, the system is capable of detecting and limiting damage not only to the core conductor, but also to the insulation layer before the core conductor becomes compromised.

#### BENEFITS

- Online operation - system can be used while wires are powered and operational, making it possible to locate intermittent faults that occur only while wires are in use
- Nonintrusive - faults are monitored in the background, using very low power signals that do not disrupt normal circuit operation
- Intelligent - pattern recognition algorithms autonomously identify the type and location of a fault without operator intervention
- Intuitive - an easy-to-understand graphical user interface displays the reflected waveforms and provides information on the type of fault and its distance from the test signal injection point
- Flexible - system is capable of monitoring up to 64 individual wires on a cable
- Simultaneously in online or offline mode



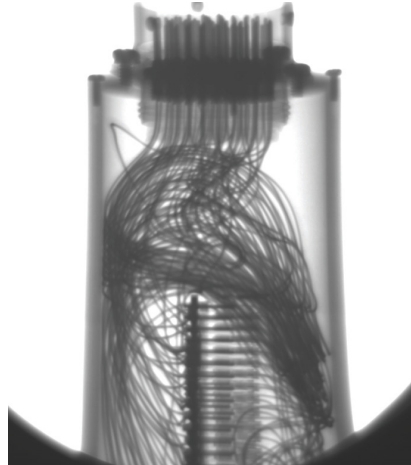
## THE TECHNOLOGY

The tester was designed to monitor electrical faults in either online or offline modes of operation. In the online mode, wires are monitored without disturbing their normal operation. A cable can be monitored several times per second in the offline mode, and once per second in the online mode. The online cable fault locator not only detects the occurrence of a fault, but also determines the type of fault (short/open/intermittent) and the location of the fault. This enables the detection of intermittent faults that can be repaired before they become serious problems. Since intermittent faults occur mainly during operations, a built-in memory device stores all relevant fault data. This data can be displayed in real time or retrieved later so maintenance and repairs can be completed without spending countless hours attempting to pinpoint the source of the problem.

Hardware and algorithms have also been developed to safely, efficiently, and autonomously transfer electrical power and data connectivity from an identified damaged/defective wire in a cable to an alternate wire path. This portion of the system consists of master and slave units that provide the diagnostic and rerouting capabilities. A test pulse generated by the master unit is sent down an active wire being monitored by the slave unit. When the slave unit detects the test pulse, it routes the pulse back to the master unit through a communication wire. When the master unit determines that a test pulse is not being returned, it designates that wire as faulty and reroutes the circuit to a spare wire.



Exterior view of the ISWDDRS prototype module casing



Interior view of ISWDDRS prototype module wiring

## APPLICATIONS

The technology has several potential applications:

- Aerospace wiring
- Marine wiring
- Automotive wiring
- Industrial wiring
- Smart grid wiring

## PUBLICATIONS

Patent No: 8,810,255; 8,593,153

## More Information

National Aeronautics and Space Administration

**Agency Licensing Concierge**

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