IE510-28GSX

Industrial Ethernet, Stackable Layer 3 Switch

Our ruggedized IE510-28GSX Industrial Ethernet switch is built for enduring performance in harsh environments, such as those found in manufacturing, transportation and physical security. Offering high throughput, rich functionality and advanced security features, the IE510-28GSX switch delivers the performance and reliability demanded by industrial deployments in the Internet of Things (IoT) age.

Overview

The Allied Telesis IE510-28GSX Layer 3 wirespeed switch is ideal for industrial Ethernet applications. With a wide operating temperature range of between -40° C and 75° C, it tolerates harsh and demanding environments, such as those found in industrial and outdoor deployment.

Device management is provided via Industry-standard CLI, SNMP, Telnet, SSH, or Allied Telesis Autonomous Management Framework™ (AMF). AMF is unique to Allied Telesis managed devices, offering simplified device provisioning, recovery and firmware upgrade management.

Performance

The IE510-28GSX managed switch is high-performance and cost-effective, and meets the high reliability requirements of industrial network operations. This robust switch provides network managers with several key features using simple web-based management functions, including port-based VLANs, IEEE 802.1p, QoS, port trunking/link aggregation, port mirroring, priority queues, and IEEE 802.1x security support. With support for up to 16K MAC addresses, the IE510-28GSX switch is the ideal option for integrating management into any network solution.

Secure

Advanced security features protect the network. Unprecedented control over user access is provided with Network Access Control (NAC), mitigating threats to network infrastructure. This ensures the network is accessed only by known users and devices—all users' adherence to network security policies is checked, and then either access is granted or remediation is offered. Secure access can also be provided for guests. A secure network environment is guaranteed. The IE510-28GSX offers powerful control over network traffic types, secure management options, loop guard to protect against cabling mistakes, and tri-authentication for comprehensive access control.

High network resiliency

The convergence of network services in the enterprise has led to increasing demand for highly available networks with minimal downtime. VCStack™, in conjunction with link aggregation, provides a network with no single point of failure, and is a simple solution for resiliency in access applications.

The IE510-28GSX supports highly stable and reliable ICT network switching, with recovery times down to 50ms. Choices include Allied Telesis Ethernet Protection Switched Ring (EPSRing™), and the standards-based ITU-T G.8032—Ethernet Ring Protection Switching (ERPS).

For high-availability automation networks based on Ethernet technology, the IE510-28GSX may run the Media Redundancy Protocol (MRP) for a deterministic failover on ring topology.

The IE510-28GSX can form a VCStack of up to four units for enhanced resiliency and simplified device management. Full EPSRing support and VCStack-LD (Long Distance), which enables stacks to be created over long distance fiber links, make the IE510-28GSX the perfect choice for distributed environments.

Key Features

- AlliedWare Plus™
- Autonomous Management Framework™ (AMF)
- OpenFlow for SDN
- Routing capability (ECMP, OSPF, RIP, Static)
- Industry-leading QoS
- Active Fiber Monitoring (AFM)
- sFlow
- Ethernet Protection Switched Ring (EPSRing™)
- EPSR Master
- Ethernet Ring Protection Switching (ITU-T G.8032)
- High-availability automation network support (MRP)
- Upstream Forwarding Only (UFO)
- Redundant power inputs
- Alarm input/output
- USB port for image/configuration backup, restore and upgrade
- VCStack and VCStack-LD
- Modbus support
- Web-based GUI for easy management

Future-proof

The IE510-28GSX ensures a future-proof network, with superior flexibility coupled with the ability to stack multiple units. The IE510-28GSX model features 1/10 Gigabit uplink ports and a comprehensive IPv6 feature set, to ensure it is ready for future network traffic demands. These models are Software Defined Networking (SDN) ready, supporting OpenFlow v1.3.

KEY FEATURES

Allied Telesis Autonomous Management Framework™ (AMF)

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.

VCStack™ (Virtual Chassis Stacking)

Create a VCStack of up to four units with 40Gbps of stacking bandwidth to each unit. Stacking links are connected in a ring so each device has dual connections to further improve resiliency. VCStack provides a highly available system where network resources are spread out across stacked units, reducing the impact if one of the units fails. Aggregating switch ports on different units across the stack provides excellent network resiliency.

