

ML600Dx-M

10G High Capacity Cyber Hardened Industrial Ethernet Switch

The ML600Dx-M devices are small form factor high capacity unit enabling immediate delivery of symmetrical high-speed Ethernet services over hybrid networks of fiber and copper whilst providing cutting edge 256-bit MACsec encryption capabilities on both fiber and copper interfaces. Up to 60 Mbps of symmetrical Ethernet traffic over copper and 1 Gbps over fiber including optional two PoE 90 watt interfaces.

Designed for Industrial, utility, ITS and smart city applications, with high security requirements, the MACsec-enabled ML600Dx-M takes in two fiber ports and/or four copper pairs and allows them to be split into two directions, east and west, thereby allowing multiple nodes to be connected over copper or fiber in a linear chain, RSTP/STP mesh or ERPSv2 ring configuration. Each node has full wire speed switching capabilities and can drop and add Ethernet traffic at each location while transferring the rest of the traffic through. MACsec can be enabled on multiple ports.

The ML600Dx-M offers extremely compact DIN rail mounting for flexible deployment within utilities, traffic and industrial cabinets. With its superior performance, extensive functionality, high robustness and reliability, the ML600Dx-M Ethernet switch offers rapid service delivery and allows for complete utilization of the existing network infrastructure. Pass Through functionality is available enabling node bypass in case of power down to allow for service continuity in drop and continue (over copper) topology.

The ML600Dx-M is a hardened and robust Ethernet switch with redundant power inputs, designed for deployment in harsh environments. Interoperable with any standard Ethernet switch, router or hub ML600Dx-M seamlessly integrates into any Ethernet network. The ML600Dx-M allows assignment of a service or a customer per port.

ML600Dx-M product line includes (please see also specification page) **"L"** represents optional MACsec capability

- **ML684DL/P-M 8 port, Hybrid fiber-copper switch with PoE 90W**
- **ML680DL/P-M 10 port fiber only switch with PoE 90W**
- **ML684D-M 8 port, Hybrid fiber-copper switch**
- **ML680D-M 8 port, Fiber only switch**

Powered by Actelis Networks' award-winning, patented EFMplus™ technology, the rate, reach and reliability are increased significantly using advanced Dynamic Spectrum Management (DSM) techniques. This technology provides the best rate/reach performance, most resilient fiber-quality transmission while ensuring high reliability.

Actelis has comprehensive mechanisms enabling high level authentication and advanced encryption capabilities including MACsec 256-bit wire-speed encryption that can be applied on Ethernet fiber ports RJ-45 ports and HSLs - 4 ports per unit (per model). In addition, segmented and scrambled Ethernet packets are disseminated over multiple transmission conduits along with sophisticated filtering and access control using layer 2 processes. Actelis ML600Dx-M offers an all-embracing level of security initiating from the physical layer through switching and up to the management and access layers. It provides a significantly strong and resilient solution, enabling transmissions with very high level of immunity with notably lower vulnerability to hacking attempts.

The ML600Dx-M provides 802.1q VLAN-aware wire-speed bridging, double tagging (VLAN stacking) for end-user VLAN transparency, L2 (Ethernet priority), L3 (ToS/Diff-Serv) classification with eight traffic classes, ERPSv2, RSTP/STP, Link Aggregation, LLCf (Link Loss Carrier Forward), bandwidth monitoring, Multicast/Broadcast limiting, as well as IGMP bandwidth snooping for video distribution applications.

The ML600Dx-M provides proactive and dynamic tools for enhanced troubleshooting and monitoring capabilities. Advanced EFM OAM, including 802.3ah, CFM (802.1ag) and Y.1731 (ITU), offering physical link and service level end-to-end advanced troubleshooting mechanisms.

The MetaASSIST™ View graphical craft application and the MetaASSIST EMS multi-platform Element Management System offer in- and out-of-band management of the ML600Dx-M. Management protocols include standard TL1, CLI and SNMP using standard MIBs for seamless integration with third-party Network Management Systems (NMS).



Highlights

- Support for two High Speed Copper Links
- Small form factor, no fan, DIN raiing
- Cutting Edge Security - MACsec 256-bit Low vulnerability to hacking
- IEEE 802.3ah Ethernet in the First Mile (EFM) 2Base-TL Solution
- Rapid Service Deployment
- Superior Rate, Reach & Reliability
- Low Delay and Jitter for Voice and Video Transmission
- Environmentally hardened
- Carrier-Class OAM
- Worldwide Spectral Compliancy
- FCC, UL, CE, NEMA 4 temp hardened

Applications

- Telemetry
- IP-based Traffic Controllers
- Smart Grid Sensors
- Dynamic Message Signs
- HD Video Cameras & Streaming
- Vehicle Detection
- Smart Parking
- Emergency Response
- Supports & Complements City Wi-Fi Access

Specifications

Interfaces

Ethernet (Network/User) - 8-10 port switch

- **10/100/1000Base-T:**
ML684DLx-M - 6 ports, ML680DLx-M-8 ports
Connector: RJ45, Auto-MDIX
- **100/1000Base-FX:** 2 ports
Connector: SFP Based, MSA compliant

