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This letter is to introduce you to **The Specialty Lab, Inc.**, and our capabilities.

Our company, established in 1995, was formerly the Central Qualification and Testing Laboratory for **Control Data Corporation**.

We have an extensive list of customers that include Military sub-contractors, medical product manufacturers, Personal computer manufacturers, small contract manufacturing houses and many other facets of the electronics industry. Our capabilities include: **Package/Ship Test, Materials Testing, Environmental Test, Shock and Vibration, Electronic Test, and Failure Analysis/Metallurgy Lab**, specializing in printed circuit boards and electronics.

The people of The Specialty Lab have nearly 250 cumulative years in the industry and are some of the best you will find.

We are a **full service company** that is capable of nearly any testing or problem solving you may need.

Please take a moment to look over our capabilities and I hope we can be of help to you in the future. For further information, take a moment to visit our web site at **<http://www.thespecialtylab.com>**.

Sincerely,

Mark D. Schneider

Mark D. Schneider
President
The Specialty Lab, Inc.

Comprehensive Services

- **Electronics Lab**
- **Material and Failure Analysis**
- **Environmental Testing**
- **Product Package Testing**
- **General Services**

Electronics Lab (Assemblies, Printed Circuit Boards, Connectors, Components and Etc.)

Specifications

- MIL-STD-202, 750, 883, 19500
- UL
- ANSI/EIA
- JEDEC
- IEC
- IPC
- Commercial, Automotive, and Custom Specifications
- Military Screening/Rescreening of Avionics, Space and Shipboard Components
- Qualification/Reliability Testing
- Design Conformance
- Point of Failure
- Specification Verification
- Failure Mode Simulation

Electrical

- Electrical Test over Temperature Range
- Characterization
- Datalog
- Parameter Sorts
- Production Testing
- ESD Testing
 - Human Body Model (HBM)
MIL-STD-883/3015.7
JEDEC
ESD DS5.1
 - Machine Model (MM)
ESD DS5.1
 - Charge Device Model (CDM)
JEDEC
ESD DS5.1
- Latch-Up, VDD over Voltage and Current Injection, JC-17 & JC-78, Transient and Elevated Temperatures
- Input and Output Capacitance
- Voltage Rating
- Transient Susceptibility
- Curve Trace
- * Test Voltages pV to kV
- * Test Currents pA to kA
- High Frequency to 18GHZ
- Thermal Impedance
- HI-POT (A.C. or D.C.)
- Dielectric Withstand Voltage
- Insulation Resistance
- Capacitance
- Inductance

Electrical Continued

- Resistance
- AC Testing
- ESD Susceptibility
- ESD Protective Material Testing
- COTS Screening/Up-screening

Printed Circuit Boards

- 1st Article Inspection
- Quality Analysis of PCB Processes
- Cleanliness/ Cleaning testing
- Printed Circuit Board Construction Analysis
- Failure Analysis
- Printed Circuit Board Impedance (TDR)
- Insulation Resistance
- Surface/Moisture Insulation Resistance (SIR/MIR)

Environmental

- Temperature Cycling (Air-Air and Liquid-Liquid)
- Stabilization Bake
- High and Low Temperature Storage
- Hermeticity, Fine and Gross (Helium Leak Testing)
- High Voltage Stress Test
- Thermal Shock (Air to Air, Liquid to Liquid)
- SMT Preconditioning
- Burn-In/HTOL: Static and Dynamic
- Moisture Content and Moisture Endurance (85°C/85%RH)
- Moisture Sensitivity
- Highly Accelerated Stress Test (HAST)
- IR-Re-flow Simulation
- Steam Aging
- Solderability and Resistance to Heat
- Liquid Burn-In/Life Testing
- Temperature Humidity Bias Life (THBL) (85/85 or customer specified)
- Autoclave
- Biased Autoclave 110°C-140°C, 85% to 100%RH
- Absorption/Desorption
- Dye Penetrant
- Flammability
- Salt Atmosphere/Salt fog
- Altitude Simulation
- Pressure Environment

Mechanical

- Mechanical Shock to 22,000 G.
- Vibration
- External Visual Inspection and Package Dimensions
- Internal Visual Inspection and Diemicro Photographs (DPA)
- Radiography (X-ray)
- Routing and Polishing
- Die Shear and Wire Bond Strength
- Plating Thickness and Metallic Structure
- Product Package Testing (Ship Testing)
- Constant Acceleration
- Lead Fatigue
- Marking Permanence
- Internal Water Vapor Content (Residual Gas Analysis, RGA)
- SEM Metallization
- Energy Dispersive X-ray Analysis (EDX)
- Baseline Analysis
- Sonoscan
- Tape and Reel
- Particle Impact Noise Detection (PIND)

