Enterprise Core Systems Engineering Reference Manual: Telecom Switch 24-Hour Full-Load Thermal Burn-in Inspection Specification

PRODUCT IDENTIFICATION

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Target Audience: Systems Engineers, Network Architects, and Procurement Specialists

This document serves as the definitive technical reference for the Enterprise Core Systems (ECS) Thermal Burn-in Inspection Protocol. It details the rigorous 24-hour full-load burn-in procedure designed to validate the reliability, thermal stability, and operational integrity of the Telecom Switch platform prior to deployment.



CORE INTERNAL TOPOLOGY & BURN-IN METHODOLOGY

The 24-Hour Full-Load Thermal Burn-in is a mandatory, non-destructive stress test performed on all units post-assembly and prior to final Quality Assurance (QA) release. The procedure is designed to identify early-life failures (infant mortality) and ensure that the hardware can sustain peak operational loads under elevated ambient temperatures (up to 55 ° C) without performance degradation.

INTERNAL TEST BED ARCHITECTURE:

The burn-in chamber is equipped with an array of traffic generators that simulate real-world carrier-grade traffic. The test bed topology mirrors a spine-leaf architecture, pushing data plane traffic and control plane protocol exchanges to 100% of the rated capacity.

- Stress Vector 1: Full Line-Rate Traffic (64-byte to 9K jumbo frames) applied to all interfaces simultaneously.
- Stress Vector 2: Protocol stress via BGP route flapping and OSPF Link State Advertisement (LSA) injections.
- Stress Vector 3: Thermal cycling with ambient temperature ramping from 25° C to 55°C over the 24-hour period.

SWITCHING SUBSYSTEM CAPABILITIES

The core silicon within the Telecom Switch integrates a high-performance, non-blocking switching fabric. During the burn-in process, all switching components are subject to sustained, maximum-throughput operations to verify the integrity of the internal bus and forwarding engine.

- Forwarding Engine: The ASIC-based engine is designed for cut-through switching, providing deterministic sub-microsecond latency. The burn-in validates the Pipeline Arbitration Logic, ensuring that data flow remains collision-free under full load.
- Packet Buffer Architecture: A deep, shared packet buffer pool (specified in the technical matrix) is utilized to absorb micro-bursts. The burn-in verifies buffer allocation and congestion management policies (Tail Drop, WRED) under

sustained, full-load stress.

- Redundancy Path Verification: Active/Standby control plane modules are tested for seamless failover under thermal stress, ensuring that the hardware watchdog timers function correctly when primary modules reach critical temperature thresholds.

OPERATIONAL ADVANTAGES

CONSEQUENCE OF FAILING BURN-IN: Any unit that exhibits a single uncorrectable error or exceeds the maximum temperature threshold during the cycle is automatically flagged and routed for deeper failure analysis. This process ensures that the Mean Time Between Failures (MTBF) metrics are statistically validated.

- Zero-Touch Deployment Readiness: Units that pass are certified "Burn-in Validated," guaranteeing immediate integration into live production networks without a separate break-in period.

- Thermal Acclimation: The process thermally cycles the soldered joints, power regulators, and optical transceivers, significantly reducing the risk of field failures due to thermal expansion mismatches.

- Fan Curve Calibration: The burn-in procedure tests the PID (Proportional-Integral-Derivative) fan control logic, verifying that the cooling

subsystem can maintain the ASIC junction temperature within operational limits even if one fan unit fails.

SPECIFICATION MATRIX

HARDWARE PHYSICAL: The chassis is constructed from aerospace-grade aluminum with a robust steel inner chassis for EMI shielding.

PROCESSOR SUBSYSTEM: The control plane utilizes a multi-core x86 processor with hardware acceleration for cryptography and tunnel termination.

MEMORY ALLOCATION: Systems are equipped with high-bandwidth ECC DDR5 DIMMs to support virtual routing and forwarding (VRF) instances.

ENVIRONMENTAL RANGES (BURN-IN VERIFIED):

- Operating Temperature (Burn-in Ambient): 0°C to +55°C (Validated during 24-Hour Full-Load Test).
- Non-Operating/Storage: -40°C to +85°C.
- Humidity (Operating): 5% to 95% (non-condensing).

Parameter	**Specification**
Form Factor	1RU Standard Rack-mount (19-inch

	compatible)
Switching Capacity	1.44 Tbps (Full-Duplex, Non-Blocking)
Power Supply	Dual Hot-Swappable Redundant AC/DC (100-240V AC, 50/60Hz; -48V DC optional)
Cooling Type	Front-to-Back Airflow, 4+1 Hot-Swappable Fan Trays
Throughput	1,071 Mpps (Million Packets Per Second - 64-byte Frame)
Burn-in Cycle	24 Hours Sustained at 100% System Load
Ambient Temperature (Test)	+55°C (Maximum Operating Range)
MTBF (Predicted)	> 450,000 hours (MIL-HDBK-217F, Ground Benign)

REGULATORY COMPLIANCE

The burn-in process is instrumental in verifying compliance with international safety and EMI standards. The hardware is tested to ensure it operates within radiated emission limits even under maximum power draw.

- Safety Certifications: IEC 62368-1 (Audio/Video, Information and Communication Technology Equipment).

- EMC Immunity: CISPR 32 / EN 55032 Class A compliance verified under full-load conditions.

- Environmental Compliance: RoHS and REACH compliant components are used throughout the assembly, with verification checks performed during the burn-in power analysis to ensure no hazardous substances cause performance anomalies.

- NEBS Compliance: The thermal burn-in cycle is aligned with GR-63-CORE (NEBS) requirements for physical protection and thermal tolerance for telecom central offices.