Long-distance stacking allows a VCStack to be created over longer distances, perfect for a distributed network environment.

Software Defined Networking (SDN)

OpenFlow is a key technology that enables the use of SDN to build smart applications that unlock value and reduce cost.

Resiliency

EPSRing and ITU-T G.8032 ERPS enable a protected ring capable of recovery within as little as 50ms. These features are perfect for high performance and high availability.

High-availability automation networks are achieved by means of de facto standards Media Redundancy Protocol (MRP) as defined by the IEC 62439-2; MRP is specified only for ring networks with up to 50 devices, and guarantees fully deterministic switchover behavior.

Spanning Tree Protocol compatible. RSTP, MSTP, static Link Aggregation Group (LAG), and dynamic Link Aggregation Control Protocol (LACP) support.

Industry-leading 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 such as voice and video take precedence over non-essential services such as file downloads, maintaining responsiveness of your applications.

Loop Protection

Thrash limiting, also known as rapid MAC movement, detects and resolves network loops. It is highly user-configurable — from the rate of looping traffic to the type of action the switch should take when it detects a loop.

With thrash limiting, the switch only detects a loop when a storm has occurred, which can potentially cause disruption to the network. To avoid this, loop detection works in conjunction with thrash limiting to send special Loop Detection Frame (LDF) packets that the switch listens for. If a port receives an LDF packet, you can choose to disable the port, disable the link, or send an SNMP trap. This feature can help to detect loops before a network storm occurs, avoiding the risk and inconvenience of traffic disruption.

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 defense against security threats. Sampled packets sent to a collector (up to 5 collectors can be configured) ensure it always has a real-time view of network traffic.

Active Fiber Monitoring (AFM)

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. Active Fiber Monitoring is supported on fiber data and fiber stacking links.

UniDirectional Link Detection (UDLD)

UniDirectional Link Detection (UDLD) is useful for monitoring fiber-optic links between two switches that use two single-direction fibers to transmit and receive packets. UDLD prevents traffic from being sent across a bad link by blocking the ports at both ends of the link in the event that either the individual transmitter or receiver for that connection fails.

Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP–MED)

LLDP-MED extends LLDP basic network endpoint discovery and management functions. LLDP-MED allows for media endpoint specific messages, providing detailed information on power equipment, network policy, location discovery (for Emergency Call Services) and inventory.

VLAN Translation

VLAN Translation allows traffic arriving on a VLAN to be mapped to a different VLAN on the outgoing paired interface.

In Metro networks, it is common for the Network Service Provider to give each customer their own unique VLAN, yet at the customer location, give all the customers the same VLAN-ID for tagged packets to use on the wire. VLAN-ID translation can be used by the Service Provider to change the tagged packet's VLAN-ID at the customer location to the VLAN-ID for tagged packets to use within the NSP's network.

This feature is also useful in Enterprise environments where it can be used to merge two networks together without manually reconfiguring the VLAN numbering scheme. This situation can occur if two companies have merged and the same VLAN-ID is used for two different purposes.

Voice VLAN

Voice VLAN automatically separates voice and data traffic into two different VLANs. This automatic separation places delay-sensitive traffic into a voice-dedicated VLAN, which simplifies QoS configurations.

VLAN Mirroring (RSPAN)

VLAN mirroring allows traffic from a port on a remote switch to be analyzed locally. Traffic being transmitted or received on the port is duplicated and sent across the network on a special VLAN.

Security (Tri-authentication)

Authentication options on the IE510-28GSX also include alternatives to IEEE 802.1X port-based authentication, such as web authentication, to enable guest access and MAC authentication for endpoints that do not have an IEEE 802.1X supplicant. All three authentication methods— IEEE 802.1X, MAC-based and Web-based—can be enabled simultaneously on the same port for tri-authentication.

Access Control Lists (ACLs)

AlliedWare Plus delivers industry-standard Access Control functionality through ACLs. ACLs filter network traffic to control whether routed packets are forwarded or blocked at the port interface. This provides a powerful network security mechanism to select the types of traffic to be analyzed, forwarded, or influenced in some way.

Upstream Forwarding Only (UFO)

UFO lets you manage which ports in a VLAN can communicate with each other, and which only have upstream access to services, for secure multi-user deployment.

