

Loop Resistance Tester

Portable, reliable, and easy to use



Loop Resistance Tester

Verifying electrical shield integrity has always been a challenge – until now



Airborne critical electrical cabling is shielded to protect against lightning and electromagnetic effects (EME). But how can you be sure that this shielding remains properly connected to an electrical return such as the airplane structure? In the past, shield inspections involved the slow and tedious process of demating critical connectors that are possibly in difficult-to-reach locations, verifying DC resistance, remating the connectors, and testing the system to ensure that the cables are properly remated. The intrusiveness of this process creates an environment in which damage to wire bundles can occur.

The Loop Resistance Tester (LRT) is a unique, patented instrument that allows the integrity of cable shielding to be tested without demating the connectors. The LRT works by magnetically coupling a low power, low-frequency AC signal onto the cable shield and measuring the resulting induced voltage and current in the loop. The complex ratio of these

values is used to determine the loop resistance, which is an indicator of the quality of the electrical bonds between the cable shield, connectors and metallic surface.

Ease of operation

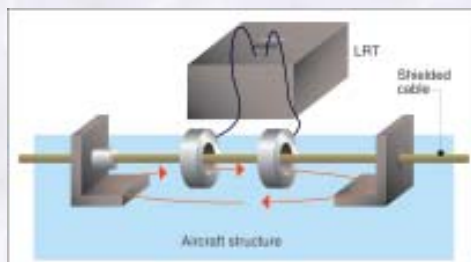
The measurement process begins when the operator clamps two magnetic couplers around the wire bundle or cable of interest. One coupler generates the AC signal, which is induced in the cable shield and measures the voltage around the loop. The second coupler measures the current induced in the loop. The loop current and loop voltage are digitized by precision 16-bit analog-to-digital convert-

ers, then numerically processed to determine the loop resistance.

The operator also can use a pair of probes to measure the resistance across a portion of the loop. These probes contain replaceable tips that ensure a reliable and repeatable electronic connection through the commonly encountered thin oxide layer on the surface of the connectors. The voltage between the two probes is simultaneously measured by the LRT using the loop current. The processor uses the measured voltage and loop current to determine the resistance of that segment of the loop.

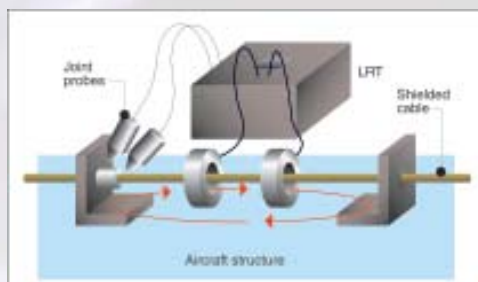
Reliable operation

Indicator light-emitting diodes (LED) are provided on both the coupler and the joint probes to signal the operator that valid, stable readings are available. Additionally, LED lights on each joint probe illuminate the hardware being measured.





When the joint probes are being used, the indicator LEDs turn from red to green if the instrument detects a low-impedance connection between the two probes. A green LED indicates that the probes are making proper contact with the item being measured. Joint measurements start automatically when this low-resistance connection is sensed. In loop mode, a remote switch is provided on the coupler assembly to allow the operator to start a loop measurement without being physically close to the instrument. The LRT will not display a reading if a coupler is open or if the joint probes aren't making a complete electrical contact.



Although the inherently synchronous nature of the measurement scheme rejects most electrical noise sources, in some cases the noise signals may be large enough to saturate the LRT amplifiers. If this occurs, the operator is warned that active voltages or currents are already present in the loop and potentially erroneous readings are suppressed with a flag note indicating the nature of the problem.

Other uses

In addition to measurements of electrical cable shielding, the LRT also can be used to check bonding of conduit, pipes, metal fittings and ground straps – any arrangement in which current can be induced in a closed loop. The LRT's UL certification allows it to be used in a fuel tank to check bonding integrity.

Certification kit available

NIST-traceable certification of the LRT can be accomplished with the optional certification standards kit that contains a set of loop and joint standards.

The loop standards are comprised of a wire loop with three copper bonding terminals, all contained inside a plastic housing. NIST-traceable instruments use these terminals to calculate the loop resistance independently from the LRT. Then the LRT measurement is checked against this value. The joint standards are precision milliohm shunts that can be connected in a loop to certify the accuracy of the joint measurement.

Features

- Automatic measurement range control
- Insensitive to loop inductance
- Portable, battery-powered operation (~8 hours)
- Battery percentage indicator
- High-performance battery charger
- 8-character, 2-row daylight readable alphanumeric display
- Adjustable display brightness
- Display flags to indicate presence of noise (ensures accurate measurements)
- Self-checking features to prevent erroneous operation
- RS-232 port to support remote data recording
- Approved intrinsically safe device per ANSI/UL913-88 for use in Division 1, Class 1, Group D hazardous locations (NFPA410 Standard on Aircraft Maintenance)
- Measures stray current in the loop
- Joint probes lighted to aid in taking measurements

Note: Features and specifications are subject to change without notice.

Specifications

- Measurement range in loop mode: 1 to 4,000 milliohms
- Measurement range in joint mode (including resistance across connectors and connector to bracket): 0.01 to 4,000 milliohms
- Accuracy: +/- 5% or +/- 0.2mΩ, whichever is greater
- Operating frequency: 200 Hz
- Temperature range: -20 degrees to +60 degrees C during operation
- Maximum cable diameter: 1.75 inches

Size and weight

- LRT
14 x 14 x 11 inches
Weight: 27 pounds
- Accessory case
14 x 14 x 11 inches
Weight: 11 pounds
- Standards case (optional)
14 x 14 x 11 inches
Weight: 20 pounds (approximately)



Accessories



Optional certification standards kit contains:

- Loop standards
- Joint standards
- Interconnecting wires



Loop certification standards (typical values)

- 2 milliohms
- 8.5 milliohms
- 14 milliohms
- 3600 milliohms



Joint certification standards (typical values)

- 0.5 milliohms
- 5 milliohms
- 25 milliohms
- 50 milliohms
- 3600 milliohms



Battery charger (provided with unit)

- 100 – to 230 +/-VAC
- 47 to 63 Hz
- Output power 35 watts
- Full charge in <8 hours