



**Environmental Simulation**  
**Report of Equipment Compliance**  
for the  
**Boeing 2-Way Switches,**  
**Part Number SWSH-810-2DR-IND-SMC**

**Tested Under**  
MIL-STD-202F; Methods 101, 106, 110, 204, and 214

**MET Report Number: ESL12363**  
September 12, 2002

**Prepared For:**

American Microwave Corporation  
7311-G Grove Road  
Frederick, Maryland 21701

**Prepared By:**

MET Laboratories, Inc.  
914 West Patapsco Avenue  
Baltimore, Maryland 21230-3432  
(410) 354-3300

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**Environmental Simulation**  
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MIL-STD-202F; Methods 101, 106, 110, 204, and 214

**MET Report Number: ESL12363**  
September 12, 2002

**Testing Performed For:**

American Microwave Corporation

**Testing Performed By:**

Philip L. Layman  
Project Engineer

Troy Franklin, Director  
Environmental Testing



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## **I. Executive Summary**

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MET Laboratories, Inc. was contracted by American Microwave Corporation to perform Environmental Simulation Testing on Boeing 2-Way Switches, Part Number SWSH-810-2DR-IND-SMC. The tests were based on MIL-STD-202F and American Microwave Corporation Purchase Order Number 20500287.

The aforementioned equipment was subjected to the following tests with the following results:

**Salt Fog, Method 101:**

The switches were subjected to a 48 hour in accordance with the requirements of Method 101 of MIL-STD-202F, Test Condition B. The visual inspection of the switches revealed no anomalies. No performance testing was performed or witnessed by MET.

**Moisture Resistance, Method 106:**

The switches, while maintaining a constant humidity, were subjected to ten, 24 hour temperature cycles in accordance with the requirements of Method 106 of MIL-STD-202F. The visual inspection of the switches revealed no anomalies. No performance testing was performed or witnessed by MET.

**Sand and Dust, Method 110:**

The switches were subjected to a sand and dust test in accordance with the requirements of Method 110 of MIL-STD-202F, Test Condition A. The visual inspection of the switches revealed no anomalies. No performance testing was performed or witnessed by MET.

**Vibration, Method 204:**

The switches were subjected to a 20g, swept sine vibration for 4 hours per axis in accordance with the requirements of Method 204 of MIL-STD-202F, Test Condition D. The visual inspection of the switches revealed no anomalies. No performance testing was performed or witnessed by MET.

**Shock, Method 213:**

The switches were subjected to a 75g, 6ms, ½ sine shock test in accordance with the requirements of Method 204 of MIL-STD-202F, Test Condition B. The visual inspection of the switches revealed no anomalies. No performance testing was performed or witnessed by MET.





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## II. General

---



**A. Overview**

The tests described in this document were formal tests as described in MIL-STD-202F. The objective of the testing was to certify conformance of the Equipment Under Test to the requirements of the aforementioned specifications.

**B. References**

<b>ISO 10012-1:1992(E)</b>	Quality Assurance Requirements for Measuring Equipment
<b>MIL-STD-202F</b>	Department of Defense Test Method Standard, Electronic and Electrical Component Parts, 1 April 1980
<b>MIL-STD-45662A</b>	Calibration System Requirements

**C. List of Abbreviations**

<b>EUT</b>	Equipment Under Test
<b>Hz</b>	Hertz
<b>g</b>	Units of Gravity

<b>°C</b>	Degrees Centigrade
<b>°F</b>	Degrees Fahrenheit
<b>kg</b>	kilograms

**D. Test Site**

All testing under ESL12363 was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore Maryland 21230-3432 except for the Sand and Dust Test. This test was conducted at Dayton T. Brown, Inc. Engineering and Test Division, Church Street, Bohemia, Long Island, New York 11716.

All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

**E. Description of Test Sample**

The Boeing 2-Way Switches, Part Number SWSH-810-2DR-IND-SMC, will be referred to as Equipment Under Test (EUT) for the remainder of this document. No detailed description of the switches was supplied by American Microwave.

**F. Modifications**

**Modifications to EUT**

No modifications were made to the EUT.

**Modifications to Test Standard**

No functional verifications were performed during testing.



### **G. Method of Monitoring EUT Operation**

All pre and post verification testing was performed by American Microwave at their facility. Therefore MET Laboratories, Inc. can not certify the proper performance of the equipment.

### **H. Disposition of Test Sample**

Multiple EUT were submitted for Environmental testing. Upon completion of testing, all the were returned to American Microwave.



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### III. Environmental Test Procedures (MIL-STD-202F)

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**A. Salt-Fog (Method 101, Test Condition B)**

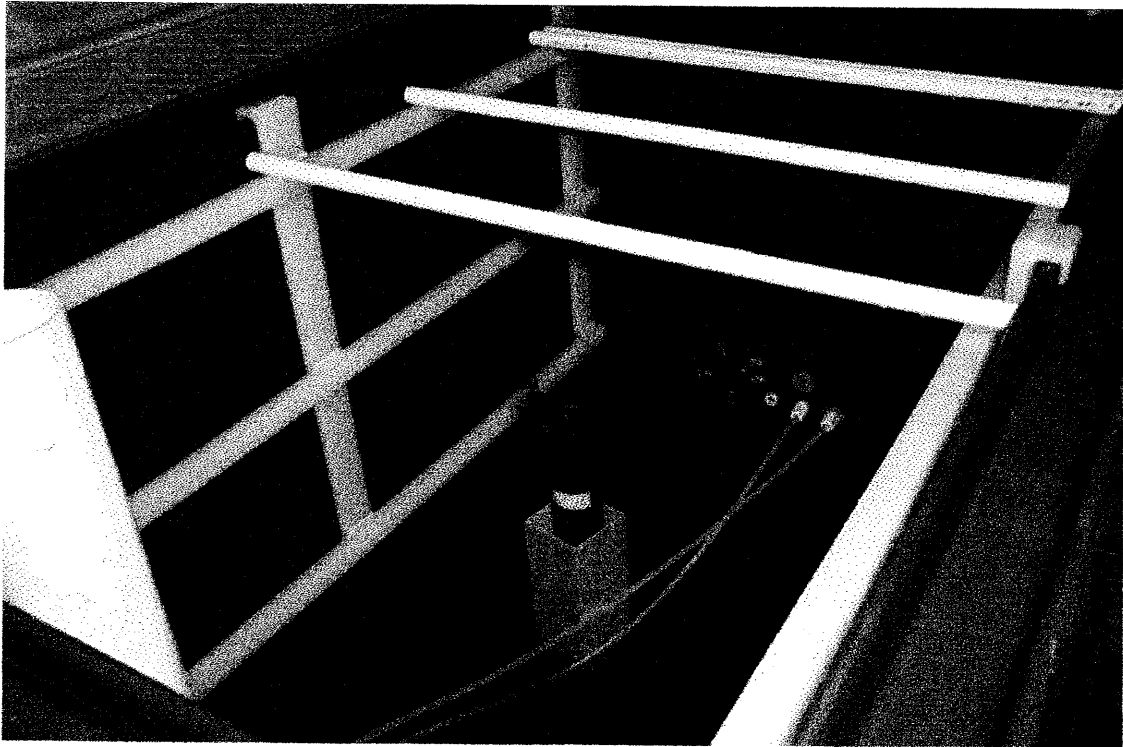
**Test Procedure**

- A. A 5% (by weight) non-iodized salt solution was prepared at least 24 hours before testing.
- B. The pretest relative density (specific gravity) of the salt solution was checked to insure that it was between 1.023 and 1.036. The pH was measured and maintained between 6.5 and 7.2. A calibration run at 35°C was performed on the test chamber to insure a fog collection of 0.5 to 3.0 milliliters per hour for each 80 square centimeters of horizontal collection area.
- C. Any surfaces scratches or nicks on the EUT were noted.
- D. After the calibration was verified, the EUT was placed in the salt fog test chamber. See Photograph 1. The EUT was subjected to 48 hours of exposure to the salt fog conditions (Test Condition B).
- E. At the conclusion of the 48 hours of exposure the EUT was removed from the salt fog test chamber and allowed to dry.
- F. The fog collection with-in the chamber was measured.

**Test Results**

The average measured fog collection within the test area was calculated to be equivalent to 2.81ml/80cm<sup>2</sup>/hr. This is within the MIL-STD-202F requirements of 0.5 to 3.0 ml/80cm<sup>2</sup>/hr. The visual inspection of the EUT revealed no anomalies. No performance testing was performed or witnessed by MET.

**Test Date: 05/30/02- 06/03/02**



Photograph 1: View of Salt Fog Test Set-up

**B. Moisture Resistance (Method 106)**

**Test Procedure**

- A. The non-operational EUT was installed in the temperature chamber at 25°C (± 5°C) and a relative humidity between 20 and 55% (see Photograph 2).

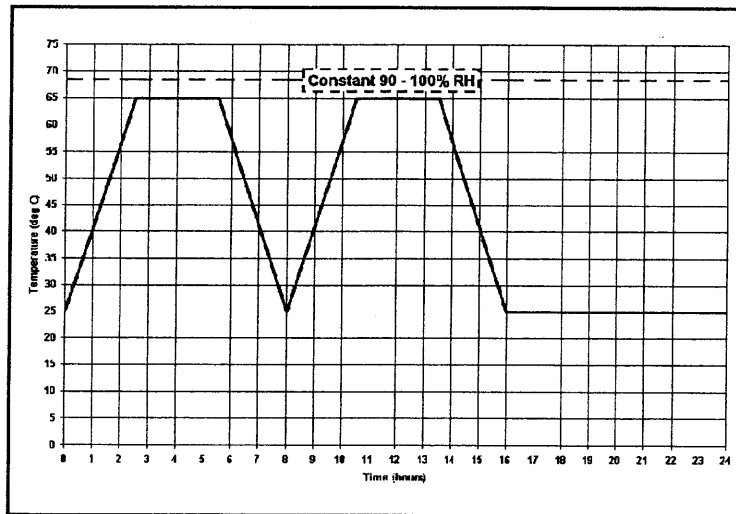


Figure 1: Moisture Resistance Profile (1 cycle)

- B. The chamber temperature was increased to 25°C and 95% RH before the start of the first cycle (see Figure 1).
- C. The chamber temperature was increased to 65°C in 2.5 hours while the RH was maintained between 90 and 100%.
- D. The chamber temperature and RH were held for 3 hours.
- E. The chamber temperature was decreased to 25°C in 2.5 hour while the RH was maintained between 90 and 100%.
- F. The chamber temperature and RH were held for 3 hours.
- G. The chamber temperature was decreased to 25°C in 2.5 hour while the RH was maintained between 90 and 100%.
- H. The chamber temperature and RH were held for 8 hours.
- Y. Steps C through H were repeated 9 times (10 cycles).

**Test Results**

The visual inspection of the EUT revealed no anomalies. No performance testing was performed or witnessed by MET.