Dynamic Host Configuration Protocol (DHCP) Snooping

DHCP servers allocate IP addresses to clients, and the switch keeps a record of addresses issued on each port. IP source guard checks against this DHCP snooping database to ensure only clients with specific IP and/or MAC address can access the network. DHCP snooping can be combined with other features, like dynamic ARP inspection, to increase security in layer 2 switched environments, and also provides a traceable history, which meets the growing legal requirements placed on service providers.

Alarm Input/Output

Alarm Input/Output are useful for security integration solution; they respond to events instantly and automatically by a pre-defined event scheme, and notify alert message to the monitoring control center. The 2-pin terminal blocks may be connected to sensors and actuator relays. Alarm Input receives signal from external devices like motion sensor and magnets; that will trigger subsequent actions if something changes. Alarm output controls external device upon a event (i.e. sirens, strobes, PTZ camera).

Premium Software License

By default, the IE510-28GSX offers a comprehensive Layer 2 and basic Layer 3 feature set that includes static routing and IPv6 management features. The feature set can easily be upgraded with premium software licenses.

Modbus

Modbus enables communication with Supervisory Control and Data Acquisition (SCADA) systems for industrial automation.

SPECIFICATIONS

Product Specifications

	100/1000X SFP Ports	1/10 Gigabit SFP+ Ports	10 Gigabit Stacking Ports	Switching Fabric	Forwarding Rate (64-Byte Packets)	Stacking Bandwidth
IE510-28GSX	24	4 (2 if stacked)	2*	128Gbps	95.2Mpps	40Gbps

* Stacking ports can be configured as additional 1G/10G Ethernet ports when unit is not stacked

Physical Specifications

	Width	Depth	Height	Weight	Enclosure	Mounting	Protection Rate
IE510-28GSX	440 mm (17.32 in)	300 mm (11.80 in)	44 mm (1.73 in)	4.8 Kg (10.58 lb)	metal shell/	rack mount	IP30

Power and Noise Characteristics

	Input Voltage	Cooling	No PoE Load		
			Max Power Consumption	Max Heat Dissipation	Noise
IE510-28GSX	±48V DC, ±60V DC *	Fan	74W**	252 BTU/h**	45 dBA

* auto-ranging ** including SFP transceivers' consumption and margin
Noise: tested to ISO7779; front bystander position

Latency (microseconds)

	Port Speed		
	100Mbps	1Gbps	10Gbps
IE510-28GSX	14.5µs	4.4µs	3.1µs

Performance

MAC address	16K entries
Packet Buffer	2 MBytes (16 Mbits)
Priority Queues	8
Simultaneous VLANs	4K
VLANs ID range	1–4094
Jumbo frames	13KB L2 jumbo frames
Multicast groups	1K (Layer 2), 256 (Layer 3)
Routes	2K (IPv4), 256 (IPv6)

Other Interfaces

Type	Serial console (UART)
Port no.	1
Connector	RJ-45 female
Type	USB2.0 (Host Controller Class)
Port no.	1
Connector	Type A receptacle
Type	Alarm Input
Port no.	1
Connector	RJ-45 female
Type	Alarm output
Port no.	1[7]
Connector	RJ-45 female
Type	Power Input
Port no.	2
Connector	2-pin Terminal Block

Reliability

- Modular AlliedWare™ operating system
- Redundant power input
- Full environmental monitoring of temperature and internal voltages. SNMP traps alert network managers in case of any failure

Expandability

- Stack up to four units in a VCStack
- Premium license option for additional features

Flexibility and Compatibility

- Gigabit SFP ports will support any combination of Allied Telesis 100Mbps and 1000Mbps SFP modules listed in this document under Ordering Information
- 10G SFP+ ports will support any combination of Allied Telesis 1000Mbps SFP and 10GbE SFP+ modules and direct attach cables listed in this document under Ordering Information
- Stacking ports can be configured as 10G Ethernet ports
- Port speed and duplex configuration can be set manually or by auto-negotiation

Diagnostic Tools

- Active Fiber Monitoring detects tampering on optical links
- Automatic link flap detection and port shutdown
- Built-In Self Test (BIST)
- Cable fault locator (TDR)
- Event logging via Syslog over IPv4
- Find-me device locator
- Optical Digital Diagnostic Monitoring (DDM)
- Ping polling and TraceRoute for IPv4 and IPv6
- Port and VLAN mirroring (RSPAN)
- UniDirectional Link Detection (UDLD)
- IEEE 802.1ag CCP Connectivity Fault Management–Continuity Check Protocol (CCP)

