

True Ruggedness by Design

- vs. just ruggedized

Many commercial board manufacturers claim that they offer “ruggedized” products which gives the impression of durability and reliability under tough conditions. The term “ruggedized,” however, often refers to desktop-grade designs which are screened at high temperatures with high yield fallout.

ADLINK believes that ruggedness should be inherent in the design. Ampro by ADLINK™ products are subjected to extensive voltage and temperature margin tests along with shock and vibration testing and HALT testing during the new product development process.

ADLINK HALT Test Program

In order to maximize product reliability and durability, ADLINK subjects Ampro by ADLINK™ products to a comprehensive Highly Accelerated Life Test (HALT) program during the product development process.

The HALT process consists of progressively increased extremes of temperatures (both high and low), rapid thermal transitions, six-axis vibration, and finally, combined temperature and vibration stress. At each stress dwell extreme, power to the unit is margined at ± 5 percent. During each test, stress is progressively increased while the unit is operating in a continuous functional test loop that exercises key subsystems such as the CPU, I/O ports, disk controllers and video. If a failure is detected, the failure is evaluated and immediate fixes are made and the test is continued until destruct limits are reached. Failures and the physical damage found at the destruct limits provide data which is used to improve the ruggedness of the product design.

Random Vibration

Ampro by ADLINK™ products are vibration-tested in accordance with the specifications of MIL-STD-202F, Method 214A, Table 214-1, Condition D for Random Vibration for five minutes on each axis. This equates to a RMS value of 11.95G of random vibration between 100Hz and 1000Hz along each axis. The units under test are operational during the tests, performing functional diagnostics on all hardware subsystems. The test routine runs continuously to verify functionality of the system and catch any intermittent failures. External peripherals (Ethernet Server, hard drive, etc.) are mounted adjacent to the vibration table and are not subjected to the test conditions.

Mechanical Shock

Mechanical Shock testing is performed on Ampro by ADLINK™ products per MIL-STD-202F, Method 213B, Table 213-1, Condition A. This specifies three 50G shocks (peak value, 11ms duration, half-sine waveform) along each of the three axes. The unit under test is mounted on a shock machine and subjected to shock pulses of 50g-peak value, 11 ms duration with half-sine waveforms. Three shocks in each direction, for a total of 18 shocks, are applied along the three mutually perpendicular axes. After shocks in two directions (+ and -) along each axis, the products are tested for functionality.

Voltage and Temperature Margin Test Suite

During the margin test suite, the Unit Under Test (UUT) is subjected to temperatures well outside the “Extended” (-40° to $+85^{\circ}\text{C}$) operating temperature range offered for Ampro by ADLINK™ products. The UUT is simultaneously subjected to minimum and maximum rated voltages ($\pm 5\%$). This process verifies that Ampro by ADLINK™ products are functional and stable over combined extremes of both temperature and voltage. It also ensures wide design margins resulting in long-term reliability under all specified operating conditions.

Extended Temperature Testing of Boards

- Your assurance that Ampro by ADLINK™ products will function in extreme temperatures

ADLINK provides optional Extended Temperature Testing to our customers for Ampro by ADLINK™ products. By testing each unit in production, the Extended Temperature Test verifies that all boards will operate at temperatures from -40° to $+85^{\circ}\text{C}$ or other ranges. ADLINK uses a leading-edge custom-designed modular card cage system in a state-of-the-art environmental chamber to test Ampro by ADLINK™ products over the entire extended temperature range. This leading edge design is fully automated and utilizes custom-designed test software.

100% ADLINK Quality

Each Ampro by ADLINK™ product is fully functionally tested during the entire range of extended temperature operation. Using the custom-designed application user interface, the board's test results are scanned into a database.

This data is used for internal quality assurance audits. Customers who require this level of detail may request summarized test results.

All boards are ramped to the specific temperature profile and soaked before power is applied. This ensures that the BIOS properly initializes all hardware and the boards are ready for diagnostic testing. This process distinguishes ADLINK from other companies that rely on a single power cycle while testing at extended temperatures. ADLINK identifies each board that passes testing with a label that indicates the boards fulfill ADLINK's stringent quality standards.



Extended Temperature Testing verifies that all boards will operate and function at temperatures from -40° to $+85^{\circ}\text{C}$ or other ranges.

Conformal Coating Protects Your Computers in the Harshest Conditions

- Prevent short circuits, corrosion, dendritic growth and electromigration

Embedded single board computers are often deployed in harsh environments. Industrial, military, naval and airborne applications often expose boards to corrosive conditions including humidity, salt spray, fungus and other contaminants. Conformal coating, a protective material applied over electronic circuitry, can prevent short circuits, corrosion, dendritic growth and electromigration of metals between conductors.

Conformal coating from ADLINK is applied by spraying, dipping or flow coating the circuit board assembly. This coating is typically three mils (0.003") thick. ADLINK generally uses HumiSeal 1B31 Acrylic coating, although epoxy, urethane, paraxyllylene and silicone based coatings are also available upon request. Acrylic coatings are fast drying and offer high moisture resistance, excellent flexibility and superior dielectric properties.

The coating is also easy to repair, making them extremely useful in a wide variety of high performance situations. HumiSeal 1B31 contains a UV safety tracer for ease of inspection under a blacklight.

Enhanced Reliability for Over 20 Years.

Based on Ampro's proven heritage, ADLINK's conformal coating process has provided enhanced reliability and corrosion protection for over 20 years.

7-Step Conformal Coating Process

1 Preparation

Separable parts are removed and cleaned.

2 Surface Treatment

Low frequency plasma gas is used to etch the solder mask and improve adhesion.

3 Masking

All interface mating surfaces, mounting holes, fans and heatsinks are masked based on ADLINK's detailed specifications.

4 Spray Coating

Using state-of-the-art spray guns and booths, boards and thickness coupons are coated.

5 Curing

Boards are cured per manufacturers' specifications. Some cures are thermal, with temperatures not to exceed 150°F (65°C).

6 Inspection

Coating thickness is verified on the coupons and board coverage is verified using a blacklight.

7 Test

Previously removed parts are re-installed and the boards are fully tested.