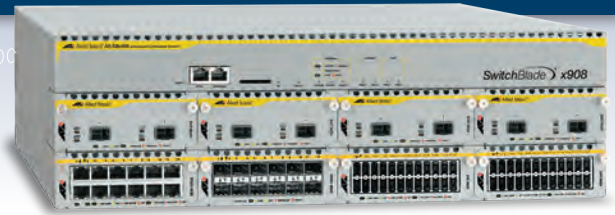


# SwitchBlade<sup>®</sup> x908

## Advanced Layer 3+ Modular Switch

The Allied Telesis SwitchBlade x908 modular switch is the ideal solution for the modern enterprise network core where reliability, resiliency and high performance are the key requirements.



### Reliable

The SwitchBlade x908 was designed with reliability in mind. With dual power supplies, fan modules and a comprehensive range of expansion modules (XEMs) — all hot-swappable — the SwitchBlade x908 can be maintained and reconfigured when necessary without affecting network uptime.

The SwitchBlade x908 switch operates with one PSU, and installing a second PSU provides ultimate redundancy. Dual internal PSUs eliminate the need for an external Redundant Power Supply (RPS), thus saving valuable rack space. Built-in redundancy guarantees uninterrupted delivery of essential services.

The SwitchBlade x908 also features front-to-back cooling, making it ideal for data center applications.

### Powerful network management

The Allied Telesis Autonomous Management Framework (AMF) meets the increased management requirements of modern converged networks, automating many everyday tasks including configuration management. AMF has powerful centralized management features that manage a complete network as a single virtual device. The network can be expanded with plug-and-play simplicity, and network node recovery is fully zero-touch.

AMF secure mode increases network security with management traffic encryption, authorization, and monitoring. AMF Guestnode allows third party devices, such as IP phones and security cameras, to be part of an AMF network.

### Resilient

High availability features such as VCStack™ (Virtual Chassis Stacking) and EPSRing™ (Ethernet Protection Switched Rings) ensure traffic flow continues even during unscheduled outages.

VCStack provides excellent resiliency by creating a single “virtual chassis” from two SwitchBlade x908 physical devices, using dedicated high speed stacking links. VCStack provides a highly available system where network resources are spread out across stacked units, reducing the impact should one of the stacked units fail. Switch ports may be aggregated on different units, for excellent high availability. VCStack delivers a resilient solution at a fraction of the cost of a full chassis-based system, and the stack may be managed as a single network node, greatly simplifying management tasks.

### High Performing

The SwitchBlade x908 features fully non-blocking switching on all ports, to facilitate low latency, wirespeed IPv4 and IPv6 Layer 2 switching and Layer 3 routing. This is ideal for high-end server deployments. When combined with a large Layer 3 route table, it is ideal for aggregating gigabit connections.

### MEF Certified

The SwitchBlade x908 has been certified by the Metro Ethernet Forum (MEF) Certification program, which tests products for conformance to the strict requirements of Carrier Ethernet. Specifically, the SwitchBlade x908 is certified for compliance to MEF 9 and MEF 14 Ethernet Services tests.



## New Features

- ▶ AMF secure mode
- ▶ AMF Guestnode
- ▶ AMF Starter
- ▶ Active Fiber Monitoring
- ▶ Microsoft Network Load Balancing (MS NLB) support
- ▶ VLAN ACLs

**VCStack**<sup>™</sup>

**AMF**<sup>™</sup>

**EPSRing**<sup>™</sup>

**ACTIVE**  
Fiber Monitoring<sup>™</sup>

## Key Features

### Allied Telesis Autonomous Management Framework (AMF)

- ▶ Allied Telesis Autonomous Management Framework (AMF) is a sophisticated suite of management tools that provide a simplified approach to network management. Common tasks are automated or made so simple that the every-day running of a network can be achieved without the need for highly-trained, and expensive, network engineers. Powerful features like centralized management, auto-backup, auto-upgrade, auto-provisioning and auto-recovery enable plug-and-play networking and zero-touch management.
- ▶ The SwitchBlade x908 switch can operate as the AMF network master, storing firmware and configuration backups for all other network nodes. The AMF master enables auto-provisioning and auto-upgrade by providing appropriate files to new network members.
- ▶ AMF secure mode encrypts all AMF traffic, provides unit and user authorization, and monitors network access to greatly enhance network security.
- ▶ AMF Guestnode allows Allied Telesis wireless access points and further switching products, as well as third party devices such as IP phones and security cameras, to be part of an AMF network.

### Virtual Routing and Forwarding (VRF Lite)

- ▶ VRF Lite provides Layer 3 network virtualization by dividing a single switch into multiple independent virtual routing domains. With independent routing domains, IP addresses can overlap without causing conflict, allowing multiple customers to have their own secure virtual network within the same physical infrastructure.

### Scalable

- ▶ Allied Telesis high speed XEMs provide both copper and fiber connectivity, delivering the ultimate in flexibility.  
XEM options are:
  - ▶ AT-XEM-2XP - 2 x 10GbE (XFP) ports
  - ▶ AT-XEM-2XS - 2 x 10GbE (SFP+) ports
  - ▶ AT-XEM-12Sv2 - 12 x 1000X SFP ports
  - ▶ AT-XEM-12Tv2 - 12 x 10/100/1000T (RJ-45) ports
  - ▶ AT-XEM-24T - 24 x 10/100/1000T (RJ Point 5) ports

All XEMs provide non-blocking performance. XEMs are ideal for aggregating Gigabit to the desktop, or for Gigabit uplinks from Fast Ethernet switches.

### EPSRing™ (Ethernet Protection Switched Rings)

- ▶ EPSRing and 10GbE modules allow several switches to form protected rings with 50ms failover — perfect for high performance at the core of Enterprise or Provider Access networks.
- ▶ SuperLoop Protection enables a link between two EPSR nodes to be in separate EPSR domains, improving redundancy and network fault resiliency.

### sFlow

- ▶ sFlow is an industry standard technology for monitoring high speed switched networks. It provides complete visibility into network use, enabling performance optimization, usage accounting/billing, and defence against security threats. Sampled packets sent to a collector ensure it always has a real-time view of network traffic.

