Medical Equipment High Reliability Network Switches - Official Technical Overview & Hardware Datasheet

PRODUCT IDENTIFICATION

Product Series: MedSwitch-HR Series (MS-HR-4024, MS-HR-4848, MS-HR-2412M)

Product Classification: Dedicated High-Reliability Layer 2/Layer 3 Managed Ethernet Switches for Medical Imaging, Surgical Robotics, PACS, HIS, and Real-Time Patient Monitoring Networks.

Target Application Environment: Operating Rooms (OR), Intensive Care Units (ICU), Radiology Suites, Catheterization Labs, and Hospital Core Infrastructure.

SYSTEM HARDWARE TOPOLOGY

The MedSwitch-HR series is architected around a non-blocking, store-and-forward switching fabric with dual, hot-swappable fabric modules. The hardware topology is segmented into three distinct planes:

- DATA PLANE: Hardware-accelerated forwarding ASIC with 32 MB of on-chip packet buffer. Zero packet loss under 100% line-rate load.
- CONTROL PLANE: Redundant ARM Cortex-A72 MPCore processors running separate real-time OS instances. Heartbeat monitoring with 50ms failover.
- MANAGEMENT PLANE: Dedicated out-of-band 1GbE Ethernet port (RJ45) and USB-C console port. Role-Based Access Control (RBAC) hardware enforcement.

DATA & CONTROL PLANE CAPABILITIES

- Switching Capacity: 336 Gbps (non-blocking) for MS-HR-4848; 128 Gbps for MS-HR-4024.
- Forwarding Rate: 250 Mpps (million packets per second) for 48-port models.
- Latency: < 1 microsecond (64-byte frames) across any two ports (cut-through mode); < 4 microseconds store-and-forward.
- Jumbo Frame Support: Up to 12,288 bytes (optimized for DICOM medical imaging).
- Redundancy Protocol: Sub-50ms ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) and Media Redundancy Protocol (MRP) for medical device ring topologies.

- Hardware Queues: 8 priority queues per port with Weighted Random Early Detection (WRED) and Strict Priority (SP) scheduling.

COMPONENT BREAKDOWN

1. POWER SUBSYSTEM:

- Dual, modular, hot-swappable power supplies (1+1 redundancy).

- Input range: 100-240V AC (47-63 Hz) OR 48-60V DC (medical-grade isolated DC/DC converter).

- Efficiency: ≥ 90% (80 PLUS Platinum medical equivalent).

- Leakage current: < 100 µA (compliant with IEC 60601-1 medical electrical equipment safety standard).

2. THERMAL MANAGEMENT:

- Fanless design for models MS-HR-2412M (silent operation, 0 dBA).

- For 24/48 port models: 3+1 redundant, hot-swappable fan trays with variable speed control.

- Airflow direction: front-to-back or back-to-front (field-reversible fan modules).

- Thermal threshold alarm: hardware-triggered at 75°C inlet temperature.

3. PHYSICAL INTERFACES:

- 10/100/1000BASE-T ports: 24 or 48 RJ45 with auto-MDI/MDIX, 30W PoE+ (IEEE 802.3at) or 60W/90W PoE++ (802.3bt) on selected SKUs.

- 1G/10G SFP+ uplink ports: 4 or 8 slots (supports SR, LR, BIDI, and CWDM optics, including medical-grade -40 ° C to +85 ° C extended temperature transceivers).

- Management port: 1x RJ45 10/100/1000, 1x USB-C (console), 1x USB 2.0 (for firmware recovery).

OPERATIONAL SPECS MATRIX

Parameter	**Specification**
Form Factor	1RU (19-inch rackmount) for MS-HR-4024/4848; Compact 0.5RU for MS-HR-2412M
Switching Capacity	336 Gbps (MS-HR-4848) / 128 Gbps (MS-HR-4024) / 56 Gbps (MS-HR-2412M)
Forwarding Rate	250 Mpps / 95 Mpps / 41.7 Mpps respectively
Latency (64-byte)	< 1 µ s (cut-through) / < 4 µ s (store-and-forward)
Power Supply	Dual hot-swap 1+1 redundant: AC

	100-240V or DC 48-60V, <100µA leakage
Operating Temperature	0°C to +60°C (fan models) / -20°C to +50°C (fanless medical-grade)
MTBF	>500,000 hours (Telcordia SR-332, 45° C ambient)
Medical Safety Compliance	IEC 60601-1 (Ed 3.1), IEC 60601-1-2 (Ed 4.1)
Port Configuration	24/48x GigE RJ45 PoE++ + 4/8x 1G/10G SFP+
Redundancy Protocols	ERPS G.8032 (<50ms), MRP, STP/RSTP/MSTP
Security	IEEE 802.1AE MACsec, 802.1X, TACACS+, RADIUS, DHCP Snooping

REGULATORY COMPLIANCE

Medical Device Safety:

- IEC 60601-1 (Edition 3.1): Medical electrical equipment – General requirements for basic safety and essential performance.

- IEC 60601-1-2 (Edition 4.1): Electromagnetic compatibility (EMC) for medical

devices – Immunity to RF wireless communications, electrostatic discharge (ESD ±15kV), and electrical fast transients (EFT ±4kV).

- IEC 60601-1-6: Usability (operating room error reduction).

EMC & Environmental:

- CISPR 11 / EN 55011: Industrial, scientific, and medical (ISM) radio-frequency equipment – Class A (hospital environment).

- IEC 61000-4-2 to 4-6: Complete immunity suite for medical environments.

- RoHS 3 (2015/863/EU) and REACH SVHC compliant.

- EN 45545-2: Fire safety for railway and hospital rolling stock (optional certification).

Network & Cybersecurity:

- IEEE 802.1X (port-based network access control) with RADIUS/TACACS+.

- MACsec (IEEE 802.1AE) line-rate encryption on all 1G/10G ports.

- NIST SP 800-193 (Platform Firmware Resiliency) compliant boot and recovery.

Reliability:

- Telcordia SR-332 (Issue 4): MTBF > 500,000 hours (45°C ambient, 100% load).

- Fault tolerance: Dual boot images, redundant power/fans/fabric.

- HALT (Highly Accelerated Life Testing): 50G shock, 10G vibration, -40°C to +85°C operational thermal cycle.