**Test Dates: 06/11/02 - 06/29/02**

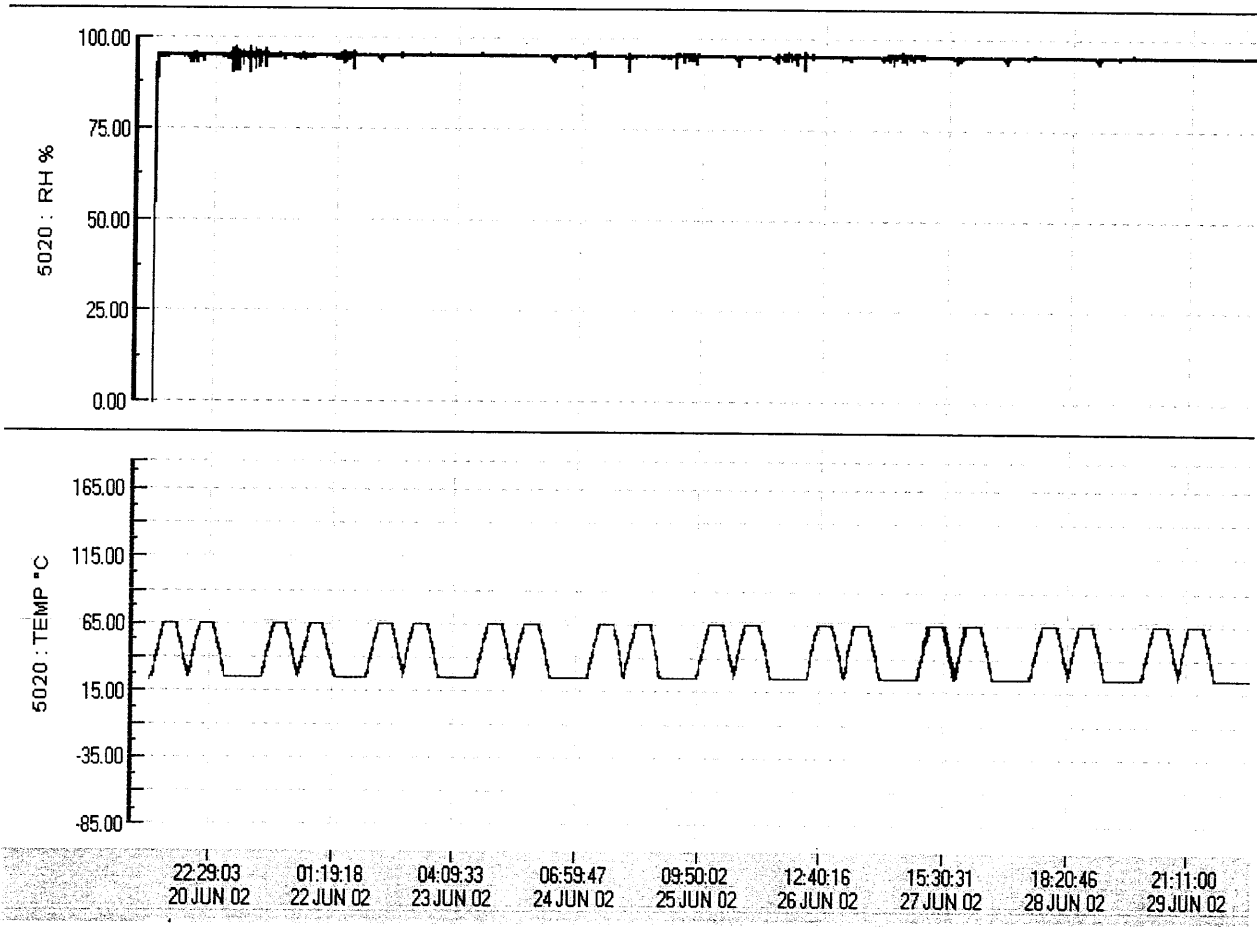


Photograph 2: View of Moisture Resistance Test Set-up





Moisture Resistance Test Data





**C. Sand and Dust (Method 110, Test Condition A)**

This test was conducted at Dayton T. Brown, Inc. Engineering and Test Division, Church Street, Bohemia, Long Island, New York 11716. A copy of the test report is included in the Appendix of this document.



### D. Vibration (Method 204, Test Condition D)

#### Test Procedure

- A. The non-operational EUT were installed on the vibration test fixture (see Photograph 3, Photograph 4, and Photograph 5). See Figure 3 and Figure 4 for test set-up.
- B. An input (control) accelerometer was mounted to the base of the test fixture.
- C. The EUT was subjected to a swept sine test, in each axis, at the following test levels (see Figure 2);

Input Frequency (Hertz)	Input Acceleration
10 - 80.85	0.06"DA
80.85 - 2000	20g

Sweep Time (10-2000-10Hz): 20 minutes

Sweep Type: Logarithmic

Number of Sweeps: 12 per Axis

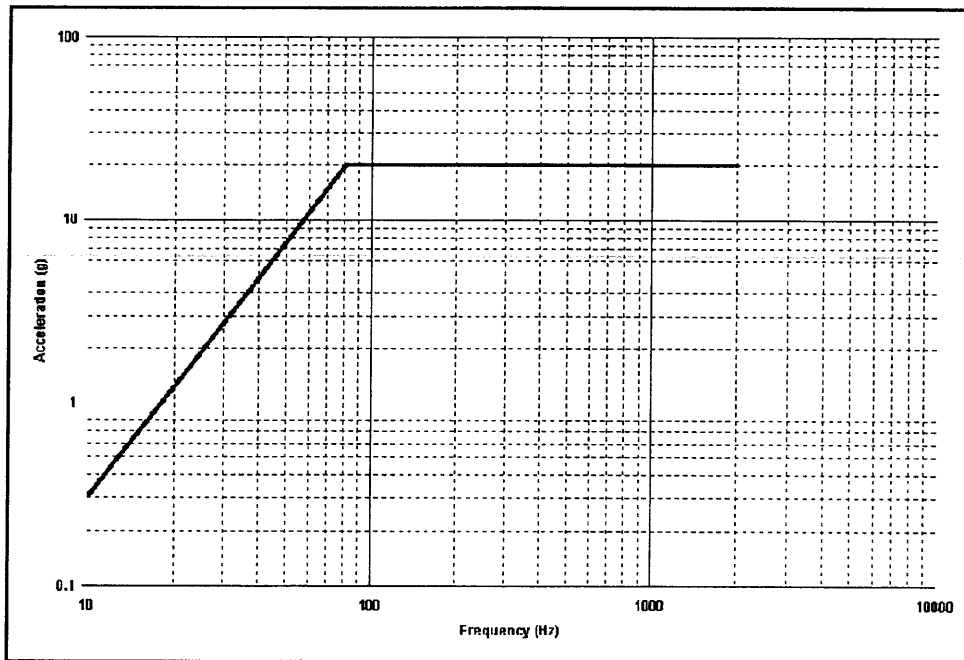


Figure 2: Random Vibration

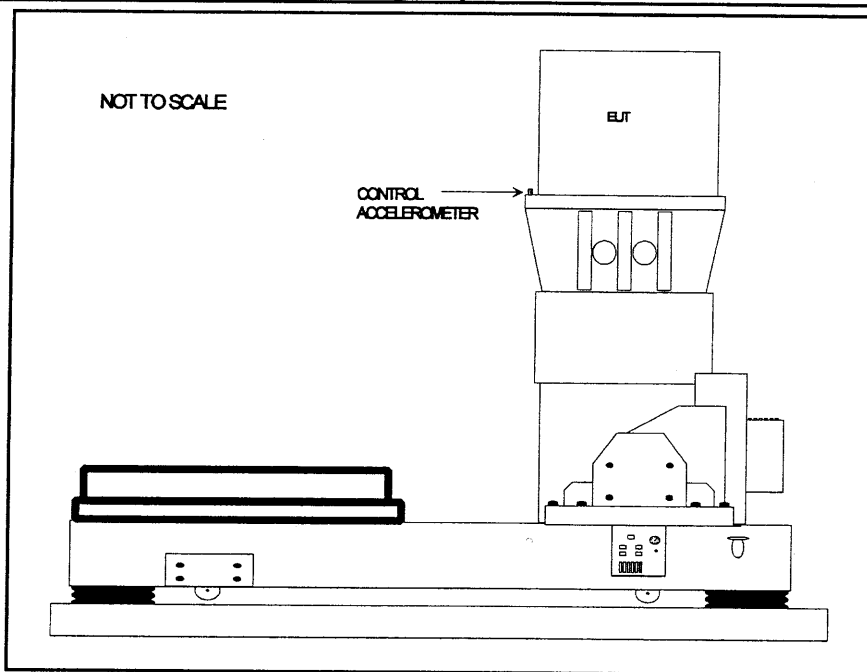


Figure 3: Transportation Vibration Test Set-up (Vertical Axis)

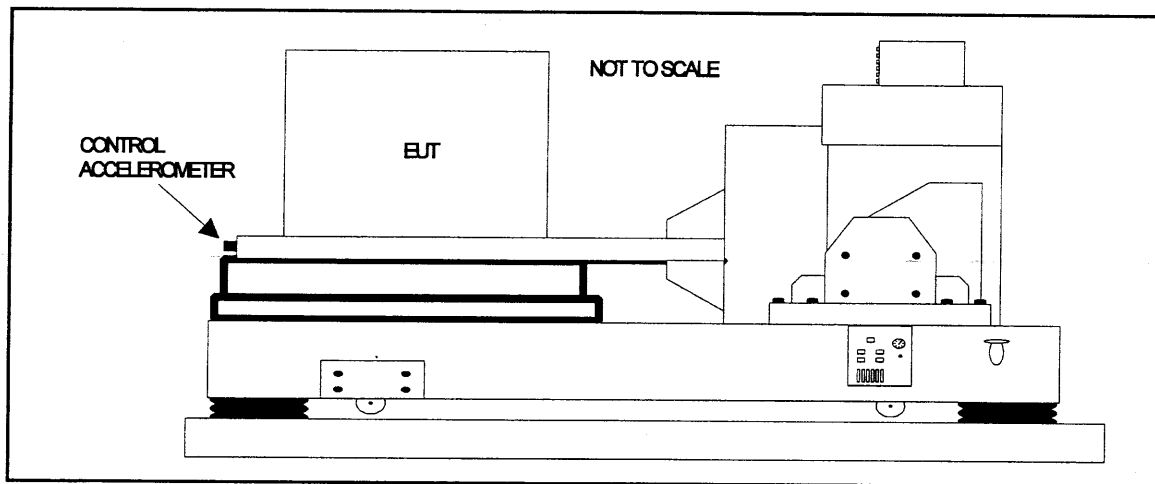


Figure 4: Transportation Vibration Test Set-up (Transverse and Longitudinal Axes)

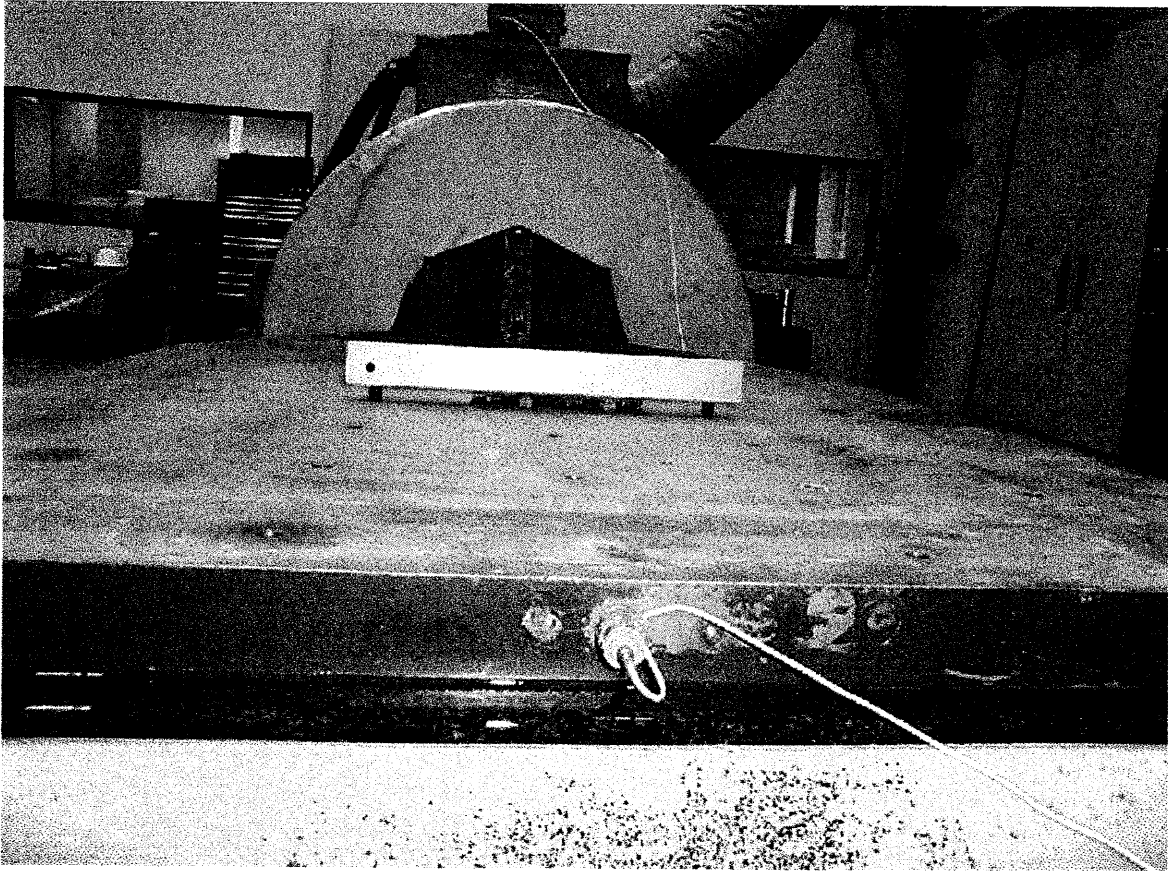
### Test Results

No structural or mechanical damage was noted as a result of this test. No performance testing was performed or witnessed by MET.