### Quality of Service (QoS)

- ▶ Comprehensive low-latency wire-speed QoS provides flow-based traffic management with full classification, prioritization, traffic shaping and min/max bandwidth profiles. Enjoy boosted network performance and guaranteed delivery of business-critical Ethernet services and applications. Time-critical services like voice and video applications take precedence over non-essential services like file downloads, maintaining responsiveness of Enterprise applications.

### Dynamic Host Configuration Protocol (DHCPv6)

- ▶ DHCPv6 is used to dynamically assign IPv6 addresses to hosts from a central location. Acting as DHCPv6 client enables the switch to receive an IPv6 address, and acting as server enables the switch to dynamically allocate IPv6 addresses to hosts. The DHCPv6 server and client both support the Prefix Delegation feature which allocates a whole IPv6 subnet to a DHCP client. The client, in turn, can allocate addresses from this subnet to the hosts that are connected to it.

### Microsoft Network Load Balancing (MS NLB) Support

- ▶ Support for MS NLB, which clusters identical servers together for increased performance through load-sharing.

### Find Me

- ▶ In busy server rooms comprising of a large number of equipment racks, it can be quite a job finding the correct switch quickly among many similar

units. The 'Find Me' feature is a simple visual way to quickly identify the desired physical switch for maintenance or other purposes, by causing its LEDs to flash in a specified pattern.

### Optical DDM

- ▶ Most modern optical SFP/SFP+/XFP transceivers support Digital Diagnostics Monitoring (DDM) functions according to the specification SFF-8472. This enables real time monitoring of the various parameters of the transceiver, such as optical output power, temperature, laser bias current and transceiver supply voltage. Easy access to this information simplifies diagnosing problems with optical modules and fiber connections.

### Active Fiber Monitoring

- ▶ Active Fiber Monitoring prevents eavesdropping on fiber communications by monitoring received optical power. If an intrusion is detected, the link can be automatically shut down, or an operator alert can be sent.

### Extended Mode

- ▶ Users can now configure the SwitchBlade x908 to use larger hardware table sizes and more ACLs, QoS traffic classes and Link Aggregation Groups (LAGs). These increases make the SwitchBlade x908 more suitable for applications in the core or distribution layers of larger networks.
- ▶ Refer to the table on page 6 for details.

### Energy Efficient Ethernet

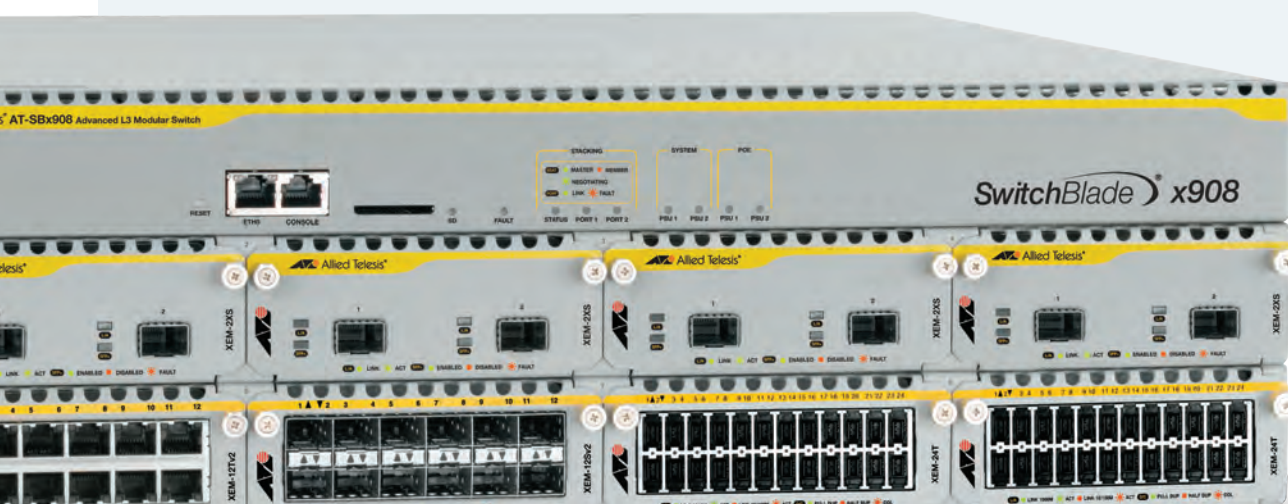
- ▶ The SwitchBlade x908 supports Energy Efficient Ethernet on the XEM-12Tv2, which automatically reduces the power consumed by the switch whenever there is no traffic on a port. This sophisticated feature can significantly lower operating costs by reducing the power requirements of the switch and any associated cooling equipment.

### VLAN ACLs

- ▶ Simplify access and traffic control across entire segments of the network. Access Control Lists (ACLs) can be applied to a Virtual LAN (VLAN) as well as a specific port.

