air-flow direction front-to-back cooling - Official Technical Overview & Hardware Datasheet

PRODUCT IDENTIFICATION

PRODUCT SERIES: Precision Thermal Series | Air Flow Architecture: Front-to-Back Cooling

MODEL VARIANTS: PTS-FB-1U, PTS-FB-2U, PTS-FB-4U

This document defines the mechanical, thermal, and operational characteristics of high-performance telecommunications equipment utilizing FRONT-TO-BACK air flow direction. The architecture is optimized for standardized datacenter hot-aisle/cold-aisle containment strategies, ensuring predictable thermal management and component longevity.

SYSTEM HARDWARE TOPOLOGY

The front-to-back cooling topology establishes a linear thermal gradient: intake via cold aisle (front bezel) → forced convection over hot-swappable line cards, fabric modules, and power supply units → exhaust into hot aisle (rear of chassis). Chassis design integrates low-impedance air ducts, variable-speed dual-rotor fan trays (N+1 redundancy), and thermal sensors at 0.1m intervals. Backplane architecture isolates high-power ASICs and PHYs into dedicated airflow lanes. All front-panel indicators (Power, Status, Alarm, Fan) remain visible during full-rate operation.

DATA & CONTROL PLANE CAPABILITIES

Forwarding Plane: Non-blocking switching capacity up to 3.2 Tbps (2U configuration).

Control Plane: Dual-core ARM Cortex-A72 management processor with 16GB DDR4 RAM, 64GB eMMC flash.

Thermal-Aware Scheduling: Dynamic fan speed modulation based on inlet temperature sensors; overtemperature protection with automatic core frequency reduction.

COMPONENT BREAKDOWN

- Air Intake Bezel: Removable, washable 70µm particulate filter (optional HEPA grade).

- Fan Tray Module: Hot-swappable, 12V DC brushless counter-rotating fans; max 12,000 RPM; acoustic emission ≤ 65 dBA at 25°C ambient.

- Power Supply Unit (PSU): Front-access, 800W AC/DC (1+1 or 2+2 redundancy); 80 PLUS Titanium efficiency; internal cooling air path separate from system airflow.

- Line Card Slot: 4x to 16x slots depending on chassis; each card includes front-to-back ducted heatsink.

- Rear Exhaust Port: Perforated metal grille with EMI fingerstock gasket; direct hot-aisle alignment.

OPERATIONAL SPECS MATRIX

- Air Flow Rate: 120 CFM (1U), 240 CFM (2U), 480 CFM (4U) at 100% fan speed.

- Static Pressure: 12.5 mm H_2 O (typical).

- Thermal Design Power (TDP) Support: Up to 400W per line card; 1200W total per 2U chassis.

- Operating Temperature Range: 0°C to 45°C (derated above 35°C).

- Storage Temperature: -40°C to +70°C.

- Relative Humidity: 5% to 85% (non-condensing).

- Altitude: 0 to 3,050 meters (10,000 feet).

Parameter	Specification
Form Factor	1RU / 2RU / 4RU Chassis (19" rack mount)
Switching Capacity	3.2 Tbps (2U full configuration)
Power Supply	800W AC (100-240V) / DC (-48V); 1+1 or 2+2 redundant
Cooling Direction	Front-to-Back (standard hot-aisle / cold-aisle)
Max Fan Speed	12,000 RPM (per fan)
Acoustic Noise	≤ 65 dBA at 25°C ambient
MTBF (System)	320,000 hours (Telcordia SR-332)

REGULATORY COMPLIANCE

- Safety: IEC/EN 62368-1, UL 60950-1 (CB Scheme).

- EMC: FCC Part 15 Class A, EN 55032 Class A, EN 55035.

- Environmental: RoHS 3 (2015/863/EU), REACH, WEEE.

- Thermal Compliance: GR-63-CORE (NEBS Level 3) for airflow direction and thermal stability.

- Airflow Certification: Verified by TÜV Rheinland per ETSI EN 300 019-1-3

(Class 3.1).