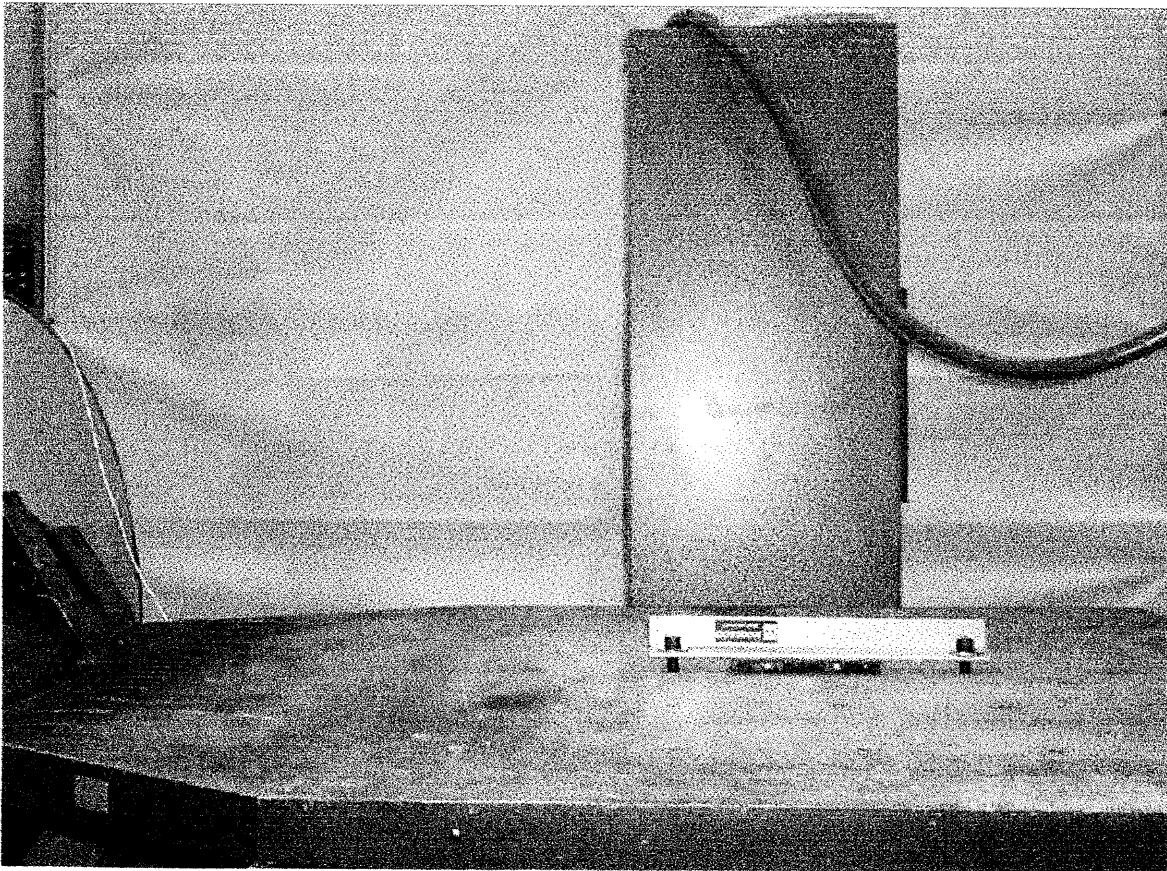
Test Dates: 05/29/02 - 06/19/02



Photograph 3: View of Vibration Test Set-up (Vertical Axis)



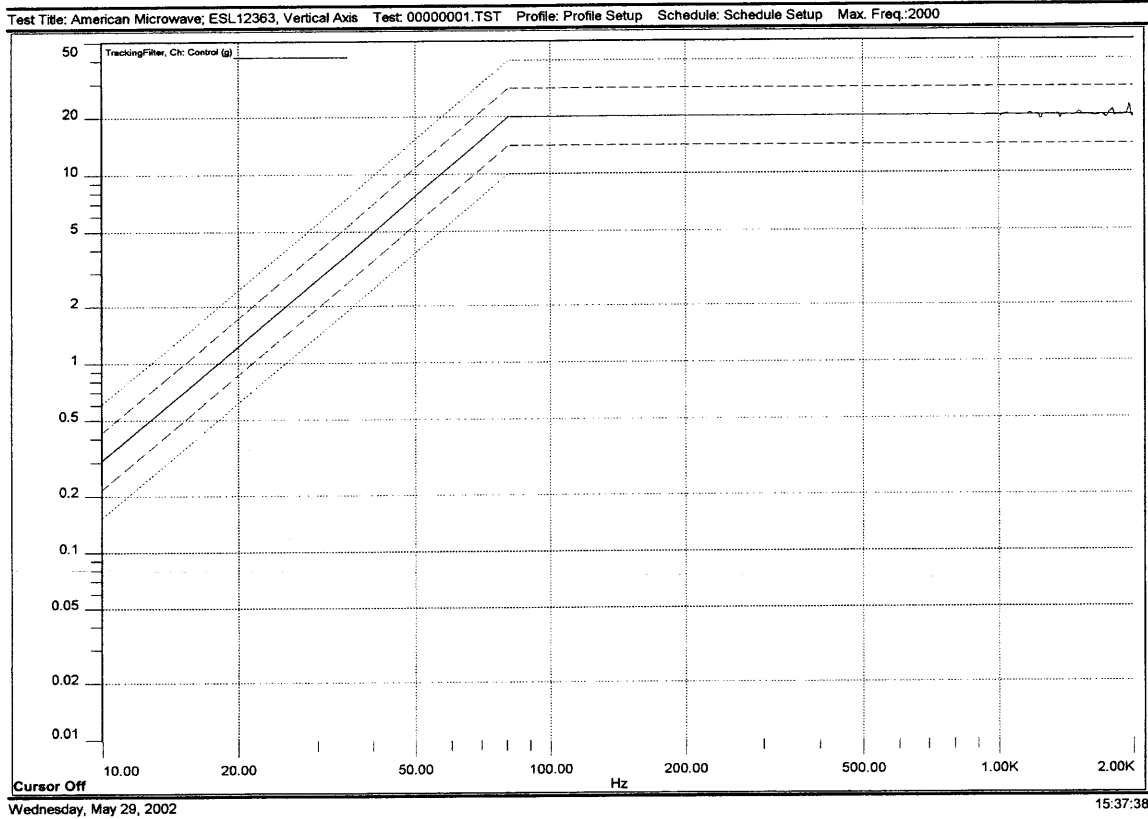
Photograph 4: View of Vibration Test Set-up (Longitudinal Axis)



Photograph 5: View of Vibration Test Set-up (Transverse Axis)



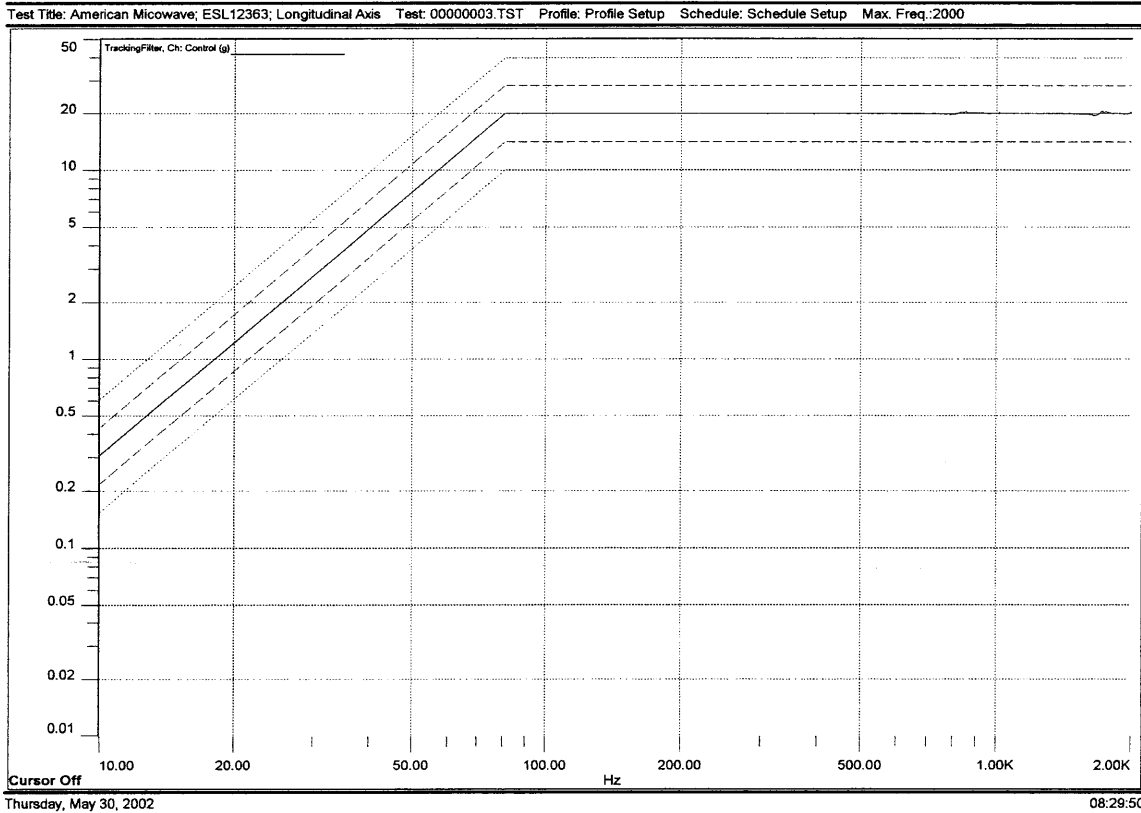
Vibration: Vertical Axis, Control Signal





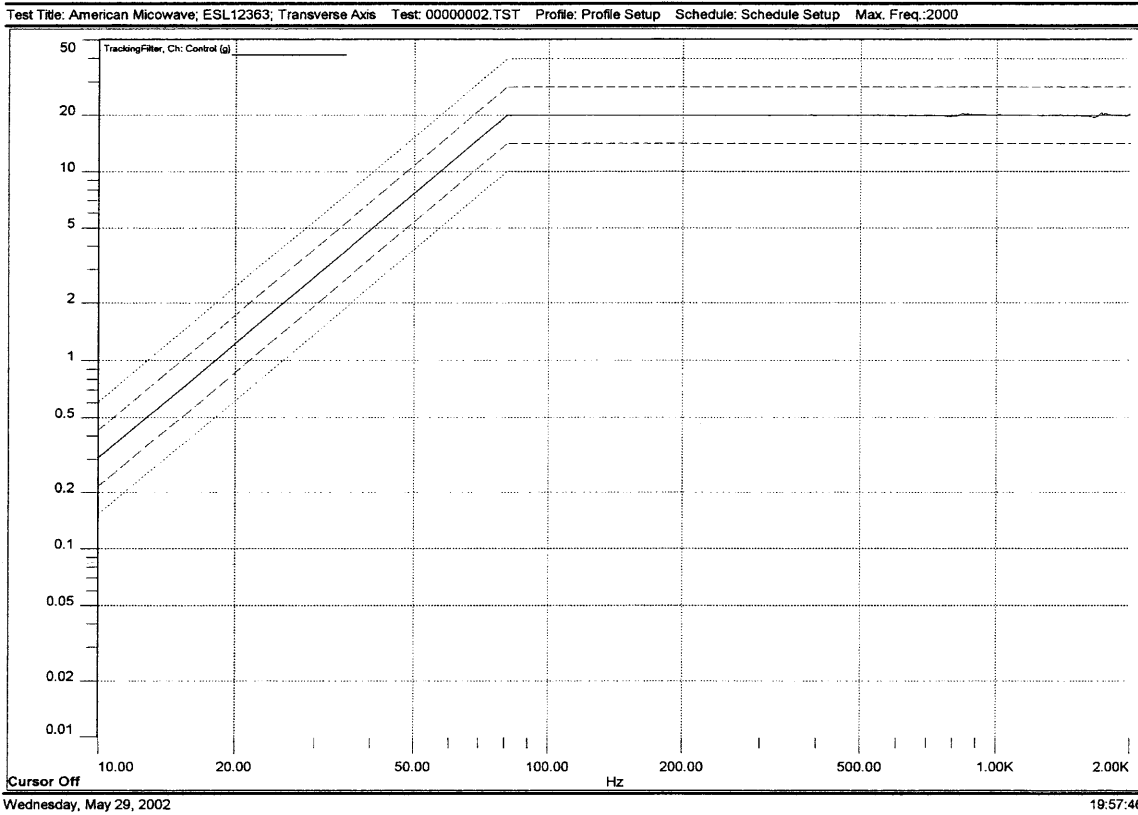


Vibration: Longitudinal Axis, Control Signal





Vibration: Transverse Axis, Control Signal



**E. Shock (Method 213, Test Condition B)  
Test Procedure**

- A. The non-operational, packaged EUT was installed on the vibration test fixture (see Photograph 6, Photograph 7, and Photograph 8). See Figure 5 and Figure 6 for test set-up.
- B. An input (control) accelerometer was mounted to the base of the test fixture.
- C. The EUT was subjected to 3 half-sine shock pulses in each direction, per axis, at the following test levels;