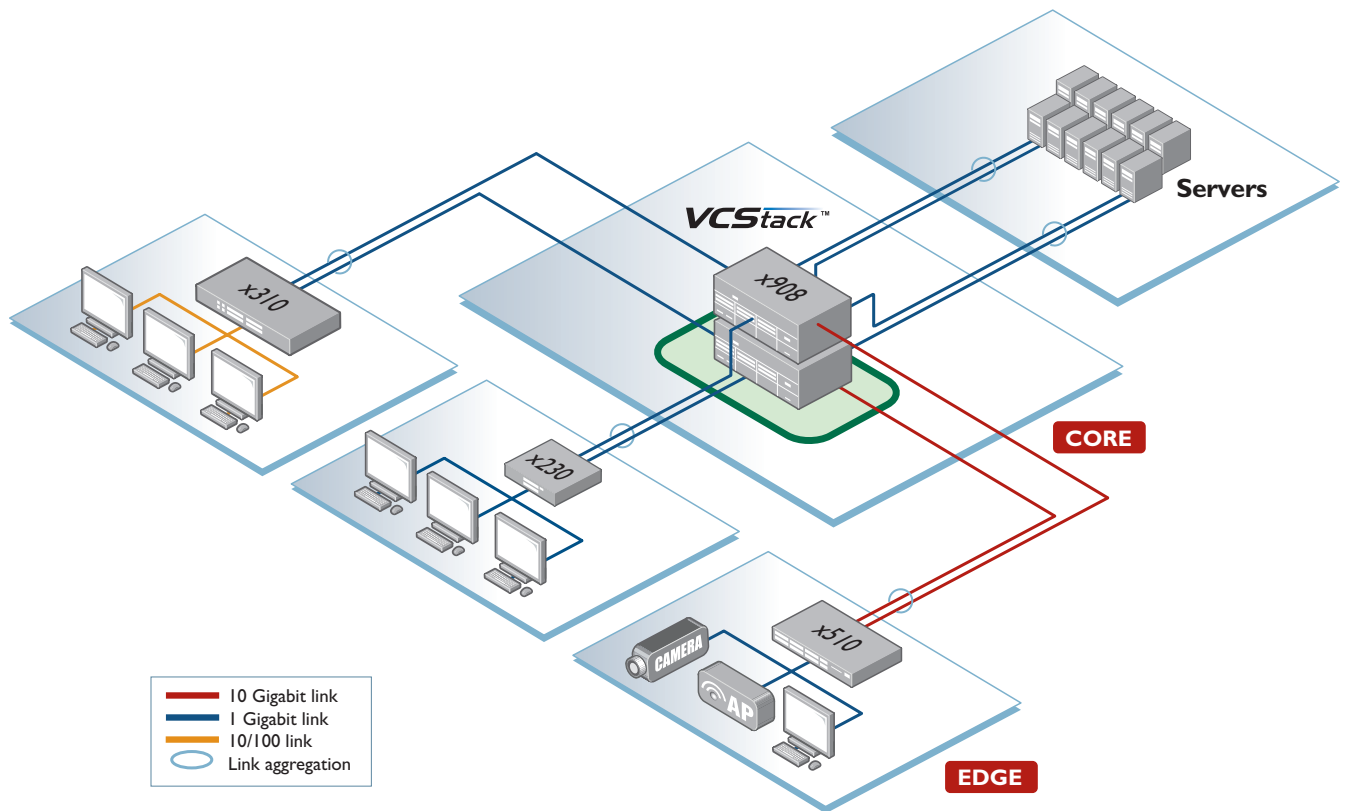
### TACACS+ Command Authorization

- ▶ Centralize control of which commands may be issued by a specific user of an AlliedWare Plus device. TACACS+ command authorization complements authentication and accounting services for a complete AAA solution.



## Key Solutions

## VCStack (Virtual Chassis Stacking)

**VCStack: Resiliency and Stability**

Today's enterprises rely on Information Technology resources and applications to access business-critical information, and for day-to-day work. A high-availability infrastructure is of paramount importance, starting with a resilient network core. VCStack on the SwitchBlade x908 provides the ideal solution — without the expense of a full chassis. With the benefits of high availability, increased capacity and ease of management, VCStack makes networking reliable and simple.

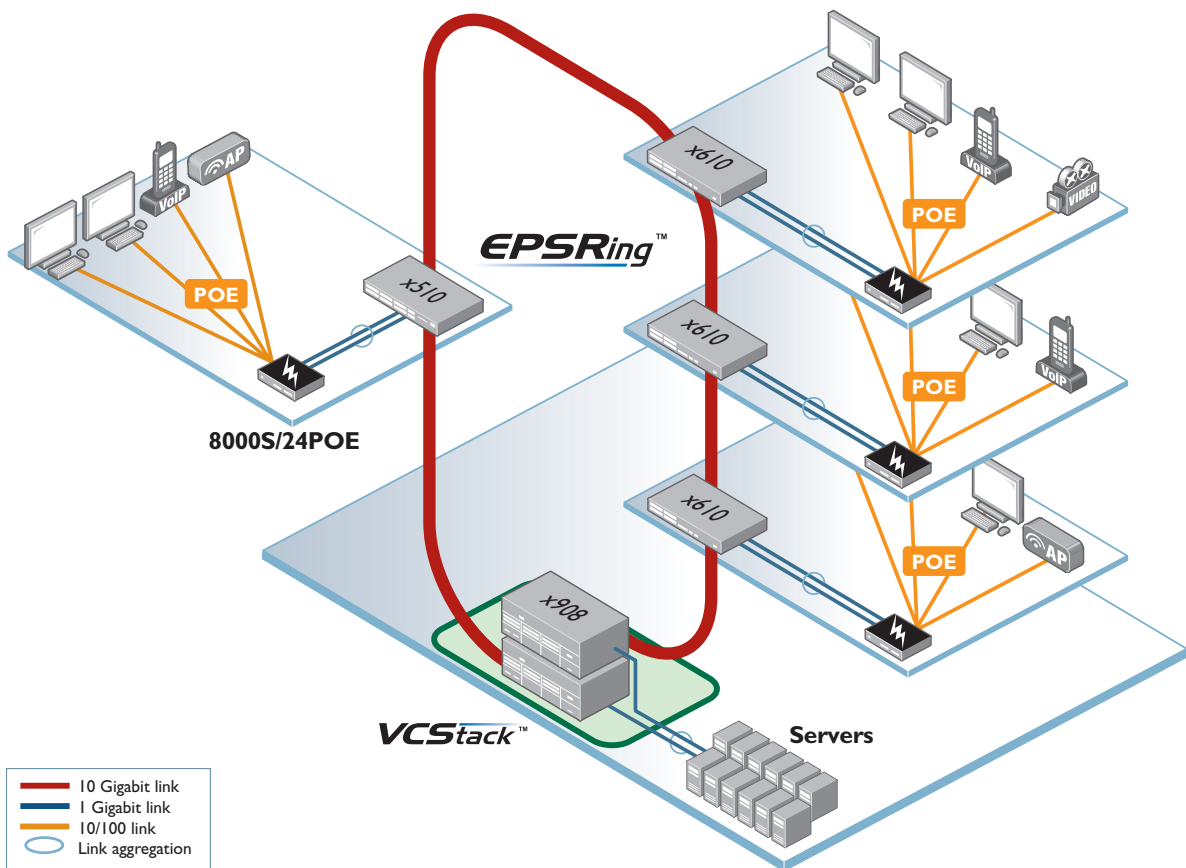
Using VCStack at the core of the network allows multiple switches to appear as a single virtual chassis. In normal operation, this virtual chassis acts as a single switch, simplifying management.

The diagram above shows link aggregation between the core VCStack and the edge switches. With link aggregation across ports on different virtual chassis members, there is no perceptible disruption in the case of a link failure, and the full bandwidth of the network remains available. Fast failover ensures absolutely minimal network downtime in the event of a problem.

