

ADVANTECH RUGGEDIZED SOLUTIONS

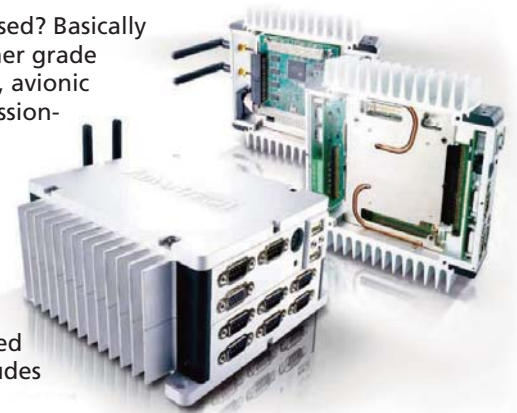


Why Advantech for Ruggedized Projects?

- Extensive experience in ruggedized markets
- Industrial grade hardware from board to system level
- CPU/memory soldering and component glueing services
- Extended temperature testing and thermal design
- Global logistics and RMA services with local support
- Extensive customization capability from board to system level
- IEC60068 and MIL-STD-810F testing
- Conformal Coating (both acrylic resin and silicon)
- Thermal simulation and airflow design
- IP65/NEMA4 level sealing
- Longevity and superior warranty/service options
- Multi-national company with worldwide presence

Advantech Ruggedized Products And Solutions For Extreme Environments

Where are ruggedized products and solutions used? Basically anywhere where standard commercial or consumer grade products simply won't do. That includes military, avionic and astronautic applications; transportation; mission-critical and industrial control systems; outdoor solutions; and any other application in demanding and/or hazardous environments.



Creating ruggedized solutions requires a combination of good design, good components, good engineering, and a lot of extra testing. Advantech's approach to embedded design for extreme environment operation includes wide temperature range testing and solutions, sophisticated cooling consulting services, extensive shock and vibration proofing, and state-of-the-art conformal coating services.

Design With Industrial Grade Components

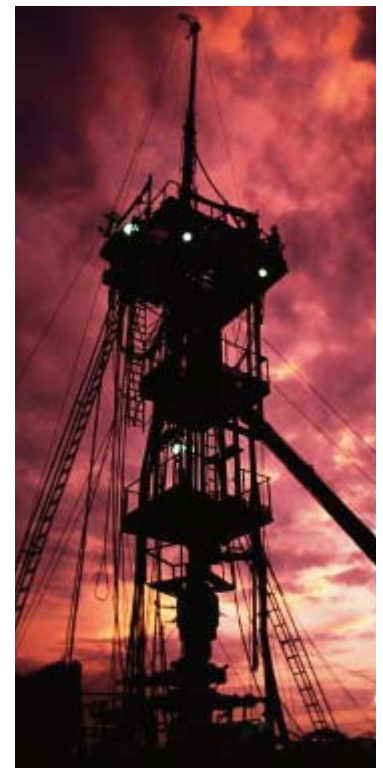
Any rugged system or solution design starts with industrial grade components that must meet stringent requirements in terms of vendor selection, extended temperature operation, ruggedness specifications, and reliability and durability. This applies to all key functions and components, including CPUs, clock generators, chipsets, I/O subsystems, power supply, etc.

Compliance Testing and Certification

Since they are often used in mission-critical applications in remote places, industrial grade products cannot and must not fail, and their maintenance requirements must be minimal and predictable. This requires targeted design, highest quality components, and extensive testing. It often also requires compliance with military or civilian standards as well as regulatory requirements.

Advantech's Ruggedized Products, Services and Solutions

Advantech offers a wide variety of consulting services, components, and products from board to system level. These include state-of-the-art design and testing services, industrial PCs, vehicle mounted computers equipped with the latest computing cores and rugged enclosures, portable computing solutions such as industrial tablet PCs and ruggedized handheld terminals, as well as a very wide range of single board computers in all the common form factors. Advantech ruggedized hardware is available for any project or purpose. Advantech software, APIs and utilities simplify and optimize system integration. And Advantech services ties it all together with testing, design, analysis and manufacturing services.



Services For Ruggedized Solutions

Building ruggedized solutions for tough real-world applications requires a combination of design, engineering and extensive testing. The Advantech Embedded Design for Extreme Environment approach includes a focus on wide temperature range solutions, cooling consulting services, solutions for vibration-prone environment, and conformal coating services.

Wide Temperature Testing

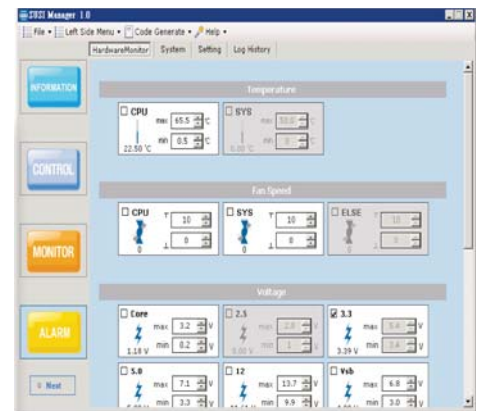
Most rugged solutions need extreme temperature resistance as well as the ability to operate within a wide range of temperatures. On the hardware side, this requires special materials and design, special cooling considerations, and extensive temperature testing. On the software side, there must be sensors and systems to measure and control hardware temperatures as well as implement thermal management and power saving methods.

