

# SOUTHWEST RESEARCH INSTITUTE

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Mechanical and Materials Engineering Division  
December 5, 2003

## SUMMARY OF ENVIRONMENTAL TESTS PERFORMED

**Project Number:** 18.04481.05.101

**Company:** Panasonic Computer Solutions Company  
50 Meadowlands Pkwy  
Secaucus, NJ 07094  
Attn: Alfred Tolentino

**Equipment Tested:** Panasonic CF-29 Toughbook Computer

**Test Dates:** October 2003 – December 2003

**Notes:** *Each test item was able to boot into the Microsoft Windows® operating system following each of the tests described within this summary report. A listing of summarized tests appear in the accompanying table.*

Two test units were exposed to each test, except for drop testing (for which 26 drops were applied across 5 test units).

Functional or visual anomalies noted for the testing are listed as follows: Blinking battery lights were observed after Thermal Shock testing. Following the Dust Resistance test, slight dust intrusion was observed in the serial, USB, and LAN ports as well as the expansion bus connector and floppy drive. The computers booted properly following each test.

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**Summary<sup>+</sup> of Environmental Tests Performed on the Panasonic CF-29**

| Test Description  | Test Parameters  | MIL-STD-810F Reference   | Pass/Fail* |
|-------------------|--|--|------------|
| Drop              | 36" drop height onto 2" of plywood, 26 drops total   | Method 516.5, Procedure IV (Transit Drop Test)   | Pass       |
| Vibration         | Non-Operational (from Figure 514.5C-17 of MIL-STD-810F):<br>0.04 g <sup>2</sup> /Hz at 20-1000 Hz, -6 dB/Octave at 1000-2000 Hz, 1 hour/axis duration<br><br>Operational (tailored to in service conditions as allowed in MIL-STD-810F)                            | Method 514.5, Procedure I, Category 24 (Minimum Integrity Test) for the non-operational condition and in-service environment for operational condition | Pass       |
| Water Resistance  | 15 minutes of exposure to dripping water   | Method 506.4, Procedure III (Drip)   | Pass       |
| Dust Resistance   | Operating temperature of 140°F and silica flour with particle sizes as defined by MIL-STD-810F   | Method 510.4, Procedure I (Dust)   | Pass       |
| Altitude          | 15,000 feet (the highest equivalent altitude given within MIL-STD-810F for cargo pressures of military aircraft) and two hours duration for both operation and storage conditions  | Method 500.4, Procedures I (Storage) and II (Operation)  | Pass       |
| High Temperature  | Storage temperature = 160°F<br>Cyclic temperature exposures (Basic Hot Induced Conditions) were used for High Temperature Storage Test.<br>Operation temperature = 140°F<br>Constant temperature exposures were used for High Temperature Operation Test           | Method 501.4, Procedures I (Storage) and II (Operation)  | Pass       |
| Low Temperature   | Operation temperature = -20°F,<br>Storage temperature = -60°F  | Method 502.4, Procedures I (Storage) and II (Operation)  | Pass       |
| Temperature Shock | High non-operating temperature = 200°F,<br>Low non-operating temperature = -60°F,<br>Three cycles (high to low = one cycle)  | Method 503.4, Procedure I (Steady State)   | Pass       |
| Humidity          | The temperature cycled between 68°F and 140°F with the relative humidity maintained at 95%. Each cycle is 48 hours and the entire test consisted of 5 cycles. The computers were non-operational during the test. A functional check was performed every 24 hours. | Method 507.4 (Aggravated)  | Pass       |

\* "Pass" indicates that the computer successfully booted Microsoft Windows<sup>®</sup> following each test