VCStack and link aggregation provide a solution where network resources are spread across the virtual chassis members, ensuring device and path resiliency. Virtualization of the network core ensures uninterrupted access to information when needed.

## Key Solutions

## EPSR (Ethernet Protection Switched Ring)

**EPSR: Resiliency and Fault Tolerance**

The increasing convergence of services and applications in the enterprise has led to increasing demand for highly available networks with minimal downtime. High bandwidth is also required for the multiple applications simultaneously using the network. Real-time applications like surveillance, video streaming and Voice over IP (VoIP) are used alongside data and Internet access.

When a high-performing, resilient Enterprise core network is required, using EPSRing with the SwitchBlade x908 provides the ideal solution. EPSR creates a high speed resilient ring that can utilize today's maximum Ethernet standard of 10Gbps, and provide extremely fast failover between nodes. EPSR enables rings to recover within as little as 50ms, preventing a node or link failure from affecting customer experience, even with demanding applications such as IP telephony and video monitoring.

The diagram above shows a corporate network based on a central EPSR ring. The inclusion of Allied Telesis VCStack (Virtual Chassis Stacking) technology at the core of the network adds a further layer of resiliency, increasing the availability of critical resources.

Now that technology has made high-availability and high-bandwidth so accessible, corporate business, education providers and other enterprise network users can enjoy the many benefits that EPSRing provides. By ensuring always-available online applications and resources, this advanced self-healing network technology meets the constant demand for information at your fingertips.

## Specifications

### Performance

- ▶ 357Mpps forwarding rate
- ▶ Extensive wirespeed traffic classification for ACLs and QoS
- ▶ Supports 10KB Jumbo frame size for data center and server aggregation applications
- ▶ Wirespeed multicasting
- ▶ 640Gbps Switching Fabric
- ▶ Up to 16K MAC addresses (64K in Extended Mode)
- ▶ Up to 4K Layer 2 multicast entries
- ▶ Up to 1K Layer 3 IPv4 multicast entries
- ▶ 4K VLANs
- ▶ 512MB DDR SDRAM
- ▶ Separate packet buffer memory
- ▶ 64MB Flash Memory

### Reliability

- ▶ Modular AlliedWare Plus operating system
- ▶ Dual hot swappable PSUs with 1 + 1 redundancy
- ▶ Dual feed support: a separate power circuit can feed each power supply providing extra reliability
- ▶ Hot-swappable XEMs
- ▶ Hot-swappable fan modules
- ▶ Full environmental monitoring of PSUs, fans, temperature and internal voltages, with SNMP traps to alert network managers in case of any failure

### Expandability

- ▶ 8 high speed 60Gbps expansion bays
- ▶ 2 x 80Gbps stacking connectors on the rear of the chassis, to create a single VCStack from 2 physical units
- ▶ Versatile licensing options for additional features

### Power Characteristics

- ▶ AC Voltage: 100 to 240V (+/-10% auto ranging)
- ▶ Frequency: 47 to 63Hz
- ▶ DC Voltage: 36 to 72V

### Flexibility and Compatibility

- ▶ Eight expansion bays supporting a choice of modules, for port flexibility and application versatility
- ▶ XEM modules compatible with AT-x900-24X and AT-x900-12XT/S
- ▶ SFP ports will support any combination of 1000T, 100FX, 100BX, 1000SX, 1000LX, 1000ZX or 1000ZX CWDM SFPs (XEM-12Sv2 does not support 100X)

### Diagnostic Tools

- ▶ Active Fiber Monitoring detects tampering on optical links
- ▶ Built-In Self Test (BIST)
- ▶ Cable fault locator (TDR)
- ▶ UniDirectional Link Detection (UDLD)
- ▶ Find-me device locator
- ▶ Hardware health monitoring
- ▶ Automatic link flap detection and port shutdown
- ▶ Optical Digital Diagnostic Monitoring (DDM)
- ▶ Ping polling for IPv4 and IPv6
- ▶ Port mirroring
- ▶ TraceRoute for IPv4 and IPv6

### IPv4 Features

- ▶ Black hole routing
- ▶ Directed broadcast forwarding
- ▶ DNS relay
- ▶ Equal Cost Multi Path (ECMP) routing
- ▶ Policy-based routing
- ▶ Route maps & Route redistribution (OSPF, BGP, RIP)
- ▶ Static unicast and multicast routes for IPv4
- ▶ UDP broadcast helper (IP helper)
- ▶ Up to 64 Virtual Routing and Forwarding (VRF lite) domains (with license)

### IPv6 Features

- ▶ DHCPv6 client and relay
- ▶ DNSv6 client and relay
- ▶ IPv4 and IPv6 dual stack
- ▶ IPv6 aware storm protection and QoS
- ▶ IPv6 hardware ACLs
- ▶ Device management over IPv6 networks with SNMPv6, Telnetv6 and SSHv6
- ▶ NTPv6 client and server
- ▶ Static unicast and multicast routes for IPv6
- ▶ Log to IPv6 hosts with Syslog v6

### Management

- ▶ Allied Telesis Management Framework (AMF) enables powerful centralized management and zero-touch device installation and recovery
- ▶ Try AMF for free with the built-in AMF Starter license
- ▶ Console management port on the front panel for ease of access
- ▶ Eco-friendly mode allows ports and LEDs to be disabled to save power
- ▶ Web-based Graphical User Interface (GUI)
- ▶ Industry-standard CLI with context-sensitive help
- ▶ Out-of-band 10/100/1000T Ethernet management port
- ▶ SD/SDHC memory card socket allows software release files, configurations and other files to be stored for backup and distribution to other devices
- ▶ Built in text editor with powerful CLI scripting engine
- ▶ Configurable logs and triggers provide an audit trail of SD card insertion and removal
- ▶ Comprehensive SNMP MIB support for standards-based device management
- ▶ Event-based triggers allow user-defined scripts to be executed upon selected system events

### Quality of Service (QoS)

- ▶ 8 priority queues with a hierarchy of high priority queues for real time traffic, and mixed scheduling, for each switch port
- ▶ Limit bandwidth per port or per traffic class down to 64kbps
- ▶ Wirespeed traffic classification with low latency essential for VoIP and real-time streaming media applications
- ▶ IPv6 QoS support
- ▶ Policy-based QoS based on VLAN, port, MAC and general packet classifiers
- ▶ Policy-based storm protection
- ▶ Extensive remarking capabilities
- ▶ Taildrop for queue congestion control