Duration (ms)	Input Acceleration
6	75g

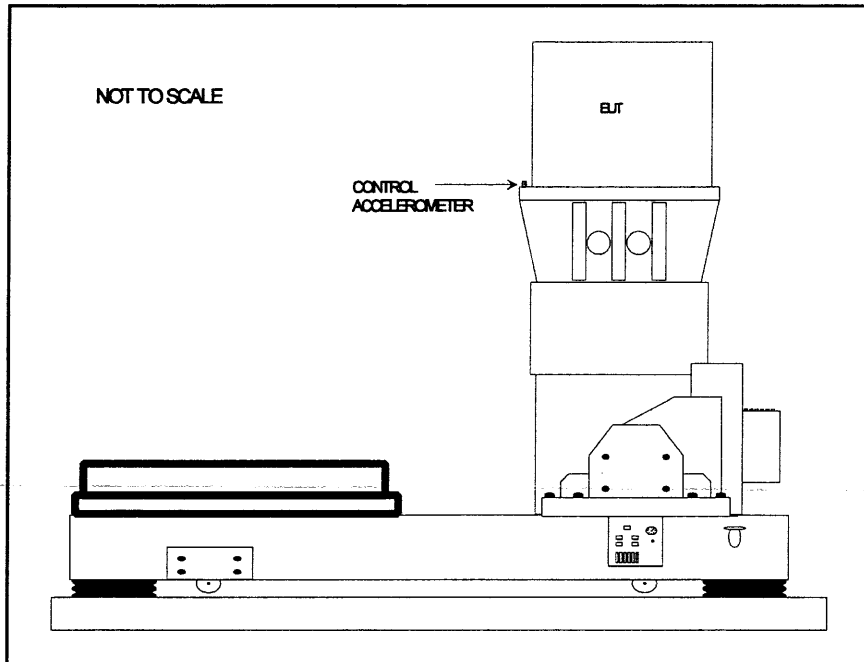


Figure 5: Transportation Shock Test Set-up (Vertical Axis)

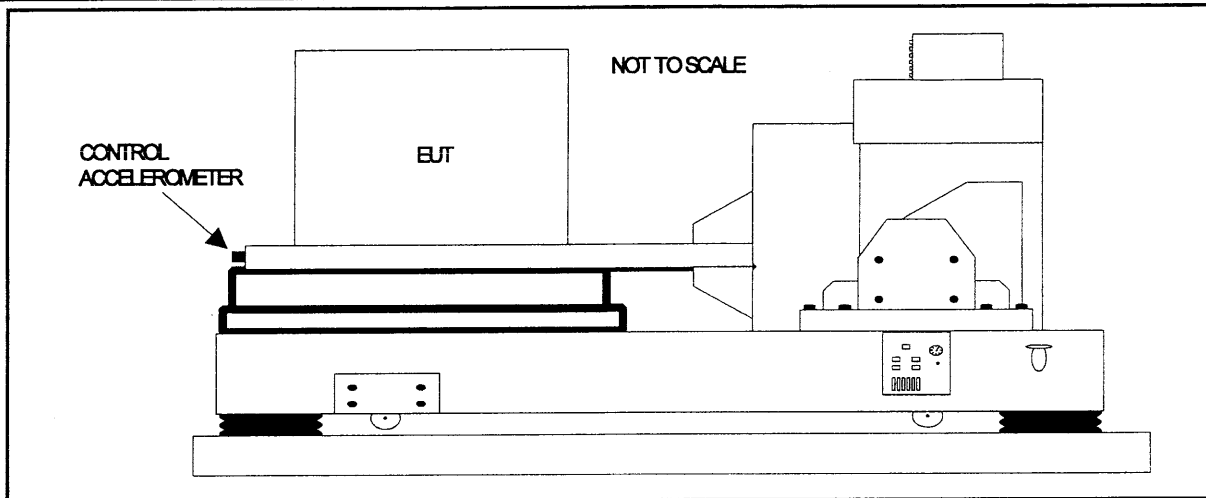
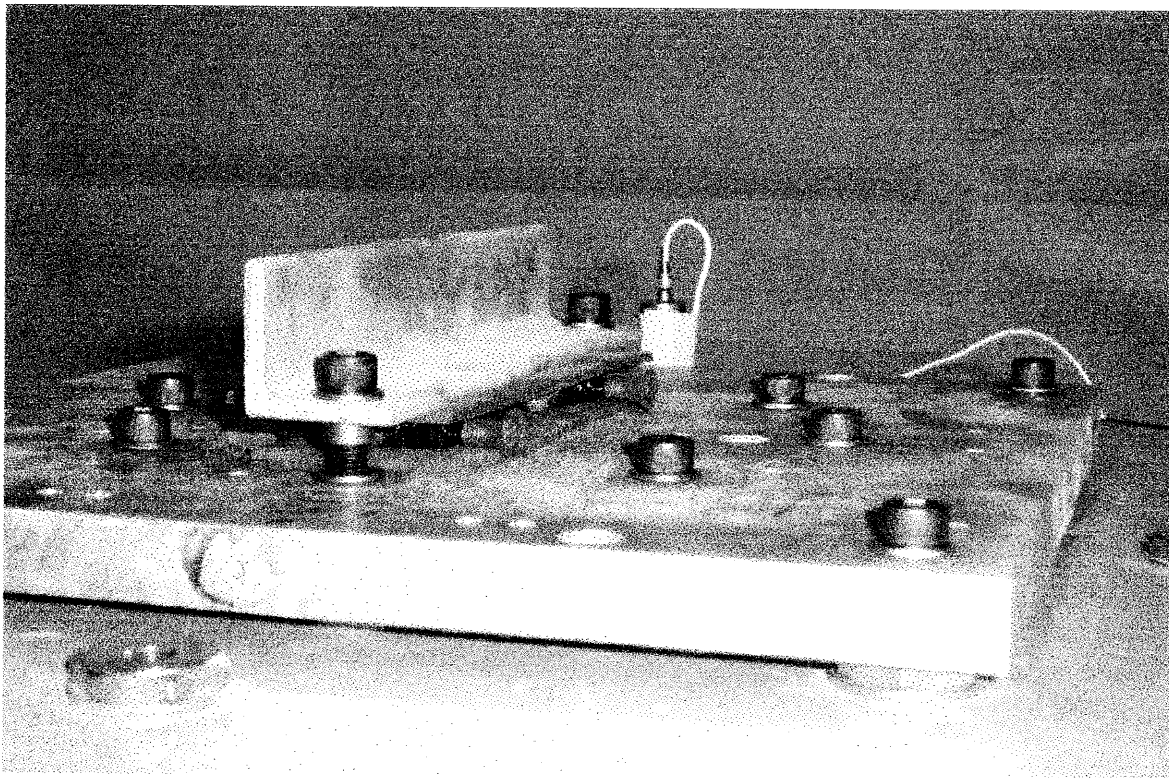


Figure 6: Transportation Shock Test Set-up (Transverse and Longitudinal Axes)

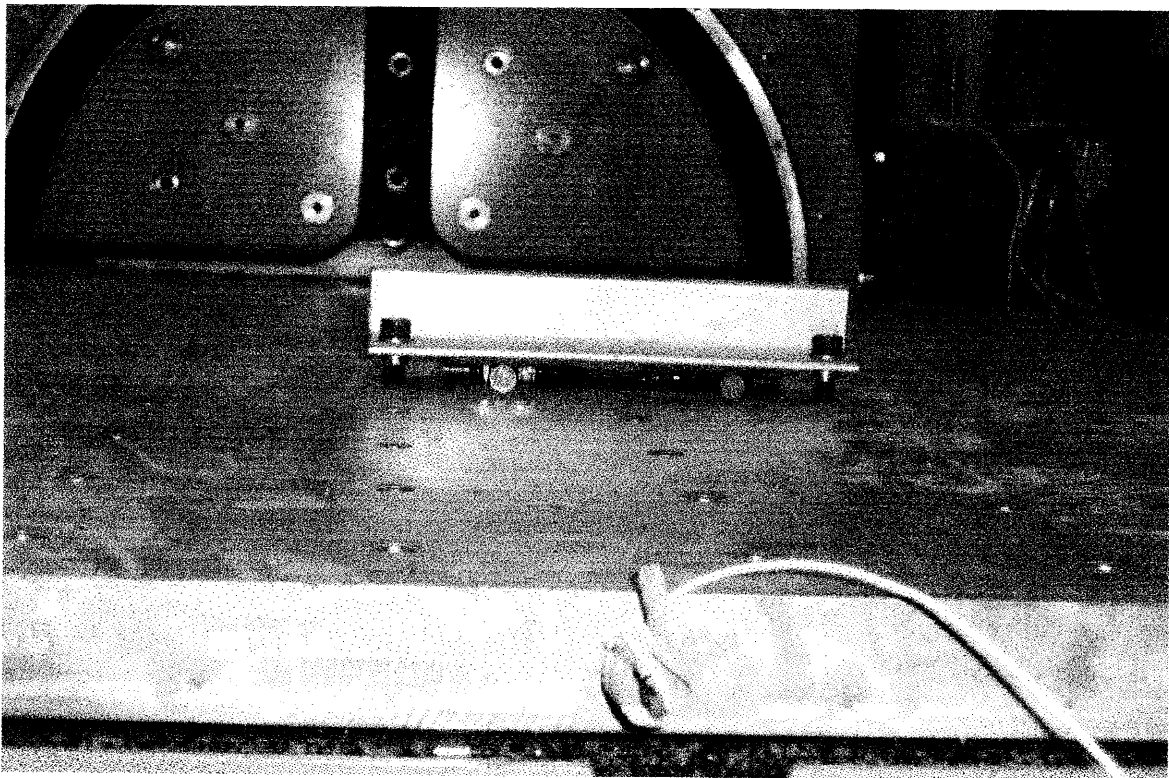
### Test Results

No structural or mechanical damage was noted as a result of this test. No performance testing was performed or witnessed by MET.