IPv4 Features

- Black hole routing
- Directed broadcast forwarding
- DHCP server and relay
- DNS relay
- Equal Cost Multi Path (ECMP) routing
- Policy-based routing
- Route redistribution (OSPF, RIP)
- Static unicast and multicast routes for IPv4
- UDP broadcast helper (IP helper)

IPv6 Features

- Device management over IPv6 networks with SNMPv6, Telnetv6 and SSHv6
- DHCPv6 relay, DHCPv6 client
- DNSv6 relay, DNSv6 client
- IPv4 and IPv6 dual stack
- IPv6 hardware ACLs
- NTPv6 client and server
- Static unicast and multicast routes for IPv6
- IPv6 Ready certified

Management

- Front panel seven-segment LED provides at-a-glance status and fault information
- Allied Telesis Autonomous Management Framework (AMF) enables powerful centralized management and zero-touch device installation and recovery
- Console management port on the front panel for ease of access
- Eco-friendly mode allows LEDs to be disabled to save power
- Web-based Graphical User Interface (GUI)
- Industry-standard CLI with context-sensitive help
- Powerful CLI scripting engine
- Built-in text editor
- Event-based triggers allow user-defined scripts to be executed upon selected system events
- SNMPv1/v2c/v3
- Comprehensive SNMP MIB support for standards based device management

- USB interface allows software release files, configurations, and other files to be stored for backup and distribution to other devices

Quality of Service

- Eight 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
- 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)
- Ethernet Protection Switched Ring (EPSRing™) with SuperLoop Protection (SLP)
- Ethernet Ring Protection Switching (ITU-T G.8032)
- Link Aggregation Control Protocol (LACP)
- Long-Distance stacking (VCStack-LD)
- Loop protection: loop detection and thrash limiting
- Media Redundancy Protocol (MRP)
- Multiple Spanning Tree Protocol (MSTP)
- PVST+ compatibility mode
- Rapid Spanning Tree Protocol (RSTP)
- Spanning Tree Protocol (STP) with root guard
- Stacking ports can be configured as 10G Ethernet ports
- Virtual Router Redundancy Protocol (VRRPv3)

Multicasting

- Internet Group Membership Protocol (IGMPv1/v2/v3)
- IGMP proxy
- IGMP snooping with fast leave and no timeout feature
- IGMP static groups
- Multicast Listener Discovery (MLDv1/v2)
- MLD snooping
- Protocol Independent Multicast (PIM)
- PIM Dense Mode (DM) for IPv4 and IPv6
- PIM Sparse Mode (SM) for IPv4 and IPv6
- PIM Dense Mode to Sparse Mode translation

Security Features

- Access Control Lists (ACLs) based on Layer 3 and 4 headers
- Dynamic ACLs assigned via port authentication
- ACL Groups enable multiple hosts/ports to be included in a single ACL, reducing configuration
- Auth-fail and guest VLANs
- Configurable ACLs for management traffic
- Authentication, Authorization and Accounting (AAA)
- Bootloader can be password protected for device security
- BPDU protection
- DHCP snooping, IP source guard and Dynamic ARP Inspection (DAI)
- DoS attack blocking and virus throttling
- Dynamic VLAN assignment
- MAC address filtering and MAC address lockdown
- Network Access 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
- RADIUS local server (100 users) and accounting
- Secure Copy (SCP)
- Strong password security and encryption
- TACACS+ Authentication and Accounting
- Tri-authentication: MAC-based, web-based and IEEE 802.1X

Environmental Specifications

- Operating temperature range: -40°C to 75°C (-40°F to 167°F)
- Storage temperature range: -40°C to 85°C (-40°F to 185°F)
- Operating humidity range: 5% to 95% non-condensing
- Storage humidity range: 5% to 95% non-condensing
- Operating altitude: up to 3,000 meters (9,842 ft)

