



THE AMERICAN ASSOCIATION FOR
LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

TRACE LABORATORIES - CENTRAL
Palatine, IL

for technical competence in the field of

Mechanical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).



Presented this 18th day of August 2008.

Peter Abney

President

For the Accreditation Council

Certificate Number 0294.02

Valid to May 31, 2010

For the tests or types of tests to which this accreditation applies,
please refer to the laboratory's Mechanical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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MECHANICAL

Valid to: May 31, 2010

Certificate Number: 0294.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

Material Property Testing:

Tensile:

ASTM D413	Test Method for Rubber Property - Adhesion to Flexible Substrate
ASTM D638	Test Method for Tensile Properties of Plastics
ASTM E8	Test Methods for Tension Testing of Metallic Materials
ASTM E345	Test Methods of Tension Testing of Metallic Foil
MIL-STD-202.X Method 211.X	Test Methods for Electronic and Electrical Component Parts Terminal Strength
MIL-STD-883.X Method 2004.X Method 2011.X Method 2019.X Method 2027.X Method 2028.X Method 2029.X Method 2031.X	Test Methods and Procedures for Microelectronics Lead Integrity Bond Strength (destructive bond pull test) Die Shear Strength Substrate Attach Strength Pin Grid Package Destructive Lead Pull Test Ceramic Chip Carrier Bond Strength Flip Chip Pull-Off Test
SAE AS23190.X Section 4.6.3	Plastic and Metal Straps, Clamps and Mounting Hardware for Cable Harness Tying and Support Tensile Strength

Tensile (cont'd):

SAE AS13441.X

Method 2003.X

Method 2007.X

Method 2009.X

Method 2010.X

Method 2012.X

Method 2013.X

Method 2014.X

Test Methods for Electrical Connectors

Crimp Tensile Strength

Contact Retention

Cable Pull-Out

Insert Retention

Contact Insertion and Removal Force

Mating and Unmating Forces

Contact Engagement and Separation Force

Flexural:

ASTM D790

Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D2519

Test Method for Bond Strength of Electrical Insulating Varnishes by the Helical Coil Test

Compression:

ASTM D575

Test Methods for Rubber Properties in Compression

ASTM D695

Test Method for Compressive Properties of Rigid Plastics

ASTM E9

Test Methods of Compression Testing of Metallic Materials at Room Temperature

Plating/Coatings:

ASTM B117

Practice for Operating Salt Spray (Fog) Apparatus

ASTM B487

Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section

ASTM B735

Test Method for Porosity in Good Coatings on Metal Substrates by Nitric Acid Vapor

SAE J400

Test for Chip Resistance of Surface Coatings

GM 4260P (Method 1)

Measuring Thickness of Electrodeposits and Anodic Coatings

GM 9500P

Gasoline Puddle Test for Gasoline Fill Areas

GM 9501P

Gasoline Dip Test for Painted Parts

GM 9502P

Knife Cross - Hatch Adhesion Test Procedure for Painted Elastomeric Plastic Substrates

GM 9506P

Dime Scrape Test to Determine Paint Adhesion and Brittleness

GM 9508P

Chip Resistance of Coating

Plating/Coatings (cont'd):

GM 9509P	Solvent Rub Method for Determining Cure of Painted Metal or Plastic Substrates
Ford BI 157-06	High Performance Stone Chip Resistance Test New Rating Scale
Ford BI 106-01	Paint Adhesion

Physical:

ISO 6427	Determination of Matter Extractable by Organic Solvents
ASTM D570	Test Method for Water Absorption of Plastics
ASTM D792	Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D2240	Test Method for Rubber Property - Durometer Hardness
ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D3363	Test Method for Film Hardness by Pencil Test
ASTM E3	Test Method Preparation of Metallographic Specimens
GM 9110P	Test Methods for Switches
Section 5 (Except 5.9, 5.11)	Performance Checks
Section 6	Visual Inspection and Analysis
IPC TM-650 Number 2.3.X	Chemical Test Methods
Method 2.3.1	Chemical Processing, Suitable Processing Material
Method 2.3.1.1B	Chemical Cleaning of Metal Clad Laminates
Method 2.3.2F	Chemical Resistance of Flexible Printed Wiring Materials
Method 2.3.3A	Chemical Resistance of Insulating Materials
Method 2.3.4B	Chemical Resistance, Marking Paints and Inks
Method 2.3.4.2A	Chemical Resistance of Laminates, Prepreg and Coated Foil Products, by Solvent Exposure
Method 2.3.4.3	Chemical Resistance of Core Materials to Methylene Chloride
Method 2.3.5B	Density, Insulating Material
Method 2.3.6A	Etching, Ammonium Persulfate Method
Method 2.3.7A	Etching, Ferric Chloride Method
Method 2.3.7.1A	Cupric Chloride Etching Method
Method 2.3.7.2A	Alkaline Etching Method
Method 2.3.8.1	Flammability of Flexible Printed Wiring
Method 2.3.9D	Flammability of Prepreg and Thin Laminate
Method 2.3.10B	Flammability of Laminate
Method 2.3.10.1	Flammability of Soldermask of Printed Wiring Laminate
Method 2.3.24	Porosity of Gold Plating