Advantech Phoenix Operation testing evaluates performance of components or systems under different environmental conditions. This includes a variety of dynamic temperature burn-in cycles over extended periods of time. Depending on the requirements, designs may have to pass either Phoenix Gold Package (-20 to 80 degrees Celsius) or Platinum Package (-40 to 85 degrees Celsius) testing without any degradation of performance or loss of function. This stringent testing ensures reliable performance in mission-critical applications under extreme and rapidly changing temperatures.

All Phoenix Operation testing is done in accordance with pertaining IEC 60028-2 testing procedures that state test dwell times, temperature slopes, thermal cycles, test times and numerous other variables. Tests include both design validations and manufacturing validations, and they are performed in Advantech's own wide temperature cycle chambers that can handle different temperature extremes.

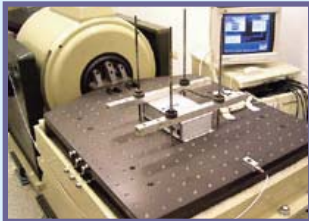
Thermal protection and performance, however, is not just a hardware issue. It also requires carefully designed and tested software support, especially in modern operating systems that no longer provide direct hardware access.

To address these software issues, Advantech offers intelligent software API middleware that allows users to directly monitor and control digital I/O, I2C, CPU stepping speed, watchdog timers, smart fans and access hardware monitoring sensors. This can help reduce heat and power consumption in extreme environments and also allows setup of warning mechanisms. Depending on customer requirements, software-based thermal protection may also include customized power event triggers, display adjustments, special CPU throttling, warnings, and critical temperature settings and actions, and other measures.



Real-time hardware monitoring provides two benefits. One is the generation of warnings or shutdowns if critical temperatures are reached. A second is real-time information on temperature, fans, voltage and other variables at all time. These systems may use watchdog timers (WDTs) that perform specific operations after a certain period of time if something goes wrong with the system. Watchdog timers may be programmed, for example, to restart the system after a predetermined time interval when an application or system hangs or otherwise fails to respond.

Our hardware monitoring APIs may be viewed as "system health supervisor" that allow developers to continuously monitor system functions and develop customized systems. The intelligent software API allows for very precise settings of numerous variables. The system can also keep logs for later inspection and it can be programmed to automatically generate voice alerts or email warnings.



Services For Ruggedized Solutions

Cooling and Thermal Design

Being able to handle extreme temperatures and temperature changes requires effective cooling. A seemingly modest 10-20 degree increase in component temperature can cut mean time between failure in half! It is therefore essential to make certain that component temperatures never exceed design specs even at full system loading. Advantech offers a variety of cooling consulting services that include thermal simulation, feasibility studies, airflow design, and heat sink design. This may include generating PCBA circuit board temperature maps, air speed distribution diagrams, and overall system temperature maps. These thermal simulations allow testing and optimizing of design decisions long before prototypes.

Advantech's thermal engineering teams use complex FloTHERM 3D computational fluid dynamics software to model and predict airflow and heat transfer in and around electronics equipment, including the combined effects of conduction, convection and radiation. Feasibility studies consider thermal specifications, reliability issues, environmental limits, as well as assembly and cost considerations. Using FloTHERM, we then optimize parts placement, recommend fan and heatsink solutions, suggest thermal interface materials, air flow, as well as chassis design and vent locations.

Rugged systems often have stringent sealing requirements that determine fan-based or fanless solutions. This may impact component and processor selection as well as the type of active or passive heatsink solution. Modeling allows to quickly locate components that may exceed thermal specifications so that they can either be replaced or arranged in different ways. Thermal simulation may, for example, result in relocating hot components such as a hard disk or a PSU, adding system fans, modifying vents and optimizing air flow.

Vibration and Shock Testing and Design

Most rugged systems and components are subjected to constant or periodic vibration. Reliable operation in a high-vibration environment requires vibration testing and special measures to counteract the anticipated impact of vibration.

Advantech performs vibration testing in accordance with IEC60068-2-64 testing procedures that specify test PSD, frequency, axis, test curves and test time. Testing is performed on our own inhouse vibration simulator equipment that can perform vibration tests for the X/Y as well as the Z-axis. Advantech also performs bump tests up to specific G-values in accordance with IEC60068-2-29 procedures on specially designed equipment.

Vibration and shock resistance requires special measures that may include soldering CPU and memory directly onto boards, glueing DRAM to securely hold it in place, using locked connectors, or applying similar measures. Designing for vibration and shock may also affect the selection of mass storage media and shock-proofing of components such as hard disks and sensitive peripheral modules.