High Speed Link (HSL) - Bonded copper pairs

- **Protocol:** IEEE 802.3ah 2Base-TL
- **Line code:** ITU-T G.991.2 rev. 2
- **Number of copper pairs:** 4, **Connector:** RJ45 x 2
- **Number of HSLs:** 1 HSL- up to 4 pairs, 2 HSLs- east/west, 2 pair each
- **Bandwidth per HSL:** 1 HSL - up to 60 Mbps; 2 HSLs up to 30Mbps
- **End-to-end Delay:** 2-4 ms (typical)
- **Spectral Compliance:** ITU-T G.991.2 annex A, B, F, G, ETSI TS 101 524 annex E, ANSI T1.417, T1.426, Per-country regulatory compliant spectral modes
- **Sealing Current:** 48 VDC/1.5mA nominal (sink)

Secure link - High-end Encryption- 4 ports

- **MACSEC:** 256bit IEEE 802.1AE -
ML684DL/P - 2x SFP and 2x HSLs
ML680DL/P - 2x SFP and 2x RJ-45 Eth ports

Management (Out-of-Band)

- **10/100Base-T Connector:** RJ45, Auto-MDIX
- **Craft:** EIA RS-232 (DCE) **Connector:** RJ45, USB 2.0

Alarm Contacts

- Terminal Block, 2 Input, 1 Output

Pass Through, Unit bypass

- Activated by power down of teh unit
Connecting pair 1 to 2 and 3 to 4

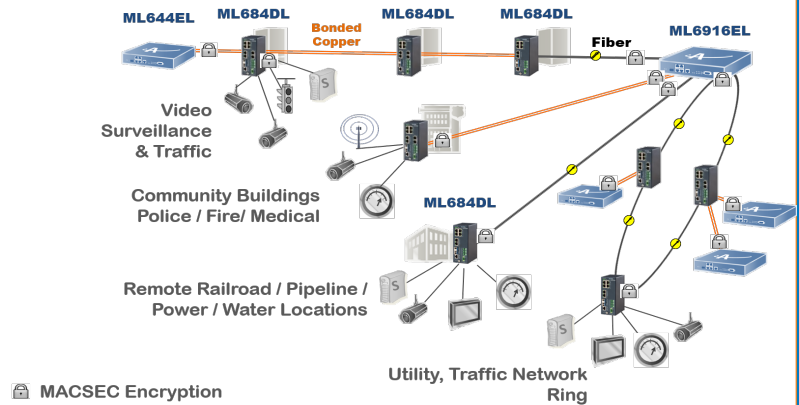
LAN Protocols

- **Dynamic Bridging:** IEEE 802.1, 8K MAC addresses
- **MTU:** 2048bytes - 9K
- **Discovery Mechanisms:** LLDP
- **VLAN Tagging:** IEEE 802.1Q
- **Double Tagging:** Q-in-Q
- **RSTP, STP:** IEEE 802.1d
- **ERPSv2:** G.8032 ERPSv2
- **Link Aggregation:** IEEE 802.3ad
- **Provider Bridge:** IEEE 802.1ad
- **IGMP snooping:** IGMP V1/V2
- **OAM:** IEEE 802.3ah clause 57 (EFM OAM), IEEE 802.1ag, ITU Y.1731, Ethernet loopback with MAC swap

Service Provisioning & Traffic Management

Quality of Service

- **Classes of Service:** 8
- **Scheduler:** WFQ, SP
- **Classification:** L2 802.1p/Q, L3 ToS/Diff Serv



Management Applications

- **EMS:** MetaASSIST EMS
- **Craft GUI:** MetaASSIST View
- **USB craft port**

Management Protocols

- **SNMP:** SNMP V3, V2C, V1
- **IP addresses:** IPV4 and IPV6
- **Command Line Interface:** TL1, CLI
- **Remote Access:** Telnet
- **Secure Access (option):** SSH v2
- **Time Synchronization:** SNTP v3
- **Web Access:** HTTP
- **File transfer:** FTP, TFTP
- **IEEE 802.3ah EFM OAM:** Dying Gasp
- **User Authentication:** RADIUS and/or local passwords
- **FIPS 140-2**

Front Panel Indicators (LEDs)

- **Status**
- **Alarm**
- **MLP per modem/pair**
- **ACT (Activity) per Ethernet port**
- **LNK (Link) per Ethernet/HSL port**
- **Power A / Power B**

Physical

- **Dimensions:** Height: 5.95" / 151 mm, Depth: 5.1" / 130 mm, Width: 2.3" / 58 mm
- **Weight:** 1.76 lbs / 0.8 kg
- **Mounting:** Din Rails, Wall Mount
Design for top hat rail EN 50022 - 35 x 7.5, or 35 x 15 - type O / type Omega (Ω)

Power

- **DC (integrated):** 12V to 72V
Range varies between specific models
- **AC (external):** 90-264 VAC
- **Optional PoE (ML68XDLP-M):** 30/60/90 Watt

Environmental

- **Operating Temp.** -40° to +74°C
- **Storage Temp.** -40° to +75°C
- **Relative humidity:** Up to 95%, non condensing

Regulatory Certifications/Compliance

Metro Ethernet Forum - MEF 9, 14
Safety - IEN 62368, IEC 62368, UL 62368

EMI (Emission):

- FCC Part 15 Class A
- ICES-003 Class A
- ETSI EN 300 386 Class A
- ETSI ETS 300 132-2
- EN 55022 Class A
- EN50121 class B

EMS (Immunity):

- EN 300 386 level 3 ESD, Surge, EFT level 2 or 3
- EN 61000 - Level 3: 4-2 (ESD), 4-3 (RS), 4-4 (EFT), 4-5 (Surge), 4-6 (CS)
- EN 61000-4-8
- ITU-T K.20, K.21, K.45

CE

• EMC and Safety

Environmental

- ETSI ETS 300 019

Security - NIST

- FIPS 140-2