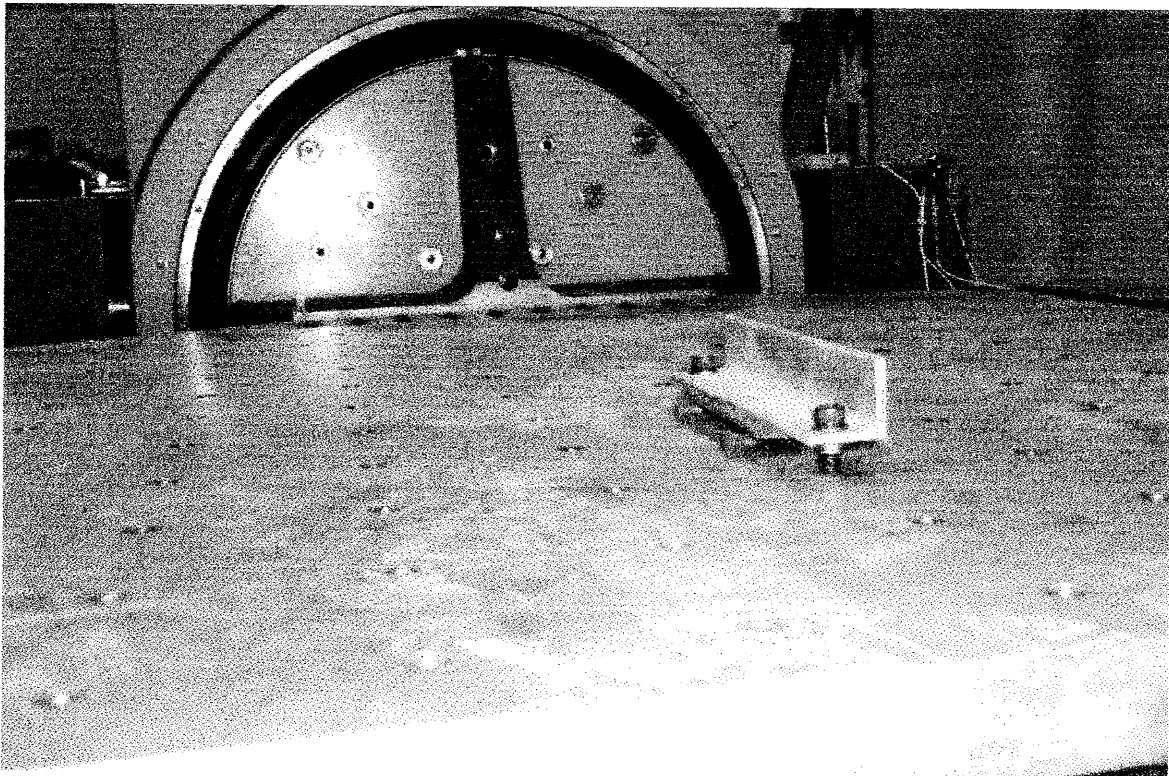
**Test Dates: 06/12/02 - 06/17/02**



Photograph 6: View of Shock Test Set-up (Vertical Axis)



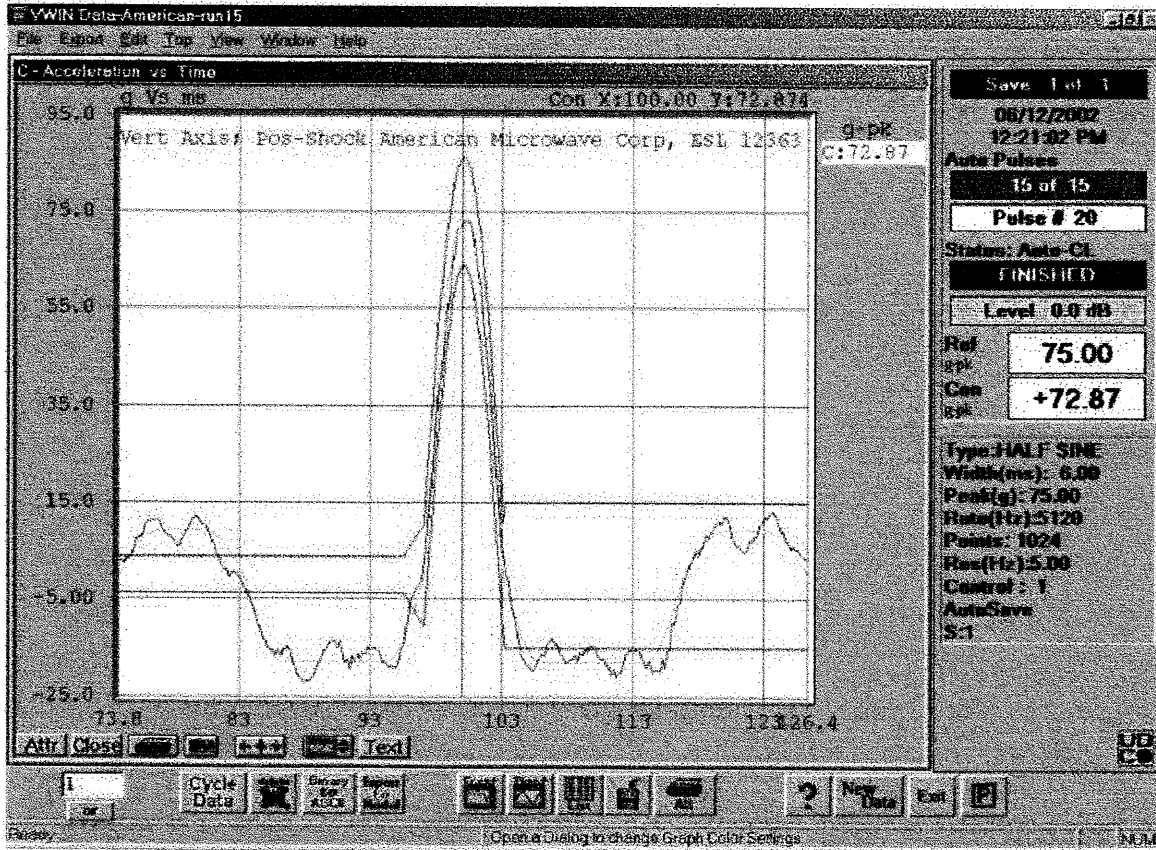
Photograph 7: View of Shock Test Set-up (Longitudinal Axis)



Photograph 8: View of Shock Test Set-up (Transverse Axis)



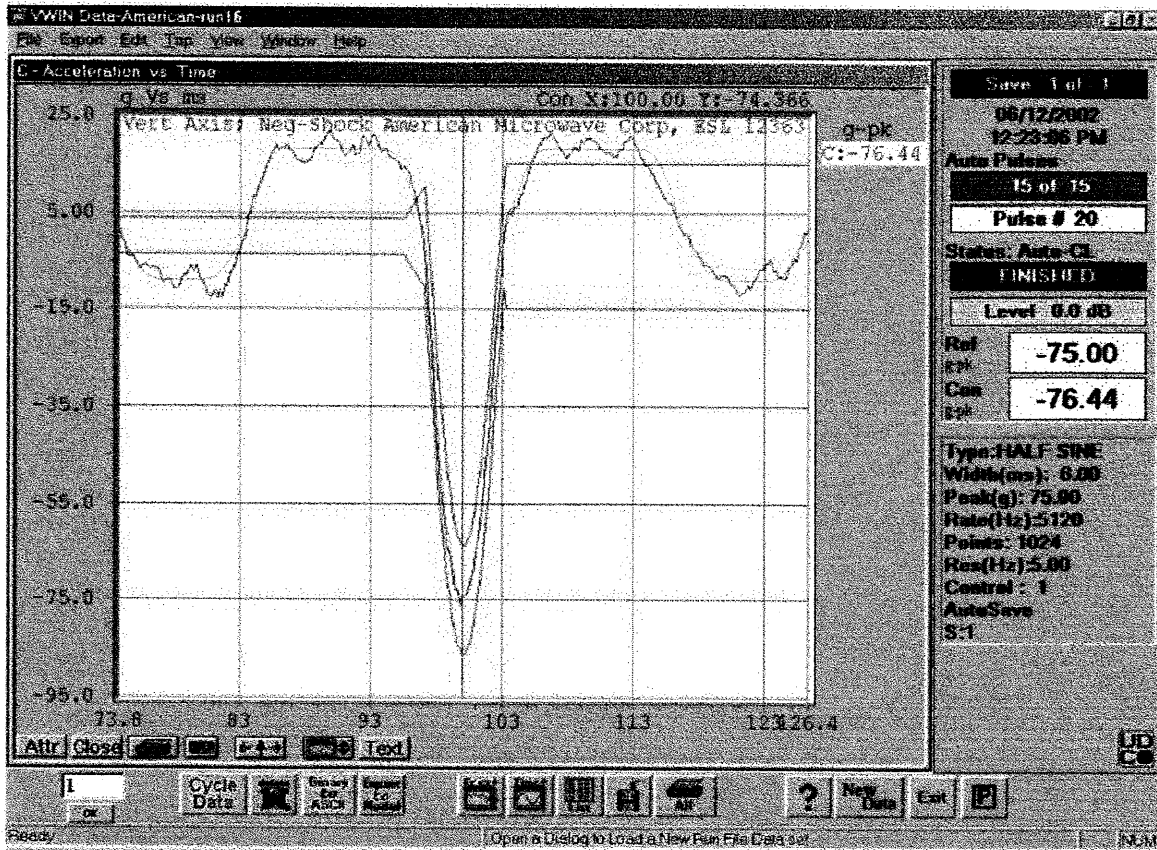
Shock Test, Positive Pulse: Vertical Axis, Control Signal





