



Marshall Space Flight Center Electrical Integration and Fabrication

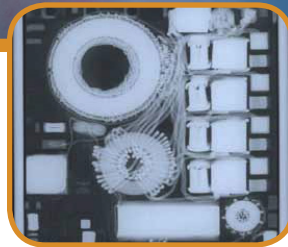
Engineering Solutions for Space Science and Exploration



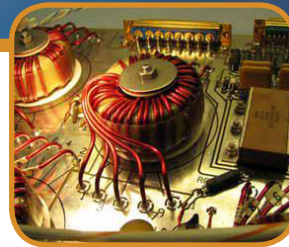
Electrical Fabrication
and Assembly



Electrical Power Systems



Radiography Testing



EMI/EMC Integration
and Test



EEE Parts Failure Analysis

Electrical Integration and

Fabrication provides electrical integration, design, analysis, fabrication, and testing of electronic hardware for NASA projects from requirements development through hardware delivery. They support the International Space Station, launch vehicles, large and small satellites, Environmental Control and Life Support System (ECLSS) as well as a number of payloads and experiments. Electrical Integration and Fabrication consists of three groups: Electrical Power, the E3 and Electrical Integration, and Parts, Packaging, and Fabrication.

- Provide design, development, testing and analysis of power electronics hardware.
- Ensure compatibility of power interfaces both electrically and physically.
- Test and evaluate flight electrical power systems such as batteries, solar arrays, fuel cells, super capacitors, relays, and switches.
- Provide electromagnetic interference, electrostatic discharge, lightning indirect effects, and space station power quality testing services.
- Provide Electrical, Electronic, and Electromechanical (EEE) parts screening and physical analysis services.
- Performs research on techniques to miniaturize electronics while improving reliability and maintaining efficient passive cooling.
- Provide electrical fabrication, assembly, and testing services including and electro-mechanical shop and automated electronic assembly with state-of-the-art processes for circuit board population.

Electrical Power performs research, design and development, and test and evaluation of flight and ground electrical power subsystems (EPS) including batteries, solar arrays, and fuel cells for power generation. They have expertise in the development of space flight electronics hardware that converts, inverts, regulates, and/or isolates source power and expertise in space platform power quality analysis for system stability.

E3 and Electrical Integration performs electrical integration of space flight vehicles, payloads, and their electrical ground support equipment (EGSE). Electrical integration products include cable assembly drawings, cable interconnect diagrams, electrical system schematics, and power distribution drawings. Electromagnetic Environmental Effect (E3) engineering personnel have expertise in electromagnetic compatibility, lightning protection, electrical grounding, and electrical bonding. They also have the capability and required facilities to perform electromagnetic interference (EMI), lightning indirect effects, electrostatic discharge (ESD), and power quality testing.

Parts, Packaging, and Fabrication provides Electro-Mechanical design, analysis, fabrication and assembly of space flight and ground support equipment (GSE) hardware. Engineering capabilities include mechanical design, printed wiring board design, thermal analysis, electrical, electronic, and electromechanical (EEE) parts selection assistance, screening and design support, EEE parts failure analysis, and acceptance testing of cable and electrical assemblies. Electrical fabrication capabilities include electrical assembly, automated solder paste and parts placement from CAD data, ball grid array (BGA) and Surface Mount Technology (SMT) vapor phase reflow, cable fabrication, potting, part marking, lead forming, out-gassing, conformal coating and integration. Personnel are also proactive in technology development in support of design, analysis and assembly of electronic hardware.

Capabilities:

EEE Parts Screening (Failure Analysis)

The Electrical, Electronic, and Electromechanical (EEE) Parts Analysis & Verification Team provides EEE parts screening and analytical services for MSFC in house projects. Components analysis includes visual inspection, radiography testing, PIND testing, bond strength testing, microsectioning, electrical and environmental testing, Fourier Transform Infrared Spectroscopy (FTIR) analysis, and microscopic examination and recording using light and scanning electron microscopy (SEM). Physical analyses are performed on suspected failures and aims to identify both the immediate cause and the root cause of the failure symptoms. Typical analyses are conducted on resistors, capacitors, microcircuits, semiconductors, relays, printed circuit boards, cables and connectors.

- > Nanofocus Real-Time X- Ray
- > 3D X-Ray Tomography
- > Environmental Scanning Electron Microscopy with Energy Dispersive Spectrometry
- > 3D Microscopy
- > X-Ray Fluorescence Spectrometry
- > Particle Impact Noise Detection (PIND)

Electrical Assembly

The Electrical Fabrication & Assembly Facility provides printed circuit assembly and cable fabrication all the way through chassis assembly and integration. The electrical shop provides the capability for both through-hole and surface mount component assembly on printed circuit boards. Along with circuit board and cable assembly, conformal coating, staking, and electrical potting processes are also performed. Other capabilities include fabrication of flight, Ground Support Equipment (GSE), and fiber optic cable harnesses.

- > Essemtec SP200AV
Solder Paste Printer with Automated Alignment 0.3mm Pitch Capability and 5um Resolution
- > Application Service Company (ASC) Vision Master 400
Solder Paste Inspection
Inspection for Coverage, Volume, Area
- > Essemtec FLX2010V
Automated Pick and Place from CAD Data Placement Capability from 01005 Chip Parts to 50mm ICs
- > Automated Production Equipment (APE) Sniper III Semi-automatic Placement of BGA's and Fine Pitch Surface Mount Devices (SMD)
Top and Bottom Convective Heaters to Remove and Replace SMDs
- > R&D Tech Services RD1
Vapor Phase Reflow Oven
Customize Reflow Profile: Preheat Temp & Dwell Time; Vapor Temperature and Dwell Time
- > Hirox Inspection System
BGA/Surface Mount Device (SMD) Endoscope Calibrated Measurement Software

For more information, please visit www.nasa.gov/centers/marshall/about/business.html

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Huntsville, AL 35812
www.nasa.gov/marshall

www.nasa.gov