- ▶ Strict priority, weighted round robin or mixed scheduling
- ▶ IP precedence and DiffServ marking based on layer 2, 3 and 4 headers

### Resiliency Features

- ▶ Control Plane Prioritization (CPP) ensures the CPU always has sufficient bandwidth to process network control traffic
- ▶ Dynamic link failover (host attach)
- ▶ EPSRing (Ethernet Protection Switched Rings) with SuperLoop Protection (SLP) and enhanced recovery for extra resiliency
- ▶ Loop protection: loop detection and thrash limiting
- ▶ PVST+ compatibility mode
- ▶ STP root guard
- ▶ VCStack fast failover minimizes network disruption
- ▶ BPDU forwarding

### Security Features

- ▶ Access Control Lists (ACLs) based on layer 3 and 4 headers, per VLAN or port
- ▶ Configurable ACLs for management traffic
- ▶ Auth-fail and guest VLANs
- ▶ Authentication, Authorisation and Accounting (AAA)
- ▶ Bootloader can be password protected for device security
- ▶ BPDU protection
- ▶ DHCP snooping, IP source guard and Dynamic ARP Inspection (DAI)
- ▶ Dynamic VLAN assignment
- ▶ MAC address filtering and MAC address lock-down
- ▶ Network Access and Control (NAC) features manage endpoint security
- ▶ Port-based learn limits (intrusion detection)
- ▶ Private VLANs provide security and port isolation for multiple customers using the same VLAN
- ▶ Secure Copy (SCP) and Secure File Transfer Protocol (SFTP)
- ▶ Strong password security and encryption
- ▶ Tri-authentication: MAC-based, web-based and IEEE 802.1x
- ▶ RADIUS group selection per VLAN or port

### Environmental Specifications

- ▶ Operating temperature range: 0°C to 40°C (32°F to 104°F)  
Derated by 1°C per 305 meters (1,000 ft)
- ▶ Storage temperature range: -20°C to 60°C (-4°F to 140°F)
- ▶ Operating relative humidity range: 0% to 80% non-condensing
- ▶ Storage relative humidity range: 0% to 95% non-condensing
- ▶ Operating altitude: 3,050 meters maximum (10,000 ft)

### Electrical Approvals and Compliances

- ▶ EMC: EN55022 class A, FCC class A, VCCI class A
- ▶ Immunity: EN55024, EN61000-3-levels 2 (Harmonics), and 3 (Flicker)

### Safety

- ▶ Standards: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950
- ▶ Certification: UL, cUL, TÜV

Physical Specifications

PRODUCT	WIDTH X DEPTH X HEIGHT	MOUNTING	WEIGHT		PACKAGED DIMENSIONS
			UNPACKAGED	PACKAGED	
SwitchBlade x908	440 x 456 x 132 mm (17.32 x 17.95 x 5.19 in)	3 RU	14.32 kg (31.57 lb)	16.7 kg (36.81 lb)	58 x 57 x 25 cm (22.8 x 22.4 x 9.8 in)
PWR05	84 x 299 x 40 mm (3.30 x 11.77 x 1.57 in)	N/A	1.32 kg (2.91 lb)	1.9 kg (4.18 lb)	38 x 16 x 18 cm (14.9 x 6.3 x 7.1 in)
XEM-12Sv2*	109 x 253 x 45 mm (4.29 x 9.96 x 1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)	32 x 20 x 13 cm (12.6 x 7.9 x 5.1 in)
XEM-12Tv2*	109 x 253 x 45 mm (4.29 x 9.96 x 1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)	32 x 20 x 13 cm (12.6 x 7.9 x 5.1 in)
XEM-24T**	109 x 253 x 45 mm (4.29 x 9.96 x 1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)	32 x 20 x 13 cm (12.6 x 7.9 x 5.1 in)
XEM-2XP	109 x 253 x 45 mm (4.29 x 9.96 x 1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)	32 x 20 x 13 cm (12.6 x 7.9 x 5.1 in)
XEM-2XS	109 x 253 x 45 mm (4.29 x 9.96 x 1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)	32 x 20 x 13 cm (12.6 x 7.9 x 5.1 in)

Chassis with 2 x PSU's and 8 x XEMs is 25.2 kg \* Require AlliedWare Plus software release 5.4.2 - 2.5 or later \*\* Require AlliedWare Plus software release 5.4.3 - 2.5 or later

Power Characteristics

PRODUCT	FULLY LOADED (ONE AC PSU)		FULLY LOADED (TWO LOAD-SHARING AC PSUs)	
	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION
SwitchBlade x908	675W	2305 BTU/hr	700W	2390 BTU/hr

Latency (microseconds)

PRODUCT	PORT SPEED			
	10 MBPS	100 MBPS	1 GBPS	10 GBPS
XEM-12Sv2			3.2µs	
XEM-12Tv2	32.6µs	6.3µs	3.7µs	
XEM-24T	32.7µs	6.4µs	3.7µs	
XEM-2XS				4.8µs
XEM-2XP				3.8µs

Restrictions on Hazardous Substances (RoHS) Compliance

- ▶ EU RoHS compliant
- ▶ China RoHS compliant

Country of Origin

- ▶ Singapore

Extended Mode

Extended Mode takes advantage of larger table sizes and increased limits, and can be enabled via the CLI when compatible XEMs are installed:

	STANDARD MODE	EXTENDED MODE
MAC entries	16K	64K
Nexthop entries	2.5K	8K
QoS Traffic Classes	713	4,096
LAGs	31	128
ACLs	1,024	4,096
Compatible XEMs	All	XEM-24T XEM-12Sv2 XEM-12Tv2 XEM-2XP XEM-2XS

Standards and Protocols

AlliedWare Plus Operating System

Version 5.4.8-1

Border Gateway Protocol (BGP)