Physical (cont'd):

Method 2.3.24.1	Porosity Testing of Gold Electrodeposited on a Nickel Plated Copper Substrate Electrographic Method
Method 2.3.24.2A	Porosity of Metallic Coatings on Copper-Based Alloys and Nickel
Method 2.3.25B	Superseded by Test Method 2.3.25C
Method 2.3.25C	Detection and Measurement of Ionizable Surface Contaminants by Resistivity of Solvent Extract
Method 2.3.25.1	Ionic Cleanliness Testing of Bare PWBs
Method 2.3.26A	Superseded by Test Method 2.3.25C
Method 2.3.26.1	Superseded by Test Method 2.3.25C
Method 2.3.29	Flammability, Flexible Flat Cable
Method 2.3.30A	Solvent pH Determination in Anhydrous Fluorocarbon Solvents
Method 2.3.32C	Flux Induced Corrosion (Copper Mirror Method)
Method 2.3.33C	Presence of Halides in Flux, Silver Chromate Method
Method 2.3.34B	Solids Content, Flux
Method 2.3.34.1B	Percentage of Flux on /in Flux-Coated and/or Flux-Cored Solder
Method 2.3.35D	Halide Content, Quantitative (Chloride and Bromide)
Method 2.3.35.1	Fluorides by Spot Test, Fluxes – Qualitative
Method 2.3.38C	Surface Organic Contaminant Detection Test
IPC TM-650 Section 2.4.X	Mechanical Test Methods
Method 2.4.1E	Adhesion, Tape Testing
Method 2.4.1.1B	Adhesion, Marking Paints and Inks
Method 2.4.1.2	Adhesion of Conductors on Hybrid Substrates
Method 2.4.1.3	Adhesion, Resistors (Hybrid Circuits)
Method 2.4.1.4	Adhesion, Overglaze (Hybrid Circuits)
Method 2.4.1.5A	Determination of Treatment Transfer
Method 2.4.1.6	Adhesion, Polymer Coating
Method 2.4.2.1D	Flexural Fatigue and Ductility, Foil
Method 2.4.3D	Flexural Fatigue, Flexible Printed Wiring Materials
Method 2.4.3.1C	Flexural Fatigue and Ductility, Flexible Printed Wiring
Method 2.4.3.2C	Flexural Fatigue and Ductility, Flexible Metal Clad Dielectrics
Method 2.4.4B	Flexural Strength of Laminates (at Ambient Temperature)
Method 2.4.4.1A	Flexural Strength of Laminates (at Elevated Temperature)
Method 2.4.5	Folding Endurance, Flexible Printed Wiring Materials
Method 2.4.5.1	Flexibility – Conformal Coating
Method 2.4.6	Hot Oil
Method 2.4.8C	Peel Strength of Metallic Clad Laminates
Method 2.4.8.2A	Peel Strength of Metallic Clad Laminates at Elevated Temperature (Hot Fluid Method)
Method 2.4.8.3A	Peel Strength of Metallic Clad Laminates at Elevated Temperature (Hot Air Method)

Physical (cont'd):