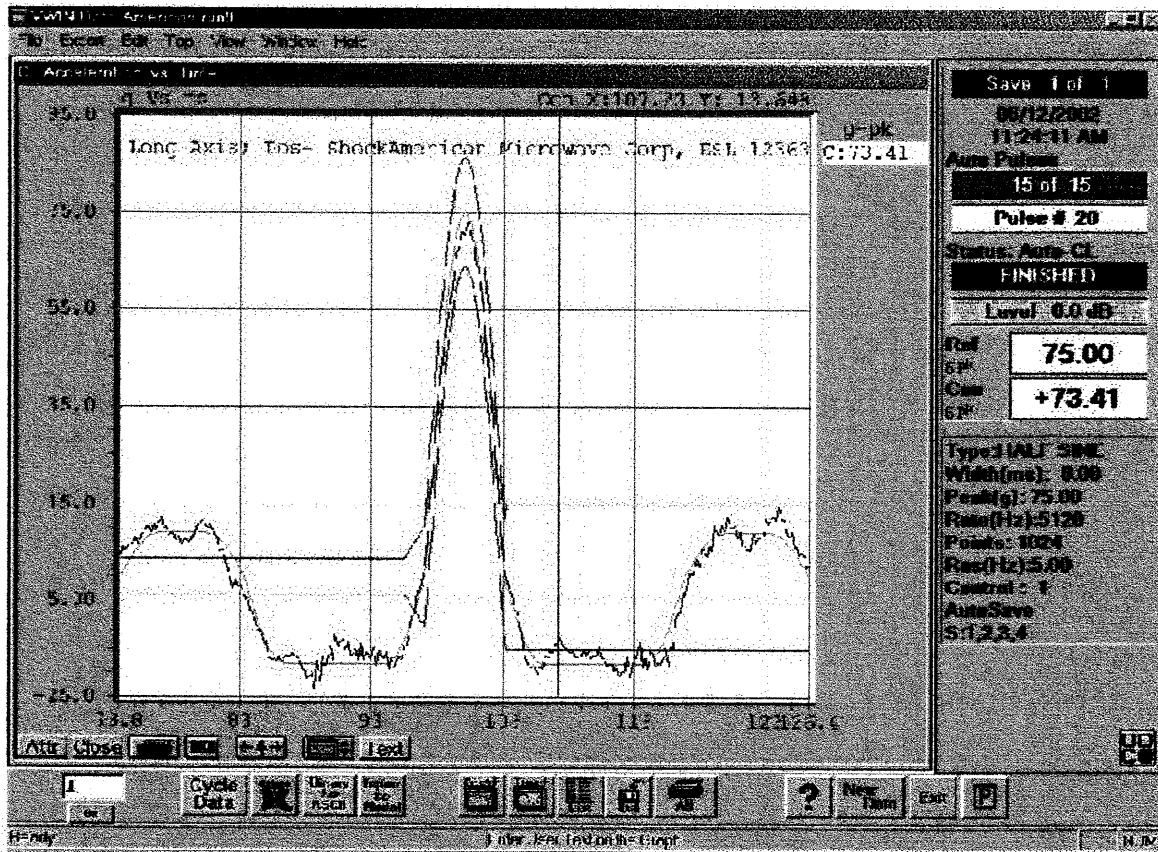


Shock Test, Negative Pulse: Vertical Axis, Control Signal



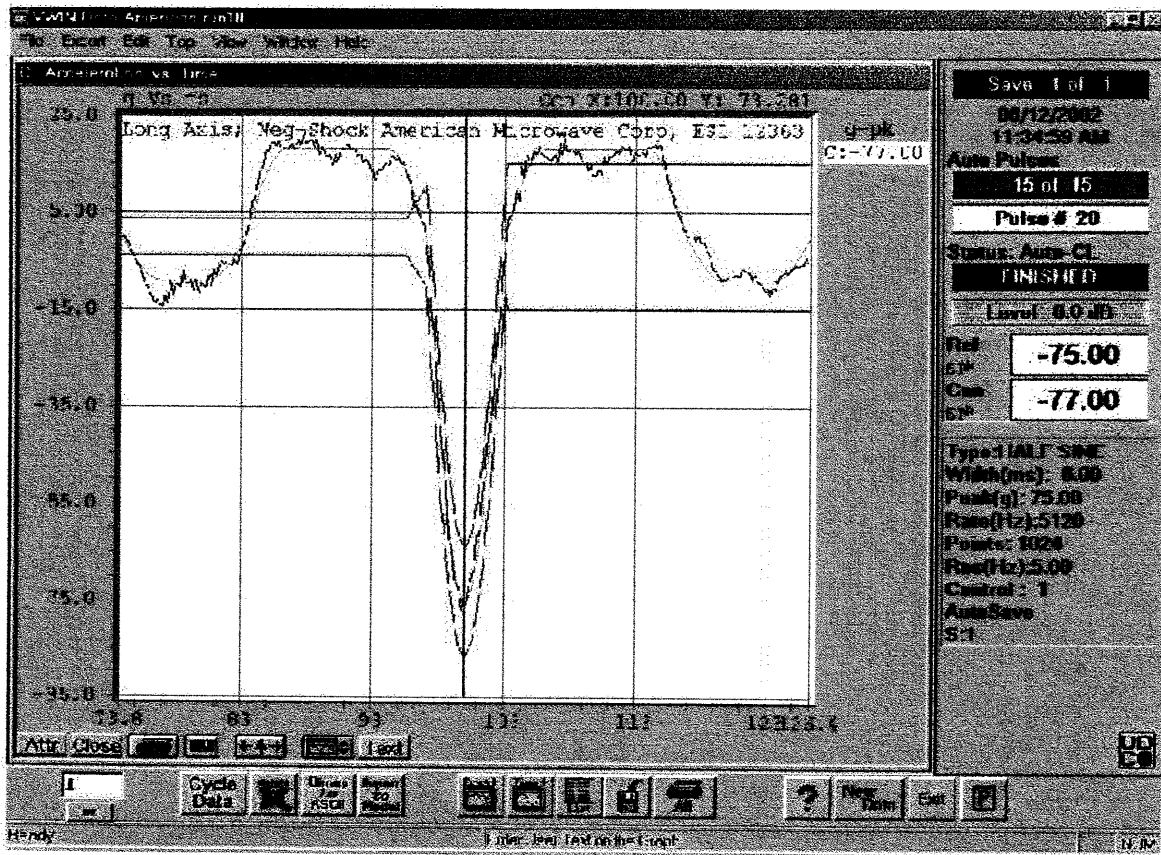


Shock Test, Positive Pulse: Longitudinal Axis, Control Signal



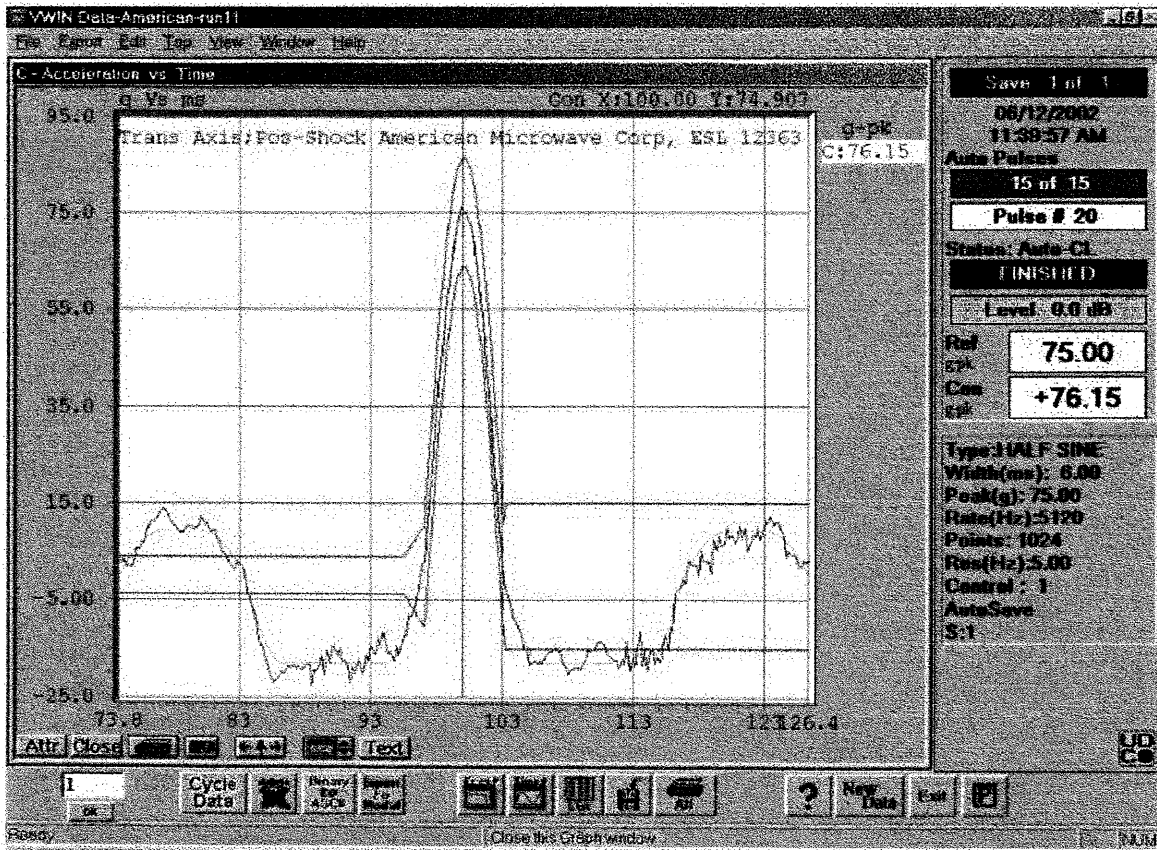


Shock Test, Negative Pulse: Longitudinal Axis, Control Signal



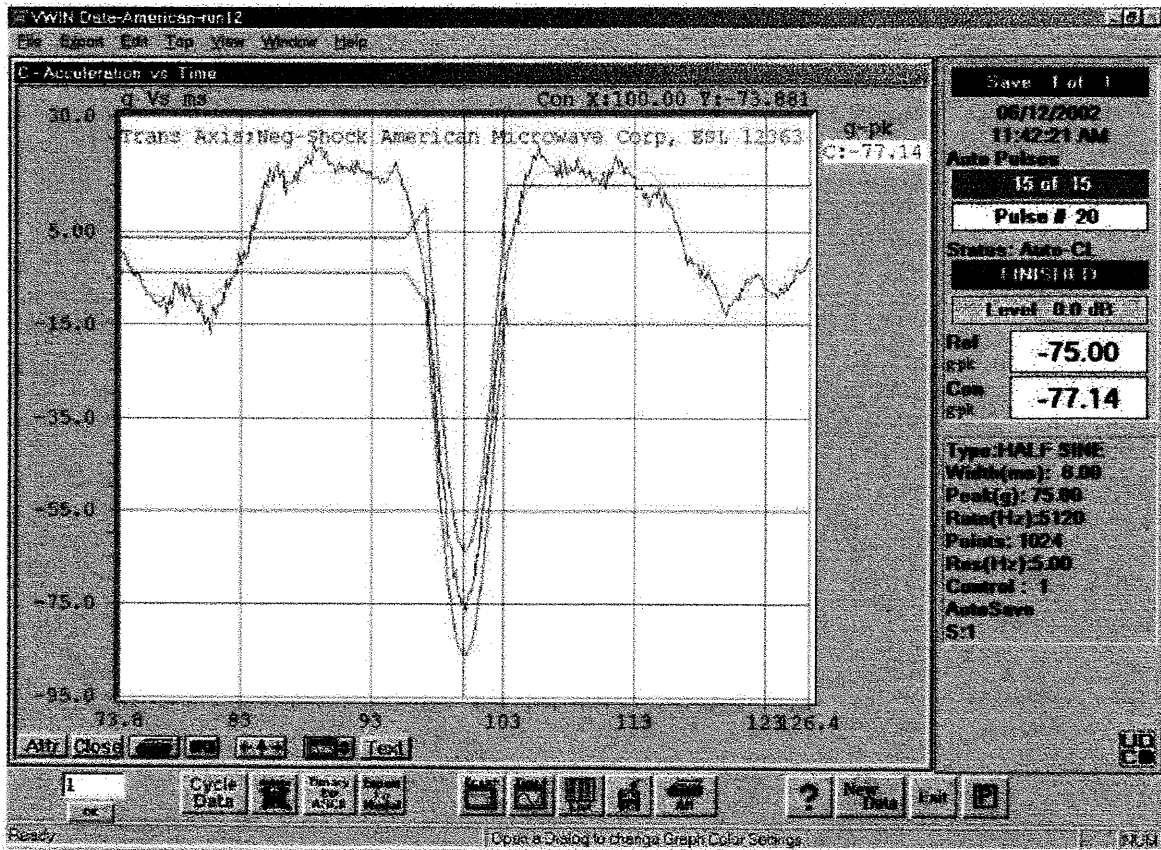


Shock Test, Positive Pulse: Transverse Axis, Control Signal





Shock Test, Negative Pulse: Transverse Axis, Control Signal





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## **IV. Test Equipment**

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Test equipment utilized during testing was maintained in a current state of calibration per the requirements of MIL-STD-45662A and ISO 10012-1:1992(E).

MET ID #	EQUIPMENT	MANUFACTURER	MODEL #	LAST CAL	CAL DUE
2T5448	VIBRATION CONTROLLER	UNIDYN CORP	DSP-400 8CH/16BIT	05-DEC-01	05-DEC-02
2T5486	ACCELEROMETER	PCB	J353B32	06-AUG-01	06-AUG-02
2T5605	CURRENT SOURCE 12 CHANNEL LINE POWERED	DYTRAN	4121	17-APR-02	17-APR-03
2T5617	SALT FOG CHAMBER/CONTROLLER	SINGLETON CORP/THERMOLOGIC	DINFJ32H1-N-N-23	27-MAR-02	27-MAR-03
2T5650	ACCELEROMETER	UNHOLTZ DICKIE	10B10T	14-DEC-01	14-DEC-02
2T5663	UD SHAKER SYSTEM	UNIHOLTZ DICKIE	R24C	FUNCTIONAL	FUNCTIONAL
3T6381	TEMP/HUMIDITY CHAMBER	THERMOTRON	SM-3.5, 5S or SM5.5C	20-AUG-01	20-AUG-02
3T6386	CONTROLLER; PROGRAMMABLE	THERMOTRON	2800	20-AUG-01	20-AUG-02
3T6387	THERM-ALARM	THERMOTRON	FOR SM3.5S	20-AUG-01	20-AUG-02
3T6456	TEMPERATURE RECORDER	PENNY & GILES	D53087/C6S00PAO	28-DEC-01	28-DEC-02



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## **V. Appendix (Sand and Dust Test Report)**

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**ENGINEERING AND TEST DIVISION**

CHURCH STREET, BOHEMIA, LONG ISLAND, NEW YORK 11716 (631) 589-6300

TEST REPORT NO.: DTB04R02-0479

DAYTON T. BROWN, INC. JOB NO.: 402731-00-000

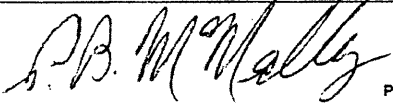
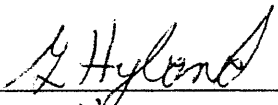


**CUSTOMER:** MET LABORATORIES, INC.  
914 W. PATAPSCO AVENUE  
BALTIMORE, MD 21230

**SUBJECT:** DUST TEST PROGRAM CONDUCTED ON TWO BOEING TWO-WAY SWITCHES  
PART NO. SSMH-810-2DR-IND-SMC, SERIAL NOS. 30 AND 31

**PURCHASE ORDER NO.:** 18661

**ATTENTION:** MR. P. LAYMAN

**THIS REPORT CONTAINS:** FIVE PAGES AND TWO ENCLOSURES

<b>PREPARED BY</b>	 P. B. McNALLY
<b>TEST ENGINEER</b>	 G. HYLAND
<b>OPERATIONS MANAGER</b>	 T. ZIMOULIS
<b>QUALITY DEPARTMENT</b>	
<b>DATE</b>	13 JUNE 2002

THE DATA CONTAINED IN THIS REPORT WAS OBTAINED BY TESTING IN COMPLIANCE WITH THE APPLICABLE TEST SPECIFICATION AS NOTED





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## 1.0 ABSTRACT

This test report details the results of the dust test program conducted on two Boeing Two-Way Switches, Part No. SSMH-810-2DR-IND-SMC, Serial Nos. 30 and 31 under reference (a) to the requirements of reference (c).