- BGP dynamic capability
- BGP outbound route filtering
- RFC 1772 Application of the Border Gateway Protocol (BGP) in the Internet
- RFC 1997 BGP communities attribute
- RFC 2385 Protection of BGP sessions via the TCP MD5 signature option
- RFC 2439 BGP route flap damping
- RFC 2545 Use of BGP-4 multiprotocol extensions for IPv6 inter-domain routing
- RFC 2858 Multiprotocol extensions for BGP-4
- RFC 2918 Route refresh capability for BGP-4
- RFC 3392 Capabilities advertisement with BGP-4
- RFC 3882 Configuring BGP to block Denial-of-Service (DoS) attacks
- RFC 4271 Border Gateway Protocol 4 (BGP-4)
- RFC 4360 BGP extended communities
- RFC 4456 BGP route reflection - an alternative to full mesh iBGP
- RFC 4724 BGP graceful restart
- RFC 4893 BGP support for four-octet AS number space
- RFC 5065 Autonomous system confederations for BGP

Cryptographic Algorithms

FIPS Approved Algorithms

- Encryption (Block Ciphers):
  - ▶ AES (ECB, CBC, CFB and OFB Modes)
  - ▶ 3DES (ECB, CBC, CFB and OFB Modes)
- Block Cipher Modes:
  - ▶ CCM
  - ▶ CMAC
  - ▶ GCM
  - ▶ XTS
- Digital Signatures & Asymmetric Key Generation:
  - ▶ DSA
  - ▶ ECDSA

- ▶ RSA
  - Secure Hashing:
    - ▶ SHA-1
    - ▶ SHA-2 (SHA-224, SHA-256, SHA-384, SHA-512)
  - Message Authentication:
    - ▶ HMAC (SHA-1, SHA-2(224, 256, 384, 512))
  - Random Number Generation:
    - ▶ DRBG (Hash, HMAC and Counter)

Non FIPS Approved Algorithms

- RNG (AES128/192/256)
- DES
- MD5

Ethernet

- IEEE 802.2 Logical Link Control (LLC)
- IEEE 802.3 Ethernet
  - IEEE 802.3ab1000BASE-T
  - IEEE 802.3ae10 Gigabit Ethernet
  - IEEE 802.3an10GBASE-T
  - IEEE 802.3azEnergy Efficient Ethernet (EEE)
  - IEEE 802.3u 100BASE-X
  - IEEE 802.3x Flow control - full-duplex operation
  - IEEE 802.3z 1000BASE-X

IPv4 Features

- RFC 768 User Datagram Protocol (UDP)
- RFC 791 Internet Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 793 Transmission Control Protocol (TCP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 894 Standard for the transmission of IP datagrams over Ethernet networks
  - RFC 919 Broadcasting Internet datagrams
  - RFC 922 Broadcasting Internet datagrams in the presence of subnets
- RFC 932 Subnetwork addressing scheme
- RFC 950 Internet standard subnetting procedure
- RFC 951 Bootstrap Protocol (BootP)
- RFC 1027 Proxy ARP
- RFC 1035 DNS client
- RFC 1042 Standard for the transmission of IP datagrams over IEEE 802 networks

RFC 1071	Computing the Internet checksum
RFC 1122	Internet host requirements
RFC 1191	Path MTU discovery
RFC 1256	ICMP router discovery messages
RFC 1518	An architecture for IP address allocation with CIDR
RFC 1519	Classless Inter-Domain Routing (CIDR)
RFC 1542	Clarifications and extensions for BootP
RFC 1591	Domain Name System (DNS)
RFC 1812	Requirements for IPv4 routers
RFC 1918	IP addressing
RFC 2581	TCP congestion control

## IPv6 Features

RFC 1981	Path MTU discovery for IPv6
RFC 2460	IPv6 specification
RFC 2464	Transmission of IPv6 packets over Ethernet networks
RFC 3056	Connection of IPv6 domains via IPv4 clouds
RFC 3484	Default address selection for IPv6
RFC 3596	DNS extensions to support IPv6
RFC 4007	IPv6 scoped address architecture
RFC 4193	Unique local IPv6 unicast addresses
RFC 4291	IPv6 addressing architecture
RFC 4443	Internet Control Message Protocol (ICMPv6)
RFC 4861	Neighbor discovery for IPv6
RFC 4862	IPv6 Stateless Address Auto-Configuration (SLAAC)
RFC 5014	IPv6 socket API for source address selection
RFC 5095	Deprecation of type 0 routing headers in IPv6
RFC 5175	IPv6 Router Advertisement (RA) flags option
RFC 6105	IPv6 Router Advertisement (RA) guard

## Management

AMF MIB and SNMP traps	
AT Enterprise MIB	
Optical DDM MIB	
SNMPv1, v2c and v3	
IEEE 802.1ABLink Layer Discovery Protocol (LLDP)	
RFC 1155	Structure and identification of management information for TCP/IP-based Internets
RFC 1157	Simple Network Management Protocol (SNMP)
RFC 1212	Concise MIB definitions
RFC 1213	MIB for network management of TCP/IP-based Internets: MIB-II
RFC 1215	Convention for defining traps for use with the SNMP
RFC 1227	SNMP MUX protocol and MIB
RFC 1239	Standard MIB
RFC 1724	RIPv2 MIB extension
RFC 2578	Structure of Management Information v2 (SMIv2)
RFC 2579	Textual conventions for SMIv2
RFC 2580	Conformance statements for SMIv2
RFC 2674	Definitions of managed objects for bridges with traffic classes, multicast filtering and VLAN extensions
RFC 2741	Agent extensibility (AgentX) protocol
RFC 2787	Definitions of managed objects for VRRP
RFC 2819	RMON MIB (groups 1,2,3 and 9)
RFC 2863	Interfaces group MIB
RFC 3176	sFlow: a method for monitoring traffic in switched and routed networks
RFC 3411	An architecture for describing SNMP management frameworks
RFC 3412	Message processing and dispatching for the SNMP
RFC 3413	SNMP applications
RFC 3414	User-based Security Model (USM) for SNMPv3
RFC 3415	View-based Access Control Model (VACM) for SNMP
RFC 3416	Version 2 of the protocol operations for the SNMP
RFC 3417	Transport mappings for the SNMP
RFC 3418	MIB for SNMP
RFC 3635	Definitions of managed objects for the Ethernet-like interface types
RFC 3636	IEEE 802.3 MAU MIB
RFC 4022	SNMPv2 MIB for TCP using SMIv2