Method 2.4.8.4	Carrier Release, Thin Copper
Method 2.4.9D	Peel Strength, Flexible Dielectric Materials
Method 2.4.10	Plating Adhesion
Method 2.4.11	Shear Strength Flexible Dielectric Materials
Method 2.4.12A	Solderability, Edge Dip Method
Method 2.4.13F	Solder Float Resistance Flexible Printed Wiring Materials
Method 2.4.13.1	Thermal Stress of Laminates
Method 2.4.15A	Surface Finish, Metal Foil
Method 2.4.16A	Initiation Tear Strength, Flexible Insulating Materials
Method 2.4.17	Tear Strength, Propagation
Method 2.4.17.1A	Propagation, Tear Strength, Flexible Insulating Materials
Method 2.4.18B	Tensile Strength and Elongation, Copper Foil
Method 2.4.1A	Tensile Strength and Elongation, In-House Plating
Method 2.4.18.3	Tensile Strength, Elongation, and Modulus
Method 2.4.19C	Tensile Strength and Elongation, Flexible Printed Wiring Materials
Method 2.4.20	Terminal Bond Strength, Flexible Printed Wiring
Method 2.4.21E	Land Bond Strength, Unsupported Component Hole
Method 2.4.22C	Bow and Twist (Percentage)
Method 2.4.22.1C	Bow and Twist – Laminate
Method 2.4.23	Soldering Resistance of Laminate Materials
Method 2.4.26	Tape Test for Additive Printed Boards
Method 2.4.27.2A	Solder Mask Abrasion (Pencil Method)
Method 2.4.28B	Adhesion, Solder Mask (Non-Melting Metals)
Method 2.4.28.1D	Adhesion, Solder Resist (Mask), Tape Test Method
Method 2.4.29B	Adhesion, Solder Mask, Flexible Circuit
Method 2.4.31A	Folding, Flexible Flat Cable
Method 2.4.32A	Fold Temperature Testing, Flexible Flat Cable
Method 2.4.33C	Flexural Fatigue and Ductility, Flat Cable
Method 2.4.36C	Rework Simulation, Plated-Through Holes for Leaded Components
Method 2.4.40	Inner Layer Bond Strength of Multilayer Printed Circuit Boards
Method 2.4.42.2	Die Shear Strength
Method 2.4.42.3	Wire Bond Pull Strength
Method 2.4.46	Spread Test, Liquid or Extracted Solder Flux, Solder Paste and Extracted Cored Wires or Preforms
Method 2.4.48	Spitting of Flux-Cored Wire Solder

SAE AS13441, Method 2018.X

Gage Location and Retention

Environmental Simulation:

SAE J1211	Recommended Environmental Plastics for Electronic Equipment Design
ASTM D618	Standard Practice for Conditioning Plastics
GM 4465P	Water Fog Humidity Test
GM 9110P (Section 8 except 8.7, 8.8)	Test Methods for Switches
GM 9504P	Oven Aging Test for Painted Plastic Substrates
GM 9505P	Automotive Environmental Cycles
GM 9640	Water Absorption, Adhesives and Sealants
Ford BQ 104-07	Environmental Cycling (<i>except Procedure 8</i>)

Thermal Testing:

MIL-STD-810.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests
Method 501.X	High Temperature
Method 502.X	Low Temperature
Method 520.X	Temperature, Humidity, Vibration and Altitude
MIL-STD-202.X	Test Methods for Electronic and Electrical Component Parts
Method 107.X	Thermal Shock
Method 108.X	Life (at elevated ambient temperature)
MIL-STD-750.X	Test Methods for Semiconductor Devices
Method 1026.X	Steady-State Operation Life
Method 1027.X	Steady-State Operation Life (Sample Plan)
Method 1031.X	High-Temperature Life (Non-Operating)
Method 1032.X	High-Temperature (Non-Operating) Life (Sample Plan)
Method 1036.X	Intermittent Operation Life
Method 1037.X	Intermittent Operation Life (Sample Plan)
Method 1051.X	Temperature Cycling (Air-to-Air)
MIL-STD-883.X	Test Methods for Microcircuits
Method 1005.X	Steady State Life
Method 1007.X	Agree Life
Method 1008.X	Stabilization Bake
Method 1010.X	Temperature Cycling
RTCA-DO-160.X	Environmental Conditions and Test Procedures for Airborne Equipment
Section 4	Temperature and Altitude
Section 5	Temperature Variation

Humidity Testing:

MIL-STD-810.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests
Method 507.X	Humidity
Method 520.X	Temperature, Humidity, Vibration and Altitude
MIL-STD-202.X	Test Methods for Electronic and Electrical Component Parts
Method 103.X	Humidity (Steady State)
Method 106.X	Moisture Resistance
MIL-STD-750.X	Test Methods for Semiconductor Devices
Method 1021.X	Moisture Resistance
MIL-STD-883.X	Test Methods for Microcircuits
Method 1004.X	Moisture Resistance
RTCA-DO-160.X	Environmental Conditions and Test Procedures for Airborne Equipment
Section 6	Humidity

Altitude Testing:

MIL-STD-810.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests
Method 500.X	Low Pressure (Altitude)
Method 520.X	Temperature, Humidity, Vibration and Altitude
MIL-STD-202.X	Test Methods for Electronic and Electrical Component Parts
Method 105.X	Barometric Pressure (Reduced)
MIL-STD-750.X	Test Methods for Semiconductor Devices
Method 1001.X	Barometric Pressure (Reduced)
MIL-STD-883.X	Test Methods for Microcircuits
Method 1001.X	Barometric Pressure, Reduced (Altitude Operation)
RTCA-DO-160.X	Environmental Conditions and Test Procedures for Airborne Equipment
Section 4	Temperature and Altitude

Corrosion Testing:

GM 4298P	Salt Spray (Mist) Testing
ASTM B117	Practice for Operating Salt Spray (Fog) Apparatus
MIL-STD-810.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests
Method 509.X	Salt Fog
MIL-STD-202.X	Test Methods for Electronic and Electrical Component Parts
Method 101.X	Salt Atmosphere (Corrosion)

Corrosion Testing (cont'd):

MIL-STD-750.X Method 1046.X	Test Methods for Semiconductor Devices Salt Spray (Corrosion)
MIL-STD-883.X Method 1009.X	Test Methods for Microcircuits Salt Atmosphere (Corrosion)
RTCA-DO-160.X Section 14	Environmental Conditions and Test Procedures for Airborne Equipment Salt Spray
Ford BI 123-01	Painted Sheet Metal Corrosion Test (Manual and Alternate Procedure)

Solvent Resistance:

MIL-STD-202.X Method 215.X	Test Methods for Electronic and Electrical Component Parts Resistance to Solvents
MIL-STD-750.X Method 1022.X	Test Methods for Semiconductor Devices
MIL-STD-883.X Method 2015.X	Test Methods for Microcircuits Resistance to Solvents
RTCA-DO-160D.X Section 11	Environmental Conditions and Test Procedures for Airborne Equipment Fluids Susceptibility
Delphi/Delco Q1000 Method 214.X	Engineering Specification Resistance to Chemicals
Ford WSS M20185 A1/A8, 3.12	Resistance to Automotive Fluid

Immersion Testing:

GM 9514P	Recommended Practice for Hot Water Immersion Testing
GM 4466P	Water Immersion Test
MIL-STD-810.X Method 512.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests Immersion Testing
MIL-STD-202.X Method 104.X	Test Methods for Electronic and Electrical Component Parts Immersion Testing
MIL-STD-750.X Method 1011.X	Test Methods for Semiconductor Devices Immersion Testing
MIL-STD-883.X Method 1002.X	Test Methods for Microcircuits Immersion Testing

Immersion Testing (cont'd):

RTCA-DO-160D.X

Section 10

Environmental Conditions and Test Procedures for Airborne Equipment

Waterproofness

Thermal Shock Testing

MIL-STD-810.X

Method 503.X

Test Methods for Environmental Engineering Considerations and Laboratory Tests

Temperature Shock

MIL-STD-883.X

Method 1011.X

Test Methods for Microcircuits

Thermal Shock

Explosive Atmosphere Testing:

MIL-STD-810.X

Method 511.X

Test Methods for Environmental Engineering Considerations and Laboratory Tests

Explosive Atmosphere

Solderability:

MIL-STD-202.X

Method 109.X

Method 202.X

Method 208.X

Test Methods for Electronic and Electrical Component Parts

Explosion

Shock

Solderability

Resistance to Solder Heat:

MIL-STD-202.X

Method 210.X

Test Methods for Electronic and Electrical Component Parts

Resistance to Soldering Heat

Terminal Strength:

MIL-STD-202.X

Method 211.X

Test Methods for Electronic and Electrical Component Parts

Terminal Strength

Strain Gage Application:

JDEC-9702

Printed Wiring Board Strain Gage Test Guideline

Rain Testing:

USCAR 2 method 5.8.1

Performance Specification for Automotive Electrical Connector Systems

Resistance to Icing:

RTCA-DO-160D.X

Section 24

Environmental Conditions and Test Procedures for Airborne Equipment

Icing

Degree of Protection

IEC 60529

Penetration of Foreign Objects and Water

Test Methods for Electrical Connectors:

SAE AS13441.X

Method 1001.1X
Method 1002.2.X
Method 1003.1.X
Method 1004.1.X
Method 1005.1.X
Method 1011.X
Method 1015.X
Method 1016.X
Method 1017.X
Method 2002.1.X
Method 2006.1.X