Results of the test are detailed in the following text.

The test items were non-operating during testing.

Test data pertinent to this program will remain on file at Dayton T. Brown, Inc. for 90 days.

The test results recorded in this report relate only to those items tested.

This test report shall not be reproduced, except in full, without the written approval of Dayton T. Brown, Inc.



## 2.0 REFERENCES

- (a) Customer Purchase Order No.: 18661
- (b) Dayton T. Brown, Inc. Job No.: 402731-00-000
- (c) Test Specifications: MET Laboratories, Inc. RFQ and E-Mail dated 5 June 2002



### 3.0 ADMINISTRATIVE INFORMATION

Customer: MET Laboratories, Inc.  
914 W. Patapsco Avenue  
Baltimore, MD 21230

Test Item Description: Boeing Two-Way Switches

Quantity Received: Two

Part No.: SMSH-810-2DR-IND-SMC

Serial Nos.: 30 and 31

Date Received: 4 June 2002

Program Test Date: 5 June 2002

Date Shipped: 6 June 2002



#### 4.0 TEST PROGRAM OUTLINE

Test	Test Item Description	Results
Dust	Two Boeing Two-Way Switches	No anomalies noted.



Enclosure 1

Dust Test and Results



## TEST REQUIREMENT

The dust test shall be conducted in accordance with reference (c).

## TEST RESULTS

A pretest visual inspection of the test items revealed no anomalies.

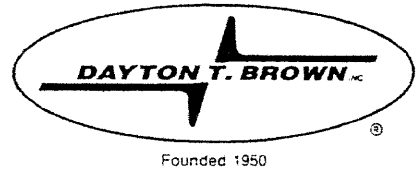
All testing was performed in accordance with the referenced specification.

Refer to the following page of this enclosure for the test data.

The test items completed all phases of testing.

A post-test visual inspection of the test items revealed no anomalies due to testing.





MET LABS  
DUST TEST DATA  
J/N 402731-01-000

REQUIRED CONDITIONS:

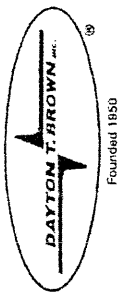
Temperature: 73°F ± 3.6°F (23°C ± 2.0°C)  
 Relative Humidity: Less than 22%  
 Air Velocity: 1750 ± 250 ft/min  
 Dust Density: 0.3 ± 0.2 gms/ft<sup>3</sup>  
 Test Duration: 30 min

ACTUAL CONDITIONS:

TIME	TEST TEMP °F	REL HUMID %	AIR VEL FT/MIN	DUST DEN GRMS/FT <sup>3</sup>	REMARKS
1700	74.2	16.5	1783	0.190	START 30MIN Run
1730	73.0	17.1	1802	0.195	END OF RUN

DATE: 5 Jun 02  
 TECH: W. Huey  
 ENGR: PM<sup>c</sup>

Test equipment utilized for the program reported herein was within its assigned Interval of calibration. Details are on file at Dayton T. Brown, Inc. and will be made available upon request.



TEST: DUST

<u>ITEM</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>DTB NO.</u>	<u>ACCURACY</u>	<u>CAL DUE DATE</u>
Sand & Dust Chamber 13 Ft Dust	Tenney	4 Ft x 13 Ft	-	-	-
Temperature Controller	Honeywell	UDC5000	25-70	±1°F	8/25/2002
Humidity Controller	Honeywell	UDC5000	25-44	±0.05% FS	8/25/2002
Humidity Transmitter	Rotronic	HT255D	31-15	±2% RH	1/5/2003
Air Velocity Meter	Kurz	455-08	43-63	±2% of RDG + 0.5% FS	3/2/2003
Air Velocity Meter	Kurz	443	43-2	2% FS	-
Chart Recorder	Honeywell	DR4500	12-2	Data	8/4/2002

02-2226

TESTED FOR MET LABORATORIES, INC.  
ITEM: BOEING TWO-WAY SWITCHES

JOB NO. 402751-00-000  
DTB04R02-0479

SETUP FOR THE DUST TEST  
FILE NO. 02-2226  
ENCLOSURE 1

S/N 0 AND 11  
P/N 2MSH-316-2DR-ND-SMC

3 JUNE 2002  
PHOTO 1



Founded 1956



Enclosure 2

A2LA Scope of Accreditation



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

DAYTON T. BROWN, INC.
Church Street
Bohemia, NY 11716-5031

Charles Gorakowski - Phone: 531 244 6315 / 1 800 TEST456 - Fax: 531 589 4046
Email: 531.244.6315@dtb.com / www.daytonbrown.com

MECHANICAL

Valid To: December 31, 2002 Certificate Number: 0767403

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

- Altitude - 14.1 meters (-282 feet to 122,000 meters); 400,000 feet or 1x10^9 TORR
Chamber volumes up to 745 cubic ft
Burn Test - High Pressure Air to 5000psi
Coating/Plating Thickness
Combined Environments - Vibration and Temperature
Dimensional - CMM - X-1200 mic (20.001mm); Y-100mm (20.001mm); Z-600mm (20.001mm)
Durability
Diameter Hardness
Dye Penetrant
Explosive Environment - Chamber Volume 75 cubic ft, Altitudes up to 50,000ft
Fungus Test Area Size 36" x 36"
Hardness
Humidity - Relative humidity range from desert (2%) to a tropical forest (100%)
Chamber volumes up to 3500 cubic ft
Magnetic Particle Inspection
Material Cleanliness
Metallographic Analysis
Microbarium
Salt Fog Spray Chamber up to a Chamber volume of 2500 cubic ft
Sand & Dust Chamber volumes up to 200 cubic ft; velocities up to 57000/min
Seal Belt Assembly Testing
Thermal Shock
Sun/Solar Radiation
Surface Temperature Profilerometer
Temperature - Chambers from 64 cubic ft to 1500 cubic ft; Ambient temperatures from -100°F to +150°F
Tensile Testing
Water Immersion
Wind & Rain

(A2LA Certificate No. 767 03) 01/12/01

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5301 Buckeystown Pike, Suite 350 - Frederick, MD 21734-8373 - Phone: 301-644-3248 - Fax: 301-662-2974

Using the following specifications directly related to the above listed testing technologies:

Table with 2 columns: Test Technology and Test Method(s). Lists various testing methods like MIL-STD-883C, MIL-STD-883D, MIL-STD-883E, MIL-STD-883F, MIL-STD-883G, MIL-STD-883H, MIL-STD-883I, MIL-STD-883J, MIL-STD-883K, MIL-STD-883L, MIL-STD-883M, MIL-STD-883N, MIL-STD-883O, MIL-STD-883P, MIL-STD-883Q, MIL-STD-883R, MIL-STD-883S, MIL-STD-883T, MIL-STD-883U, MIL-STD-883V, MIL-STD-883W, MIL-STD-883X, MIL-STD-883Y, MIL-STD-883Z, MIL-STD-883AA, MIL-STD-883AB, MIL-STD-883AC, MIL-STD-883AD, MIL-STD-883AE, MIL-STD-883AF, MIL-STD-883AG, MIL-STD-883AH, MIL-STD-883AI, MIL-STD-883AJ, MIL-STD-883AK, MIL-STD-883AL, MIL-STD-883AM, MIL-STD-883AN, MIL-STD-883AO, MIL-STD-883AP, MIL-STD-883AQ, MIL-STD-883AR, MIL-STD-883AS, MIL-STD-883AT, MIL-STD-883AU, MIL-STD-883AV, MIL-STD-883AW, MIL-STD-883AX, MIL-STD-883AY, MIL-STD-883AZ, MIL-STD-883BA, MIL-STD-883BB, MIL-STD-883BC, MIL-STD-883BD, MIL-STD-883BE, MIL-STD-883BF, MIL-STD-883BG, MIL-STD-883BH, MIL-STD-883BI, MIL-STD-883BJ, MIL-STD-883BK, MIL-STD-883BL, MIL-STD-883BM, MIL-STD-883BN, MIL-STD-883BO, MIL-STD-883BP, MIL-STD-883BQ, MIL-STD-883BR, MIL-STD-883BS, MIL-STD-883BT, MIL-STD-883BU, MIL-STD-883BV, MIL-STD-883BW, MIL-STD-883BX, MIL-STD-883BY, MIL-STD-883BZ, MIL-STD-883CA, MIL-STD-883CB, MIL-STD-883CC, MIL-STD-883CD, MIL-STD-883CE, MIL-STD-883CF, MIL-STD-883CG, MIL-STD-883CH, MIL-STD-883CI, MIL-STD-883CJ, MIL-STD-883CK, MIL-STD-883CL, MIL-STD-883CM, MIL-STD-883CN, MIL-STD-883CO, MIL-STD-883CP, MIL-STD-883CQ, MIL-STD-883CR, MIL-STD-883CS, MIL-STD-883CT, MIL-STD-883CU, MIL-STD-883CV, MIL-STD-883CW, MIL-STD-883CX, MIL-STD-883CY, MIL-STD-883CZ, MIL-STD-883DA, MIL-STD-883DB, MIL-STD-883DC, MIL-STD-883DD, MIL-STD-883DE, MIL-STD-883DF, MIL-STD-883DG, MIL-STD-883DH, MIL-STD-883DI, MIL-STD-883DJ, MIL-STD-883DK, MIL-STD-883DL, MIL-STD-883DM, MIL-STD-883DN, MIL-STD-883DO, MIL-STD-883DP, MIL-STD-883DQ, MIL-STD-883DR, MIL-STD-883DS, MIL-STD-883DT, MIL-STD-883DU, MIL-STD-883DV, MIL-STD-883DW, MIL-STD-883DX, MIL-STD-883DY, MIL-STD-883DZ, MIL-STD-883EA, MIL-STD-883EB, MIL-STD-883EC, MIL-STD-883ED, MIL-STD-883EE, MIL-STD-883EF, MIL-STD-883EG, MIL-STD-883EH, MIL-STD-883EI, MIL-STD-883EJ, MIL-STD-883EK, MIL-STD-883EL, MIL-STD-883EM, MIL-STD-883EN, MIL-STD-883EO, MIL-STD-883EP, MIL-STD-883EQ, MIL-STD-883ER, MIL-STD-883ES, MIL-STD-883ET, MIL-STD-883EU, MIL-STD-883EV, MIL-STD-883EW, MIL-STD-883EX, MIL-STD-883EY, MIL-STD-883EZ, MIL-STD-883FA, MIL-STD-883FB, MIL-STD-883FC, MIL-STD-883FD, MIL-STD-883FE, MIL-STD-883FF, MIL-STD-883FG, MIL-STD-883FH, MIL-STD-883FI, MIL-STD-883FJ, MIL-STD-883FK, MIL-STD-883FL, MIL-STD-883FM, MIL-STD-883FN, MIL-STD-883FO, MIL-STD-883FP, MIL-STD-883FQ, MIL-STD-883FR, MIL-STD-883FS, MIL-STD-883FT, MIL-STD-883FU, MIL-STD-883FV, MIL-STD-883FW, MIL-STD-883FX, MIL-STD-883FY, MIL-STD-883FZ, MIL-STD-883GA, MIL-STD-883GB, MIL-STD-883GC, MIL-STD-883GD, MIL-STD-883GE, MIL-STD-883GF, MIL-STD-883GG, MIL-STD-883GH, MIL-STD-883GI, MIL-STD-883GJ, MIL-STD-883GK, MIL-STD-883GL, MIL-STD-883GM, MIL-STD-883GN, MIL-STD-883GO, MIL-STD-883GP, MIL-STD-883GQ, MIL-STD-883GR, 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MIL-STD-883TM, MIL-STD-883TN, MIL-STD-883TO, MIL-STD-883TP, MIL-STD-883TQ, MIL-STD-883TR, MIL-STD-883TS, MIL-STD-883TT, MIL-STD-883TU, MIL-STD-883TV, MIL-STD-883TW, MIL-STD-883TX, MIL-STD-883TY, MIL-STD-883TZ, MIL-STD-883UA, MIL-STD-883UB, MIL-STD-883UC, MIL-STD-883UD, MIL-STD-883UE, MIL-STD-883UF, MIL-STD-883UG, MIL-STD-883UH, MIL-STD-883UI, MIL-STD-883UJ, MIL-STD-883UK, MIL-STD-883UL, MIL-STD-883UM, MIL-STD-883UN, MIL-STD-883UO, MIL-STD-883UP, MIL-STD-883UQ, MIL-STD-883UR, MIL-STD-883US, MIL-STD-883UT, MIL-STD-883UU, MIL-STD-883UV, MIL-STD-883UW, MIL-STD-883UX, MIL-STD-883UY, MIL-STD-883UZ, MIL-STD-883VA, MIL-STD-883VB, MIL-STD-883VC, MIL-STD-883VD, MIL-STD-883VE, MIL-STD-883VF, MIL-STD-883VG, MIL-STD-883VH, MIL-STD-883VI, MIL-STD-883VJ, MIL-STD-883VK, MIL-STD-883VL, MIL-STD-883VM, MIL-STD-883VN, MIL-STD-883VO, MIL-STD-883VP, MIL-STD-883VQ, MIL-STD-883VR, MIL-STD-883VS, MIL-STD-883VT, MIL-STD-883VU, MIL-STD-883VV, MIL-STD-883VW, MIL-STD-883VX, MIL-STD-883VY, MIL-STD-883VZ, MIL-STD-883WA, MIL-STD-883WB, MIL-STD-883WC, MIL-STD-883WD, MIL-STD-883WE, MIL-STD-883WF, MIL-STD-883WG, MIL-STD-883WH, MIL-STD-883WI, MIL-STD-883WJ, MIL-STD-883WK, MIL-STD-883WL, MIL-STD-883WM, MIL-STD-883WN, MIL-STD-883WO, MIL-STD-883WP, MIL-STD-883WQ, MIL-STD-883WR, MIL-STD-883WS, MIL-STD-883WT, MIL-STD-883WU, MIL-STD-883WV, MIL-STD-883WW, MIL-STD-883WX, MIL-STD-883WY, MIL-STD-883WZ, MIL-STD-883XA, MIL-STD-883XB, MIL-STD-883XC, MIL-STD-883XD, MIL-STD-883XE, MIL-STD-883XF, MIL-STD-883XG, MIL-STD-883XH, MIL-STD-883XI, MIL-STD-883XJ, MIL-STD-883XK, MIL-STD-883XL, MIL-STD-883XM, MIL-STD-883XN, MIL-STD-883XO, MIL-STD-883XP, MIL-STD-883XQ, MIL-STD-883XR, MIL-STD-883XS, MIL-STD-883XT, MIL-STD-883XU, MIL-STD-883XV, MIL-STD-883XW, MIL-STD-883XX, MIL-STD-883XY, MIL-STD-883XZ, MIL-STD-883YA, MIL-STD-883YB, MIL-STD-883YC, MIL-STD-883YD, MIL-STD-883YE, MIL-STD-883YF, MIL-STD-883YG, MIL-STD-883YH, MIL-STD-883YI, MIL-STD-883YJ, MIL-STD-883YK, MIL-STD-883YL, MIL-STD-883YM, MIL-STD-883YN, MIL-STD-883YO, MIL-STD-883YP, MIL-STD-883YQ, MIL-STD-883YR, MIL-STD-883YS, MIL-STD-883YT, MIL-STD-883YU, MIL-STD-883YV, MIL-STD-883YW, MIL-STD-883YX, MIL-STD-883YY, MIL-STD-883YZ, MIL-STD-883ZA, MIL-STD-883ZB, MIL-STD-883ZC, MIL-STD-883ZD, MIL-STD-883ZE, MIL-STD-883ZF, MIL-STD-883ZG, MIL-STD-883ZH, MIL-STD-883ZI, MIL-STD-883ZJ, MIL-STD-883ZK, MIL-STD-883ZL, MIL-STD-883ZM, MIL-STD-883ZN, MIL-STD-883ZO, MIL-STD-883ZP, MIL-STD-883ZQ, MIL-STD-883ZR, MIL-STD-883ZS, MIL-STD-883ZT, MIL-STD-883ZU, MIL-STD-883ZV, MIL-STD-883ZW, MIL-STD-883ZX, MIL-STD-883ZY, MIL-STD-883ZZ

(A2LA Certificate No. 767 03) 01/12/01

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American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

DAYTON T. BROWN, INC.
Church Street
Bohemia, NY 11716-5031

Charles Gorakowski - Phone: 531 244 6315 / 1 800 TEST456 - Fax: 531 589 4046
Email: 531.244.6315@dtb.com / www.daytonbrown.com

ACOUSTICS & VIBRATION

Valid To: December 31, 2002 Certificate Number: 0767401

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

Vibration (Sine, Random, Sine on Random, Gunfire, Shipboard), Buzz, Squeak and Rattle, Combined Environments and Reliability (Temperature, Humidity and Vibration), Classical Shock (Half Sine, Sawtooth, Square Wave), Pyroshock, Airborne and Structure Borne Noise Measurements.

VIBRATION/SHOCK CAPABILITIES UP TO THE FOLLOWING:

Random
Force Rating 40,000 lb
Frequency Range 4 to 2000 Hertz
Maximum Level 200 gms
Displacement 2 inches Peak-to-Peak

Sinusoidal
Force Rating 40,000 lb
Frequency Range 4 to 3000 Hertz
Site Velocity Continuous Duty 125 in/sec
Site Velocity Intermittent Duty 125 in/sec
Maximum Level 200 g's
Displacement 2 inches Peak-to-Peak

Classical Shock
Force 30,000 lb
Waveforms Sine, Sawtooth, Trapezoidal
Maximum Level 600 to 2500 g's

Pyroshock
Level 5000 to 20,000 g's
Frequency Range 100 to 10,000 Hertz

Displacement 2 inches Peak-to-Peak

Airborne and Structure Borne Noise Measurements

(A2LA Certificate No. 767 01) 01/12/01

Page 1 of 2

5301 Buckeystown Pike, Suite 350 - Frederick, MD 21734-8373 - Phone: 301-644-3248 - Fax: 301-662-2974

Table with 2 columns: Testing Criteria and Specification(s). Lists various testing criteria like Airborne and Structure Borne Noise Measurement, Acceleration (Centrifuge), Buzz, Squeak and Rattle, Pyre Shock, Sound and Power, Shock Test, High Impact on Shipboard Machinery, Equipment and Systems, Reliability, Automotive, etc.

ANSI S12.35 - Precision Methods for the Determination of Sound Power Levels of Noise Sources in Anechoic and Semi-Anechoic Rooms
ANSI S12.2 - Method for the Physical Measurement of Sound
ANSI S1.35 - Sound Power Levels of Noise Sources in Anechoic and Semi-Anechoic Rooms
MIL-STD-810 (Vibration: 810C 514.2, 810D 514.1, 810E 513.4, 810F 514.5, Acoustical Noise: 810C 515.2, 810D 515.3, 810E 515.4, 810F 515.5; Gunfire Vibration, Aircraft: 810C 519.2, 810D 519.3, 810E 519.4, 810F 519.5)
Bellcore GR-63-CORE (Office Vibration 5.4.2; Transportation Vibration 5.4.2)
MIL-STD-202 201A Vibration, 202D, 203D Random Drop, 204D Vibration High frequency, 205E, 207A high-impact shock, 212A Acceleration, 213D Shock (specified pulse), 214A Random Vibration
RTCA/DO-160C (Sections 7.0 Operational Shocks and Crash Safety, 3.0 Vibration)
MIL-STD-157-1 Shipboard vibration
NAVY/MAT P-9492 Environmental Stress Screening for Navy Components

(A2LA Certificate No. 767 01) 01/12/01

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American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

DAYTON T. BROWN, INC.
Church Street
Bohemia, NY 11716-5901
Charles Gorkowski - Phone: 631 244 6315 / 1 800 TEST455 - Fax: 631 589 4046
Email: test@daytonbrown.com / www.daytonbrown.com

ELECTRICAL (AEMCLAP/EMC)

Valid To: December 31, 2002

Certificate Number: 075702

In recognition of the successful completion of the AZLA evaluation process, accreditation is granted to this laboratory to perform the following electrical/electromagnetic compatibility (EMC) and telecommunications tests:

Table with 2 columns: Test Technology and Test Method(s). Includes Capacitance, AC Capacitance, AC Loss Characteristics, Conductivity, Current (AC/DC), Impedance, Inductance, Power Factor, Resistance (D electric Constant, Insulation Resistance), Voltage (AC/DC).

EMC/EMI

Table with 2 columns: Test Technology and Test Method(s). Includes Conducted Emissions, Conducted Transient Susceptibility, Conducted Immunity, Radiated Emissions (3m & 10m Sites), Radiated Emissions, Shielded Room, Mode Stirring, Radiated Susceptibility (Immunity), Radiated Transient Susceptibility, Electrostatic Discharge (ESD), Electromagnetic Pulse (EMP), Surge Immunity, Input Power Variations, Magnetic Field Emission, Magnetic Field Susceptibility, Harmonics - Powerline & RF, RF Power Handling, Shielding Effectiveness, Electrical Fast Transient (EFT), Transmissibility, Electromagnetic Site Survey.

Automotive EMC (AEMCLAP)

Table with 2 columns: Test Technology and Test Method(s). Includes Electrostatic Discharge (ESD), Transverse Electromagnetic (TEM) Cell, Audio Frequency Conducted Immunity, Absorption Chamber, Conducted Emissions.

On the following types of materials and products:

Aerospace Components & Systems; Automotive Components & Systems; Shipboard Components & Systems; Railroad & Industrial Vehicle Components & Systems; Information Technology & Telecommunication Equipment & Systems; Electrical & Electronic Components & Systems; Medical Electronic Equipment; Military Equipment & Hardware.

(AZLA Cert. No. 075702) 07/17/01

Signature Page 1 of 2

5301 Buckeytown Pike, Suite 350 - Frederick, MD 21704-8373 - Phone: 301-644-3248 - Fax: 301-662-2974

Using the following sources of standards:

Table with 2 columns: Test Technology and Test Method(s). Includes EMC Emissions and Immunity, EMC Emissions, Harmonic Current Emissions, Voltage Fluctuation and Flicker, EMC Immunity, Electrostatic Discharge, Radiated Field Immunity, Electrical Fast Transient, Surge Immunity, Conducted Immunity, Harmonic Immunity, Magnetic Field Immunity, Voltage Dips, Interruptions and Variations, Telecom, Commercial Aviation, Military, Automotive, Safety.

(AZLA Cert. No. 075702) 07/17/01

Signature Page 2 of 2

In recognition of the successful completion of the AZLA and the Automotive EMC Laboratory Accreditation Program (AEMCLAP) evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility tests:

Table with 2 columns: Test Technology and Test Method(s). Includes Electrostatic Discharge (ESD), Absorption Chamber, Transverse Electromagnetic (TEM) Cell, Conducted Emissions, Audio Frequency Conducted Immunity.

(AZLA Cert. No. 075702) 07/17/01

Signature Page 1 of 1