RFC 4113	SNMPv2 MIB for UDP using SMIv2
RFC 4188	Definitions of managed objects for bridges
RFC 4292	IP forwarding table MIB
RFC 4293	SNMPv2 MIB for IP using SMIv2
RFC 4318	Definitions of managed objects for bridges with RSTP
RFC 4560	Definitions of managed objects for remote ping, traceroute and lookup operations
RFC 5424	Syslog protocol
RFC 6527	Definitions of managed objects for VRRPv3

## Multicast Support

Bootstrap Router (BSR) mechanism for PIM-SM	
IGMP query solicitation	
IGMP snooping (IGMPv1, v2 and v3)	
IGMP snooping fast-leave	
IGMP/MLD multicast forwarding (IGMP/MLD proxy)	
MLD snooping (MLDv1 and v2)	
PIM-SM and SSM for IPv6	
RFC 1112	Host extensions for IP multicasting (IGMPv1)
RFC 2236	Internet Group Management Protocol v2 (IGMPv2)
RFC 2710	Multicast Listener Discovery (MLD) for IPv6
RFC 2715	Interoperability rules for multicast routing protocols
RFC 3306	Unicast-prefix-based IPv6 multicast addresses
RFC 3376	IGMPv3
RFC 3810	Multicast Listener Discovery v2 (MLDv2) for IPv6
RFC 3956	Embedding the Rendezvous Point (RP) address in an IPv6 multicast address
RFC 3973	PIM Dense Mode (DM)
RFC 4541	IGMP and MLD snooping switches
RFC 4601	Protocol Independent Multicast - Sparse Mode (PIM-SM): protocol specification (revised)
RFC 4604	Using IGMPv3 and MLDv2 for source-specific multicast
RFC 4607	Source-specific multicast for IP

## Open Shortest Path First (OSPF)

OSPF link-local signaling	
OSPF MD5 authentication	
Out-of-band LSDB resync	
RFC 1245	OSPF protocol analysis
RFC 1246	Experience with the OSPF protocol
RFC 1370	Applicability statement for OSPF
RFC 1765	OSPF database overflow
RFC 2328	OSPFv2
RFC 2370	OSPF opaque LSA option
RFC 2740	OSPFv3 for IPv6
RFC 3101	OSPF Not-So-Stubby Area (NSSA) option
RFC 3509	Alternative implementations of OSPF area border routers
RFC 3623	Graceful OSPF restart
RFC 3630	Traffic engineering extensions to OSPF
RFC 4552	Authentication/confidentiality for OSPFv3
RFC 5329	Traffic engineering extensions to OSPFv3
RFC 5340	OSPFv3 for IPv6 (partial support)

## Resiliency Features

IEEE 802.1AXLink aggregation (static and LACP)	
IEEE 802.1D MAC bridges	
IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)	
IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)	
IEEE 802.3adStatic and dynamic link aggregation	
RFC 5798	Virtual Router Redundancy Protocol version 3 (VRRPv3) for IPv4 and IPv6

## Routing Information Protocol (RIP)

RFC 1058	Routing Information Protocol (RIP)
RFC 2080	RIPng for IPv6
RFC 2081	RIPng protocol applicability statement
RFC 2082	RIP-2 MD5 authentication
RFC 2453	RIPv2

## Quality of Service (QoS)

IEEE 802.1p Priority tagging	
RFC 2211	Specification of the controlled-load network element service ng for IPv6

RFC 2081	RIPng protocol applicability statement
RFC 2082	RIP-2 MD5 authentication
RFC 2453	RIPv2

## Security Features

SSH remote login	
SSLv2 and SSLv3	
TACACS+ Accounting, Authentication, Authorization (AAA)	
IEEE 802.1X authentication protocols (TLS, TTLS, PEAP and MD5)	
IEEE 802.1X multi-suplicant authentication	
IEEE 802.1X port-based network access control	
RFC 2560	X.509 Online Certificate Status Protocol (OCSP)
RFC 2818	HTTP over TLS ("HTTPS")
RFC 2865	RADIUS authentication
RFC 2866	RADIUS accounting
RFC 2868	RADIUS attributes for tunnel protocol support
RFC 2986	PKCS #10: certification request syntax specification v1.7
RFC 3546	Transport Layer Security (TLS) extensions
RFC 3579	RADIUS support for Extensible Authentication Protocol (EAP)
RFC 3580	IEEE 802.1x RADIUS usage guidelines
RFC 3748	PPP Extensible Authentication Protocol (EAP)
RFC 4251	Secure Shell (SSHv2) protocol architecture
RFC 4252	Secure Shell (SSHv2) authentication protocol
RFC 4253	Secure Shell (SSHv2) transport layer protocol
RFC 4254	Secure Shell (SSHv2) connection protocol
RFC 5246	Transport Layer Security (TLS) v1.2
RFC 5280	X.509 certificate and Certificate Revocation List (CRL) profile
RFC 5425	Transport Layer Security (TLS) transport mapping for Syslog
RFC 5656	Elliptic curve algorithm integration for SSH
RFC 6125	Domain-based application service identity within PKI using X.509 certificates with TLS
RFC 6614	Transport Layer Security (TLS) encryption for RADIUS
RFC 6668	SHA-2 data integrity verification for SSH

## Services

RFC 854	Telnet protocol specification
RFC 855	Telnet option specifications
RFC 857	Telnet echo option
RFC 858	Telnet suppress go ahead option
RFC 1091	Telnet terminal-type option
RFC 1350	Trivial File Transfer Protocol (TFTP)
RFC 1985	SMTP service extension
RFC 2049	MIME
RFC 2131	DHCPv4 (server, relay and client)
RFC 2132	DHCP options and BootP vendor extensions
RFC 2616	Hypertext Transfer Protocol - HTTP/1.1
RFC 2821	Simple Mail Transfer Protocol (SMTP)
RFC 2822	Internet message format
RFC 3046	DHCP relay agent information option (DHCP option 82)
RFC 3315	DHCPv6 (server, relay and client)
RFC 3633	IPv6 prefix options for DHCPv6
RFC 3646	DNS configuration options for DHCPv6
RFC 3993	Subscriber-ID suboption for DHCP relay agent option
RFC 4330	Simple Network Time Protocol (SNTP) version 4
RFC 5905	Network Time Protocol (NTP) version 4