Test Methods for Electrical Connectors

Salt Spray (Corrosion)
Humidity
Temperature Cycling
Altitude Immersion
Temperature Life
Altitude-Low Temperature
Simulated Life
Fluid Immersion
Porosity
Maintenance Aging
Probe Damage (Contacts)

SAE AS23190.X

Section 4.6.2
Section 4.6.4.2
Section 4.6.5
Section 4.6.7

Plastic and Metal Straps, Clamps and Mounting Hardware for
Cable Harness Tying and Support

Moisture Conditioning
Temperature Cycling
Fluid Immersion
Corrosion

Engineering Specification:

Delphi/Delco Q1000

Method 100.X
Method 101.X
Method 102.X
Method 103.X
Method 105.X

Method 106.X
Method 115.X
Method 116.X
Method 119.X
Method 200.X
Method 205.X
Method 206.X
Method 232.X

Engineering Specification

High Temperature Storage Life
Temperature Cycling
Power-Temperature Cycling Test
Operating Life Test
Cycled Temperature Humidity Test (Biased or
Unbiased)
Stead State Humidity Test (Biased or Unbiased)
Dew Point
Finished Adhesion
Surface Ion Contamination
Physical Dimension
Lead Bend Test
Lead Pull Test
Heat Cured Silicone Conformal Coating Compatibility

Flammability:

SAE J369

Flammability of Polymeric Interior Materials - Horizontal

UL 94

Test for Flammability of Plastic Materials for Parts in D devices
and Appliances

GM 9070P

Procedure for Testing Flammability of Materials

FMVSS-302

Flammability Standard for Automobile Interiors

JIS-D-1601

Test Method for Flammability of Organic Interior Materials for
Automobiles

Flammability (cont'd):

MIL-STD-202.X Method 111.X	Test Methods for Electronic and Electrical Component Parts Flammability (external flame)
SAE AS13441.X Method 1012.X	Test Methods for Electrical Connectors Flammability
Delco Q1000.X Method 120.X Method 311.X	Engineering Specification Flammability Flame Retardance

Vibration/Shock:

Qualmark Halt Guidelines >10Hz	Highly Accelerated Life Testing
GM 9110P (sections 7.5, 7.6, 7.7)	Test Methods for Switches
GM 9232P (except 1.5 gm. Transducer)	Extensional Vibration Performance
ISTA Procedure 1A	Pre-Shipment Test Procedures
MIL-STD-810.X Method 514.X Method 516.X Method 520.X	Test Methods for Environmental Engineering Considerations and Laboratory Tests Vibration Shock Temperature, Humidity, Vibration and Altitude
MIL-STD-202.X Method 201.X Method 204.X Method 213.X Method 214.X	Test Methods for Electronic and Electrical Component Parts Vibration Vibration, High Frequency Shock (Specified Pulse) Random Vibration
MIL-STD-750.X Method 2016.X Method 2046.X Method 2051.X Method 2056.X Method 2057.X	Test Methods for Semiconductor Devices Shock Vibration Fatigue Vibration Noise (exposure only) Vibration, Variable Frequency Vibration, Variable Frequency (Monitored)
MIL-STD-883.X Method 2002.X Method 2005.X Method 2007.X Method 2026.X	Test Methods for Microcircuits Mechanical Shock Vibration Fatigue Vibration, Variable Frequency Random Vibration
SAE AS13441.X Method 2004.1X Method 2005.1.X	Test Methods for Electrical Connectors Shock (Specified Pulse) Vibration

Vibration/Shock (cont'd):

SAE AS23190.X Plastic and Metal Straps, Clamps and Mounting Hardware for
Cable Harness Tying and Support
Section 4.6.4.1.X Vibration

Delco Q1000.X Engineering Specification
Method 211.X Random Vibration
Method 212.X Vibration Fatigue

Acceleration

MIL-STD-810.X Test Methods for Environmental Engineering Considerations and
Laboratory Tests
Method 513.X Acceleration

RTCA-DO-160D.X Environmental Conditions and Test Procedures for Airborne
Equipment
Table 7-1 Acceleration

Mechanical Durability:

SAE AS13441.X Test Methods for Electrical Connectors
Method 2016.X Durability
Method 2017.X Cable Seal Flexing

GM9110P.X Procedure for Testing Switches
Section 9.X Accelerated Durability Tests

* X or .X is equivalent to alphanumeric revisions and interim – applicable for MIL specs.