Material and Failure Analysis

Destructive Analysis per Military/Industry Standards

- External Visual
- Mechanical Dimensions
- Solvent Resistance
- Steam ageing/Solderability/Resistance to Solder Heat
- Lead Integrity and Tensile Strength
- Radiography
- Real Time X-Ray
- Fine and Gross Leak (Hermeticity)
- Internal Visual
- Microsectioning
- Bond Strength (Wire Pull)
- Die Shear
- SEM Metallization
- Jet-Etch
- Destructive Physical Analysis (DPA)
- Baseline Analysis
- Sonoscan
- Board Contamination
- Two-point Microprobing
- Auger Microanalysis
- Dynamic Voltage Contrast
- Digital Imaging
- Electron Spectroscopy for Chemical Analysis (ESCA)
- Fourier Transform Infrared Spectroscopy (FTIR)
- IR Microscopy
- Reverse Engineering
- Secondary Ion Mass Spectroscopy (SIMS)
- Differential Scanning Calorimetry (DSC)

Material Analysis

- Quality Assessment of PC Boards, Connectors, components, and Assemblies.
- Identification of Microstructures
- Metallurgical Fatigue Analysis
- Metallurgical Fracture Analysis
- Hardness Testing
- Identification of Contaminants
- Identification of Materials
- Metallurgical Microsectioning Analysis of Materials
- Plating Quality Assessment and Analysis
- Plating Thickness Measurements

Material Analysis Continued

- Cleanliness Testing of PC Assemblies (Ionography)
- Internal Water Vapor Content (Residual Gas Analysis)
- Energy Dispersive X-Ray Analysis (EDX)
- X-ray Fluorescent
- Corrosion Analysis
- Tensile Strength (Instron)
- Elongation and Yield (Instron)
- Compression (Instron and MTS)

Electrical and Physical Analysis

- Analysis of Mechanical Components
- Analysis Electronic Components
- Die Probing
- Radiography (X-Ray)
- Electrical Testing per Specification
- Decapsulation to Reveal Internal Construction and Defects
- Microsectioning
- Optical and Scanning Electron Microscopy
- Removal of Semiconductor Die Passivation, Metallization, Oxide and Polysilicon Layers
- Thermal Imaging

Environmental Testing

Mechanical Shock

- Product Package and Pallet Capabilities (Ship Testing)
- Shock to 20,000 g's
- Half-sine, Square Wave, and Terminal Peak Sawtooth Waveforms
- Test Capacity to 1,300 lbs.
- Fragility Assessment
- Multi-channel Data Capture and Analysis
- Shock Response Spectrum (SRS) Analysis
- Transient Capture
- Real-time Closed-loop Transient/Shock Testing
- Broad Band Complex Pulses to Match Reference SRS

Vibration

- Sine or Random, Vibration Testing Methods
- Test Capacity to 2,200 lbs.
- Multi-channel Control and Analysis

Device/Assembly Burn-in 65°C to +350°C

Humidity 10 to 100% RH

Temperature Cycling -65°C to +200°C

Thermal Shock Air-to-Air -65°C to +200°C
Liquid-to-liquid -65°C to +175°C

Salt Atmosphere MIL-STD, ASTM or JESD22-A107

Constant Acceleration 30,000 g's

Autoclave 110°C to 140 C (up to 2 atm)

Biased Autoclave 110°C-140°C (up to 100%RH)

Tensile/Compression Testing (to 30,000 lbF)

Product Package Testing (ASTM, UPS, FEDEX, ISTA)

Vibration Testing

- ASTM, ISTA, UPS, FEDEX, and MIL Spec Test Methods
- Product, Package and Pallet Capabilities
- Sine or Random Vibration Testing Methods
- Test Capacity to 2,200 lbs.
- Multi-channel Control and Analysis
- Pre-conditioning Temperature and Humidity
- Simulation of Transportation Environments

Shock Testing

- ASTM, ISTA, UPS, FEDEX, and MIL Spec Test Methods
- Product, Package and Pallet Capabilities
- Free Fall Drop Testing
- Programmable Shock Inputs to 2000 g's
- Half-sine and Square Wave Pulse Programming Techniques
- Test Capacity to 1,300 lbs.
- Damage Boundary Testing
- Fragility Assessment
- Shock Response Spectrum (SRS) Analysis
- Transient Capture
- Real-time Closed-Loop Transient/Shock Testing
- Half-sine, and Trapezoidal Pulse Testing
- Broad Band Complex Pulses to Match Reference SRS
- Pre-conditioning Temperature and Humidity
- Simulation of Handling Environment
- IR Re-flow Simulation

Compression Testing

- ASTM, ISTA, UPS, FEDEX, and MIL Spec Test Methods
- Pallet and Package Testing to 30,000 lbs. Force
- Low Cycle Fatigue Testing
- Simulation of Transportation and Warehouse Storage Environments

General Services

- Consulting
 - MTBF Reports based on MIL-HDBK-217 and BELLCORE
 - Design Analysis
 - ESD Auditing and Training
 - Accelerated Life Test
 - Fault isolation
 - Corrective actions
 - Manufacturing Defects

- Custom Test Equipment/Test Fixture Design and Fabrication
 - Burn-In Boards
 - Device Under-Test (DUT) Fixtures
 - Articulating microscope stands



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