Failure Analysis and Test Facility

Purpose:

To provide Electrical, Electronic, Electromagnetic (EEE) parts screening and analytical services for MSFC in house projects, including the screening and failure analysis of EEE parts and electrical testing of EEE parts, cable assemblies and wiring harnesses, and prototype electrical black boxes.

EEE Parts Screening and Failure Analysis

Screening and failure analysis of EEE parts and electrical testing of EEE parts, cable assemblies and wiring harnesses, and prototype electrical black boxes are major categories of this MSFC facility. The team uses and maintains the following facilities in Building 4487 for screening and failure analysis: the Light Optics Laboratory (visual inspection, optical microscopy, film and real time radiography), the Scanning Electron Microscopy (SEM) Laboratory (SEM imaging and elemental analysis), the Fourier Transform Infrared Spectroscopy (FTIR) Laboratory (chemical identification) and the Electrical & Environmental Test Facility particle impact noise detection (PIND) testing, curve tracing, parametric testing, leak testing and other environmental factor testing). Screening services include up-screening of flight parts (microcircuits, hybrids, and various semiconductor devices) usually consisting of PIND testing and radiography inspection in accordance with military specifications, and construction analysis or destructive physical analysis of parts being evaluated for use. Construction and destructive physical construction quality of parts being considered for use. Components analysis includes visual inspection, radiography testing, PIND testing, bond strength testing, microsectioning, electrical and environmental testing, FTIR analysis, and microscopic examination and recording using light and scanning electron microscopy. Failure analyses are performed on suspected failures and in order to identify both the immediate cause of the failure symptoms and the root causes leading to the failure. Analyses are typically conducted on resistors, capacitors, microcircuits, semiconductors, relays, printed circuit boards, cables and connectors.

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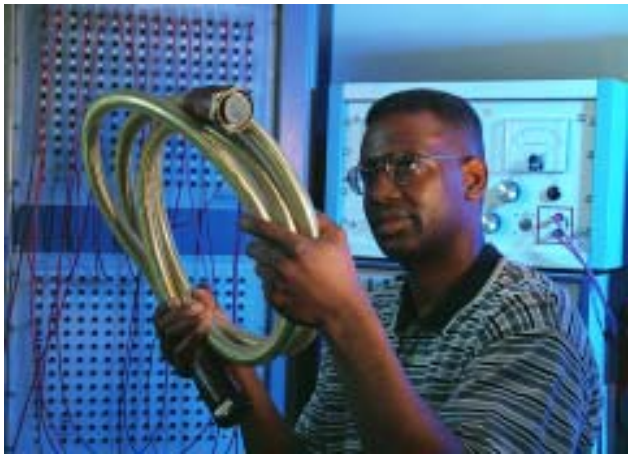
Visual inspection tools range from simple magnifying lenses to high quality stereomicroscopes and photomicroscopes. A number of fine optical microscopes and metallographs are available with bright-field, dark-field, polarized light and differential interference contrast modes of observation. An SEM is capable of resolving features smaller than 100 angstroms, providing great depth-of-field for three-dimensional like images of component surfaces. The SEM has several modes of



operation that provide unique information about integrated circuits and semiconductors. Voltage contrast and induced current modes of operation provide continuity maps and subsurface diffusion profiles without physically probing the surface. The SEM with energy dispersive x-ray spectroscopy can be used to determine the chemical elements present at micrometer sized and larger damaged sites.

Precision cutting and grinding tools are used to open and precisely section components for analysis.

FTIR microscopy provides the capability of nondestructively identifying minute quantities of chemical compounds present at damage sites on EEE components. FTIR can identify organic compounds which consist largely of carbon and hydrogen which are generally not detectable by the SEM.

Electrical Parts Test Laboratory

Various functions are performed here including acceptance testing of electrical piece parts and components (microcircuits, semiconductor devices, resistors, relays, etc.), electrical parametric testing in the failure analysis of electrical piece parts, electrical integrity acceptance testing of cable assemblies and wiring harnesses, and the fabrication and electrical testing of prototype electrical black boxes and related cable assemblies. Acceptance tests are performed on incoming electrical piece parts to insure functionality prior to board population. Automated test systems are necessary tools in testing today's state-of-the-art electrical piece parts. The HP 82000 Digital Test System, GenRad 1731 Linear Test System, and Testronics 201C Discrete Test Systems are used in these efforts. High voltage potential testers, digital multimeters, meggers, mating test cables, break-out boxes, and switching megger boxes are used in electrical integrity tests on incoming cable assemblies. Fabrication skills, soldering and crimping certificates, adequate laboratory workstations and proper materials and tools enable the facility team to build black box prototypes, circuit cards, and interconnecting cable assemblies. The Electrical Parts Test Laboratory is located in Building 4705.

Point-of-Contact:

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