Environmental Compliance

- RoHS
- China RoHS
- WEEE

Electrical/Mechanical Approvals

Compliance Mark	CE, FCC, VCCI
Safety	EN/IEC/UL 60950-1 CAN/CSA-22.2 no. 60950-1
EMC	CISPR 32 EN55024 EN55032 Class A EN50121-4 EN61000-3-2 EN61000-3-3 EN61000-4-2 (ESD) EN61000-4-3 (RS) EN61000-4-4 (EFT) EN61000-4-5 (Surge) EN61000-4-6 (CS) EN61000-4-8 EN61000-4-11 EN/IEC61000-6-4 FCC Part 15B, Class A ICES-003, Class A VCCI, Class A

STANDARDS & PROTOCOLS

AlliedWare Plus Operating System

Version 5.5.5-1

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 802.1AX Link aggregation (static and LACP)
IEEE 802.2 Logical Link Control (LLC)
IEEE 802.3 Ethernet
IEEE 802.3ab 1000T
IEEE 802.3ad Static and dynamic link aggregation
IEEE 802.3ae 10 Gigabit Ethernet
IEEE 802.3af Power over Ethernet (PoE)
IEEE 802.3at Power over Ethernet Plus (PoE+)
IEEE 802.3az Energy Efficient Ethernet (EEE)
IEEE 802.3u 100X
IEEE 802.3x Flow control – full-duplex operation
IEEE 802.3z 1000X

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 2711	IPv6 router alert option
R FC 3056	Connection of IPv6 domains via IPv4 cloud
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 802.1AB Link 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 2011 SNMPv2 MIB for IP using SMIv2
RFC 2012 SNMPv2 MIB for TCP using SMIv2
RFC 2013 SNMPv2 MIB for UDP using SMIv2
RFC 2096 IP forwarding table MIB
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 3621 Power over Ethernet (PoE) MIB
RFC 3635 Definitions of managed objects for the Ethernet-like interface types
RFC 3636 IEEE 802.3 MAU MIB
RFC 4188 Definitions of managed objects for bridges
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 The 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 3618 Multicast Source Discovery Protocol (MSDP)
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

Quality of Service (QoS)

IEEE 802.1p Priority tagging
RFC 2211 Specification of the controlled-load network element service
RFC 2474 DiffServ precedence for eight queues/port
RFC 2475 DiffServ architecture
RFC 2597 DiffServ Assured Forwarding (AF)
RFC 2697 A single-rate three-color marker
RFC 2698 A two-rate three-color marker
RFC 3246 DiffServ Expedited Forwarding (EF)

Resiliency Features

IEC 62439-2 Media Redundancy Protocol (MRP)
IEEE 802.3ad Static and dynamic link aggregation
EEE 802.1ag CFM Continuity Check Protocol (CCP)
IEEE 802.1AX Link 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)
ITU-T G.8032 / Y.1344 Ethernet Ring Protection Switching (ERPS)
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

Security Features

SSH remote login
SSLv2 and SSLv3
TACACS+ Accounting and Authentica)
IEEE 802.1X Authentication protocols (TLS, TTLS, PEAP and MD5)
IEEE 802.1X Multi-supplicant 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 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 5176 RADIUS CoA (Change of Authorization)
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 The TFTP protocol (revision 2)
RFC 1985 SMTP service extension
RFC 2049 MIME
RFC 2131 DHCPv4 (server, relay and client)
RFC 2132 DHCP options and BootP vendor extensions
RFC 2554 SMTP service extension for authentication
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 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)
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 LAN Features

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 802.3ac VLAN tagging

Voice over IP (VoIP)

LLDP-MED ANSI/TIA-1057
Voice VLAN

FEATURE LICENSES

	Description	Includes
AT-FL-IE5-L2-01	IE510-28GSX Layer-2 Premium license	■ EPSR Master ■ VLAN Translation ■ VLAN double tagging (QinQ) ■ UDLD
AT-FL-IE5-L3-01	IE510-28GSX Layer-3 Premium license	■ OSPF ■ OSPFv3 ■ PIM-SM, DM and SSM ■ PIMv6-SM and SSM ■ RIP ■ RIPng ■ VRRP
AT-FL-IE5-G8032	IE510-28GSX license for ITU-T G.8032	■ ITU-T G.8032 ■ Ethernet CFM
AT-FL-IE5-MRP	MRP license	■ Media Redundancy Protocol
AT-FL-IE5-OF13-1YR	OpenFlow license	■ OpenFlow v1.3 for 1 year
AT-FL-IE5-OF13-5YR	OpenFlow license	■ OpenFlow v1.3 for 5 years
AT-FL-IE5-MODB	Modbus license	■ Modbus for industrial applications

