

Ruggedized Telecom Infrastructure Application Note: Harsh Environment Wide Temperature Ethernet Hardware

RUGGEDIZED TELECOM INFRASTRUCTURE APPLICATION NOTE: HARSH ENVIRONMENT WIDE TEMPERATURE ETHERNET HARDWARE

EXECUTIVE SUMMARY

This application note provides a comprehensive technical overview of the next-generation Harsh Environment Wide Temperature Ethernet Hardware platform, engineered specifically for mission-critical deployments in unmanaged and extreme climatic conditions. This series of industrial-grade switches and routers transcends traditional commercial equipment limitations, delivering carrier-class performance, reliability, and serviceability across a broad operational temperature range of -40°C to $+75^{\circ}\text{C}$ (-40°F to $+167^{\circ}\text{F}$). Designed for the edge of the network, this hardware ensures uninterrupted data flow in transportation corridors, energy sector facilities, military installations, and smart city infrastructure, where environmental stress is a constant operational factor.



ARCHITECTURE & CHASSIS DESIGN

The foundation of this platform's resilience is its advanced thermal and mechanical engineering. The chassis is constructed from a ruggedized, corrosion-resistant aluminum alloy with a specialized conformal coating applied to the internal printed circuit boards (PCBs) to protect against moisture, dust, and corrosive atmospheres. The system utilizes a fanless, passive cooling architecture that leverages a high-efficiency heat sink and strategic internal airflow channeling to dissipate thermal loads without the reliability concerns of moving parts. This design is coupled with a conduction-cooled power supply module, ensuring stable operation across the entire temperature spectrum. For applications demanding higher port density or modularity, a compact 1RU and 2RU chassis options are available, supporting a variety of front-accessible SFP/SFP+ and RJ-45 ports.

HARDWARE FEATURES & INTERFACES

The platform boasts a fully non-blocking switching architecture, guaranteeing wire-speed forwarding for all packet sizes. Key hardware features include:

- Wide Temperature Range Operation: Verified for continuous operation from -40°C to +75°C ambient, with short-term surge tolerance for extreme events.
- Industrial-Grade Components: Utilizes high-reliability capacitors, resistors, and oscillators with extended operational lifecycles and low failure rates.
- Advanced Port Flexibility: The port matrix supports a mix of 10/100/1000BASE-T (RJ-45) and 100/1000BASE-X (SFP) interfaces, including optional 10G SFP+ uplink slots for high-speed backbone aggregation.
- Enhanced Surge Protection: Integrated per-port surge protection (up to 6kV) and ESD protection (up to 15kV) to safeguard against lightning strikes and electrostatic discharge events common in outdoor or factory environments.
- Redundant Power Inputs: Supports dual DC power inputs (12-48VDC) or optional AC (90-264VAC) with reverse polarity protection, enabling seamless failover in the event of a primary power source interruption.

COMPLIANCE & STANDARDS

This equipment has undergone rigorous third-party testing and is certified to meet the most stringent industry standards for environmental resilience and electromagnetic compatibility. Full compliance is maintained with:

- Environmental: IEC 60068-2 series (temperature, humidity, vibration, shock).
- EMC: FCC Part 15, CE Mark (EN 55032, EN 55024), and IEC 61000-6-2/4 for industrial environments.
- Safety: UL 60950-1 / CSA 22.2 No. 60950-1, and EN 60950-1.
- Industrial Protocols: Support for standard network protocols including IEEE 802.1Q VLAN, IEEE 802.1p QoS, IGMP snooping, and STP/RSTP/MSTP for robust Layer 2 networking, with optional Layer 3 static routing capabilities.

TECHNICAL SPECIFICATIONS

The following table outlines the primary technical parameters for the core fixed-configuration and modular chassis models. All specifications are subject to standard operational tolerances and are verified under worst-case conditions.

Parameter	Specification
Form Factor	1RU or 2RU Rack-Mountable / DIN-Rail

Switching Capacity	Up to 128 Gbps (Non-Blocking)
Forwarding Rate	Up to 95 Mpps
Operating Temperature	-40°C to +75°C (-40°F to +167°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Humidity	5% to 95% (Non-Condensing)
Power Supply	Dual Redundant DC 12-48V or AC 90-264V
Power Consumption	< 45W (Max)
MTBF	> 500,000 Hours
Ingress Protection	IP40 (Front Panel)
Surge Protection	6kV Per Port
Cooling	Fanless / Passive

ENVIRONMENTAL ACCREDITATIONS & MTBF

A cornerstone of this product line's value proposition is its unmatched reliability in extreme conditions. The robust design philosophy extends to a comprehensive set of environmental accreditations, ensuring deployment readiness in a wide array of hostile environments.

- Extended Temperature & Humidity: Operational humidity range from 5% to

95% (non-condensing) ensures performance in tropical and coastal environments.

- Shock & Vibration Resilience: Tested to IEC 60068-2-27 (Shock) and IEC 60068-2-6 (Vibration) standards, making it ideal for railway trackside and marine applications.

- High MTBF: The fanless design, combined with premium component selection, contributes to an industry-leading Mean Time Between Failures (MTBF) rating of over 500,000 hours, significantly reducing total cost of ownership (TCO) and minimizing unscheduled maintenance.

- IP Rating: The chassis, when paired with appropriate sealed connectors, supports front-panel ingress protection up to IP40, guarding against solid particles > 1mm.



ORDERING OPTIONS & SKU GUIDE

This hardware platform is available in multiple pre-configured SKUs to streamline procurement and deployment. Customers can also select from a range of optional accessories, including DIN-rail mounting kits, rack-mount brackets, and a comprehensive selection of SFP optical transceivers (supporting both multi-mode and single-mode fiber up to 120km). Please refer to the official price list or consult your sales representative for specific lead times and custom configuration requests. This application note serves as a preliminary technical guide and all specifications are subject to change without prior notice.