## VLAN Support

Generic VLAN Registration Protocol (GVRP)	
IEEE 802.1ad Provider bridges (VLAN stacking, Q-in-Q)	
IEEE 802.1Q Virtual LAN (VLAN) bridges	
IEEE 802.1v VLAN classification by protocol and port	
IEEE 802.3acVLAN tagging	

## Voice over IP (VoIP)

LLDP-MED	ANSI/TIA-1057
Voice VLAN	

## Feature Licenses

NAME	DESCRIPTION	INCLUDES	STACK LICENSING
AT-FL-SBX9-01	SwitchBlade x908 Advanced Layer 3 license	<ul style="list-style-type: none"> <li>▶ OSPF<sup>1</sup> (10,000 routes)</li> <li>▶ PIM-v4-SM, DM &amp; SSM</li> <li>▶ VLAN double tagging (Q-in-Q)</li> <li>▶ BGP4<sup>1</sup> (5,000 routes)</li> <li>▶ VRF Lite (64 domains)</li> <li>▶ UDLD</li> </ul>	One license per stack member
AT-FL-SBX9-02	SwitchBlade x908 IPv6 Pack	<ul style="list-style-type: none"> <li>▶ RIPng (1,000 routes)</li> <li>▶ MLDv1 &amp; v2</li> <li>▶ PIMv6-SM and SSM</li> <li>▶ BGP4+ for IPv6 (5,000 routes)</li> <li>▶ OSPFv3 (8,000 routes)</li> </ul>	One license per stack member
AT-FL-RADIUS-FULL	Increase local RADIUS server support limits <sup>2</sup>	<ul style="list-style-type: none"> <li>▶ 5000 users</li> <li>▶ 1000 NAS</li> </ul>	One license per stack member
AT-FL-SBX9-AM40-1YR	AMF Master License	▶ AMF Master 40 nodes for 1 year	One license per stack
AT-FL-SBX9-AM40-5YR	AMF Master License	▶ AMF Master 40 nodes for 5 years	One license per stack

<sup>1</sup> 64 OSPF and BGP routes included in base software

<sup>2</sup> 100 users and 24 NAS can be stored in local RADIUS database with base software



## Ordering Information

### SwitchBlade x908

Advanced Layer 3 modular switch chassis  
8 x high speed expansion bays

### AT-PWR05-xx

Hot-swappable load-sharing power supply

### AT-FAN03<sup>3</sup>

Spare fan module

### AT-XEM-2XP

2 x 10GbE (XFP) ports

### AT-XEM-2XS

2 x 10GbE (SFP+) ports

### AT-XEM-24T

24 x 10/100/1000T (RJ Point 5) ports

### AT-XEM-12Sv2

12 x 1000X SFP ports

### AT-XEM-12Tv2

12 x 10/100/1000T (RJ-45) ports

### AT-HS-STK-CBL650

650mm high speed stacking cable

Where xx = 10 for AC power supply with US power cord  
20 for AC power supply with no power cord  
30 for AC power supply with UK power cord  
40 for AC power supply with AU power cord  
50 for AC power supply with EU power cord  
80 for DC power supply

Note that NO power supplies ship with the base chassis product, they must be ordered separately.



## Accessories

### SFP Modules

#### AT-SPTX

1000T 100m copper

#### AT-SPSX

1000SX GbE multi-mode 850 nm fiber up to 550 m

#### AT-SPSX/I

1000SX GbE multi-mode 850 nm fiber up to 550 m industrial temperature

#### AT-SPEX

1000X GbE multi-mode 1310nm fiber up to 2 km

#### AT-SPLX10

1000LX GbE single-mode 1310 nm fiber up to 10 km

#### AT-SPLX10/I

1000LX GbE single-mode 1310 nm fiber up to 10 km industrial temperature

#### AT-SPBD10-13

1000LX GbE Bi-Di (1310 nm Tx, 1490 nm Rx) fiber up to 10 km

#### AT-SPBD10-14

1000LX GbE Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 10 km

#### AT-SPLX40

1000LX GbE single-mode 1310 nm fiber up to 40 km

#### AT-SPZX80

1000ZX GbE single-mode 1550 nm fiber up to 80 km

#### AT-SPBD20-13/I

1000BX GbE Bi-Di (1310 nm Tx, 1550 nm Rx) fiber up to 20 km

#### AT-SPBD20-14/I

1000BX GbE Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 20 km

### 10GbE XFP Modules

#### For use with XEM-2XP

#### AT-XPSR

10GbE-SR 850 nm short-haul, 300 m with MMF

#### AT-XPLR

10GbE-LR 1310 nm medium-haul, 10 km with SMF

#### AT-XPER40

10GbE-ER 1550 nm long-haul, 40 km with SMF

### 10GbE SFP+ Modules

#### For use with XEM-2XS

#### AT-SP10SR

10GSR 850 nm short-haul, 300 m with MMF

#### AT-SP10SR/I

10GSR 850 nm short-haul, 300 m with MMF industrial temperature

#### AT-SP10LRM

10GLRM 1310 nm short-haul, 220 m with MMF

#### AT-SP10LR

10GLR 1310 nm medium-haul, 10 km with SMF

#### AT-SP10LR/I

10GLR 1310 nm medium-haul, 10 km with SMF industrial temperature

#### AT-SP10LR20/I

10GER 1310nm long-haul, 20 km with SMF industrial temperature

#### AT-SP10ER40/I

10GER 1310nm long-haul, 40 km with SMF industrial temperature

#### AT-SP10ZR80/I

10GER 1550nm long-haul, 80 km with SMF industrial temperature

#### AT-SP10T

10GBase-T 20 m copper\*

\* Using Cat 6a/7 cabling

### 10GbE SFP+ Cables for use with XEM-2XS

#### AT-SP10TW1

1 meter SFP+ direct attach cable

#### AT-SP10TW3

3 meter SFP+ direct attach cable

#### AT-SP10TW7

7 meter SFP+ direct attach cable



### RJ.5 to RJ45 Cables For use with XEM-24T

#### AT-UTP/RJ.5-100-A-008

RJ.5 to RJ45 1 m Ethernet cables (pack of 8)

#### AT-UTP/RJ.5-300-A-008

RJ.5 to RJ45 3 m Ethernet cables (pack of 8)

<sup>3</sup> For spares only. Fan modules are included with chassis.