PCB Value-Added Services: Conformal Coating

Conformal coating relates to applying coating materials to electronic circuits in order to protect them against failure resulting from moisture, temperature extremes, mold, friction, dust or chemicals. In contrast to other method of coating, conformal coating produces a uniform, repeatable layer of protection. Advantech offers automated conformal coating services using Asymtek C-740 Conformal Coater equipment for cost-effective selective application of conformal coating materials that virtually eliminates extensive masking and rework and maximizes throughput. Using acrylic resin or silicon (superior to epoxy for flexibility, and superior to urethane for repairs), we follow IPC-610D regulations to generate consistent, adjustable coating thickness. Advantech coating services generates Conformal Coating SOPs and our top-of-the-line equipment allows for very precise masking of components that must, and must not, be coated.

ADVANTECH RUGGEDIZED SERVICES

- ✓ Thermal simulation
- ✓ Feasibility studies
- ✓ Airflow design
- ✓ Heat sink design
- ✓ PCB temperature maps
- ✓ Overall system temp maps
- ✓ FloTHERM 3D modeling
- ✓ Optimized parts placement
- ✓ Quiet/silent operation
- ✓ Optimal vent locations
- ✓ Thermal interface materials
- ✓ Vibration testing
- ✓ Shock/drop testing
- ✓ CPU/memory soldering
- ✓ Component glueing
- ✓ Shock-proofing
- ✓ Moisture/dust sealing
- ✓ Conformal coating
- ✓ MIL-SPEC testing



ADVANTECH RUGGEDIZED EXAMPLES

Application Examples

A systems integrator needed to create a high voltage power line activity monitoring solution that would reliably alert the central office in case of an incident or failure. It had to be capable of handling harsh environmental conditions 24/7 with zero failure and minimal maintenance. The solution consisted of Advantech ruggedized PCM-3353Z Single Board Computers and PCM-3910Z Power Modules, both able to operate in a -20 to 80 degree Celsius temperature range, and the customer's proprietary chassis and GPS module.

Unmanned Aerial Vehicles (UAVs) represent an operating environment where weight, space and power are constrained and environmental conditions can be extreme. Temperature in an equipment bay can range from 70°C before takeoff down to -40°C at 10,000 foot altitude. Shock and vibration can also be extreme. The client used Advantech PC/104 CPU and peripheral modules that met all required specifications.



For more information:

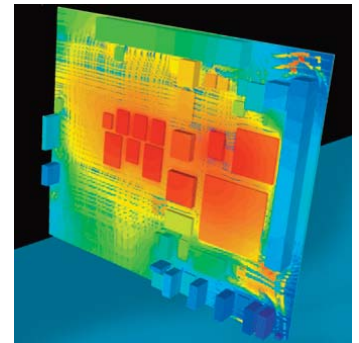
www.advantech.com
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Advantech Rugged Systems and Components

In addition to its design, testing and other rugged systems consulting services, Advantech offers a wide range of ruggedized boards, systems and peripherals for solutions that require extended operating temperature range, vibration and shock resistance, water/humidity/dust resistance, unregulated power operation, or any combination thereof.

Extended Temperature

Among Phoenix Platinum rated (-40 to 85°C) products, Advantech offers the PCM-4380 and PCM-4381 EPIC SBCs, the PCM-9342 and PCM-9375 3.5-inch SBCs, the PCM-3342, PCM-3353, PCM-4153 and PCM-3355 PC/104 computers, and the SOM-4481 and SOM-4486 ETX-standard COM-Express modules. For somewhat less demanding temperature applications, there are the Phoenix Gold rated (-20 to 80°C) PCM-4386, PCM-9584 and PCM-9588 5.25-inch/EPIC boards, two new 3.5-inch SBCs (the PCM-9388 and the Atom-based PCM-9361), the PCM-3380 PC/104 board, and the SOM-4455 ETX module.



In addition, the rugged ARK-4000 Series of PC/104-based embedded box computers, available in modular, space-efficient aluminum enclosures, includes industrial grade components that have passed strict testing and quality assurance and feature extreme temperature resistance. The ARK-1000 Series includes rugged, fanless, ultra-compact embedded box IPCs that also feature an extended operating temperature range and can handle a wide range of unregulated power.

Vibration and Shock Resistant

An example of products specifically designed to withstand shock and vibration is Advantech's TREK Series of vehicle mounted systems. These are industrial grade computing platform solutions for vehicles such as forklifts, trucks, trailers, tractors, taxis, and cranes. Their rugged enclosures have no ventilation holes, ensuring that the front and back panels can withstand dust and water penetration.

Moisture/Water/Humidity/Dust/Corrosion/Salt Protection

Systems and components that are exposed to the elements require special protection, both inside and out. Advantech's high quality conformal coating can protect electronics and boards whereas ruggedized enclosures, sealed ports, and special surface treatments provide exterior protection.

Examples are, in addition to the TREK models, the MARS-3100R and 3100S rugged tablet PCs with 10.4-inch touchscreens/digitizers and impressive environmental test specifications for dust and water sealing, humidity, drops, vibration and general suitability for day-to-day work in tough and punishing environments.