ORDERING INFORMATION

AT-IE510-28GSX-80	24x 100/1000X SFP, 4x 1/10G SFP+, Industrial Ethernet, Stackable Layer 3 Switch
Power Supplies	
AT-IE048-240-20	240W @48Vdc, Industrial AC/DC power supply, DIN rail mount (5 years warranty)
AT-SDR120-48	120W @48Vdc, Industrial AC/DC power supply DIN rail mount
AT-SDR240-48	240W @48Vdc, Industrial AC/DC power supply DIN rail mount)

Accessories

Refer to the installation guide for the recommended Maximum Operating Temperature according to the selected SFP module.

10Gbps SFP+ Modules	
AT-SP10TW1	Twinax direct attach cable (1 meter)
AT-SP10TW3	Twinax direct attach cable (3 meters)
AT-SP10TW7	Twinax direct attach cable (7 meters)
AT-SP10ER40/I	10Gbps ER SFP+, 40 km
AT-SP10LR	10Gbps LR SFP+, 10 km
AT-SP10LR20/I	10 Gigabit Small Form-Factor, 20 km
AT-SP10LRM	10Gbps LRM SFP+, 550 m

AT-SP10SR	10Gbps SR SFP+, 300 m
AT-SP10SR/I	10Gbps SR SFP+, 300 m
AT-SP10ZR80/I	10Gbps ZR SFP+, 80 km)
1000Mbps SFP Modules	
AT-SPBD10-13	10 km, 1G BiDi SFP, LC, SMF, I-Temp (1310 Tx/1490 Rx)
AT-SPBD10-14	10 km, 1G BiDi SFP, LC, SMF, I-Temp (1490 Tx/1310 Rx)
AT-SPBD20-13/I	20 km, 1G BiDi SFP, SC, SMF, I-Temp, (1310 Tx/1490 Rx)

1000Mbps SFP Modules	
AT-SPBD20-14/I	20 km, 1G BiDi SFP, SC, SMF, I-Temp, (1490 Tx/1310 Rx)
AT-SPBD20LC/I-13	20 km, 1G BiDi SFP, LC, SMF, I-Temp, (1310 Tx/1490 Rx)
AT-SPBD20LC/I-14	20 km, 1G BiDi SFP, LC, SMF, I-Temp, (1490 Tx/1310 Rx)
AT-SPEX	2 km, 1000EX SFP, LC, MMF, 1310 nm
AT-SPEX/E	2 km, 1000EX SFP, LC, MMF, 1310 nm, Ext. Temp
AT-SPLX10	10 km, 1000LX SFP, LC, SMF, 1310 nm
AT-SPLX10/I	10 km, 1000LX SFP, LC, SMF, 1310 nm, I-Temp
AT-SPLX10/E	10 km, 1000LX SFP, LC, SMF, 1310 nm, Ext. Temp
AT-SPLX40	40 km, 1000LX SFP, LC, SMF, 1310 nm
AT-SPLX40/E	40 km, 1000LX SFP, LC, SMF, 1310 nm, Ext. Temp
AT-SPSX	550 m, 1000SX SFP, LC, MMF, 850 nm
AT-SPSX/I	550 m, 1000SX SFP, LC, MMF, 850 nm, Ext. Temp
AT-SPSX/E	550 m, 1000SX SFP, LC, MMF, 850 nm, Ext. Temp
AT-SPTX	100 m, 10/100/1000T SFP, RJ-45
AT-SPTX/I	100 m, 10/100/1000T SFP, RJ-45, I-Temp
AT-SPZX80	80 km, 1000ZX SFP, LC, SMF, 1550 nm
100Mbps SFP Modules	
AT-SPFX/2	2 km, 100FX SFP, LC, MMF, 1310 nm
AT-SPFX/15	15 km, 100FX SFP, LC, SMF, 1310 nm
AT-SPFXBD-LC-13	15 km, 100FX BiDi SFP, LC, SMF (1310 Tx/1550 Rx)
AT-SPFXBD-LC-15	15 km, 100FX BiDi SFP, LC, SMF (1550 Rx/1310 Tx)