# x510 Series

## STACKABLE GIGABIT SWITCHES


The Allied Telesis x510 Series of stackable Gigabit switches includes a full range of security and resiliency features, coupled with easy management, making them the ideal choice for network access applications.

Allied Telesis x510 Series switches are a high-performing and feature-rich choice for today's networks. They offer a versatile solution for enterprise applications. With a choice of 24- and 48-port models with 10Gigabit uplink ports, plus the power of Allied Telesis Virtual Chassis Stacking (VCStack™), the x510 Series can connect anything from a small workgroup to a large business.

### Powerful Network Management

Meeting the increased management requirements of modern converged networks, Allied Telesis Management Framework (AMF) automates many everyday tasks including configuration management. The complete network can be managed as a single virtual device with powerful centralized management features. Growing the network can be accomplished with plug-and-play simplicity, and network node recovery is fully zero-touch.

### 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 an easy solution for resiliency in access applications. The addition of Ethernet Protection Switched Ring (EPSRing™) resilient ring protocol ensures distributed network segments have high-speed, resilient access to online resources and applications.

The x510 Series 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 x510 Series the perfect choice for distributed environments.

### Reliable

The x510 Series was designed with reliability in mind, and guarantees continual delivery of essential services. With dual built-in power supplies and near-hitless online stack reconfiguration, reconfiguration and maintenance may be performed without affecting network uptime.

The x510DP features dual hot-swappable load-sharing power supplies for maximum uptime. With front-to-back or back-to-front cooling options, the x510DP is ideal for data center applications.

### Secure

Advanced security features protect the network from the edge to the core. 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 x510 Series offers powerful control over network traffic types, secure management options, loop guard to protect against cabling mistakes, and tri-authentication for comprehensive access control.

### Future-proof

The x510 Series ensures a future-proof network, with superior flexibility coupled with the ability to stack multiple units. All x510 Series models feature 10 Gigabit uplinks ports and a comprehensive IPv6 feature set, to ensure they are ready for future network traffic demands.

### Environmentally friendly

The x510 Series supports Energy Efficient Ethernet (EEE), automatically reducing the power consumed by the switch whenever there is no traffic on a port. This sophisticated feature can significantly reduce operating costs by reducing the power requirements of the switch and any associated cooling equipment.

## New Features

- Allied Telesis Management Framework (AMF
- IPv6 Ready certification
- x510DP-52GTX

# Key Features

**Allied Telesis Management Framework (AMF)**

» Allied Telesis 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.

**VCStack (Virtual Chassis Stacking)**

» Create a Virtual Chassis Stack (VCStack) of up to four units with 40Gbps of stacking bandwidth to each unit. 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.

**EPSRing (Ethernet Protection Switched Ring)**

» EPSRing and 10 Gigabit Ethernet allow several x510 switches to form a high-speed protected ring capable of recovery within as little as 50ms. This feature is perfect for high performance and high availability in enterprise networks.

» Super-Loop Protection (SLP) enables a link between two EPSR nodes to be in separate EPSR domains, improving redundancy and network fault resiliency.

**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. Boosted network performance and guaranteed delivery of business-critical Ethernet services and applications are provided. Time-critical services such as voice and video take precedence over non-essential services such as file downloads, maintaining responsiveness of Enterprise 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.

**Power over Ethernet Plus (PoE+)**

» With PoE, a separate power connection to media endpoints such as IP phones and wireless access points is not necessary. PoE+ reduces costs and provides even greater flexibility, providing the capability to connect devices requiring more power (up to 30 Watts) such as, tilt and zoom security cameras.

**High Reliability**

» The x510 series switches feature front to back cooling and dual power supply units (PSUs). The x510DP features dual hot-swappable load sharing power supplies for maximum uptime, and the option of either front-to-back or back-to-front cooling. This makes it ideal for use as a top-of-rack data center switch.

**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.

**Multicast Support**

» Multicast support ensures streaming video traffic is efficiently managed and forwarded in today's converged networks.

**Open Shortest Path First (OSPFv3)**

» OSPF is a scalable and adaptive routing protocol for IP networks. The addition of OSPFv3 adds support for IPv6 and further strengthens the Allied Telesis focus on next generation networking.

**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 ensure it always has a real-time view of network traffic.

**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.

**Network Access Control (NAC)**

» NAC allows for unprecedented control over user access to the network, in order to mitigate threats to network infrastructure. Allied Telesis x510 switches use IEEE 802.1x port-based authentication in partnership with standards-compliant dynamic VLAN assignment, to assess a user's adherence to network security policies, and either grant access or offer remediation.

» If multiple users share a port, then multi-authentication can be used. Different users on the same port can be assigned into different VLANs, and so given different levels of network access. Additionally, a guest VLAN may be configured to provide a catch-all for users who aren't authenticated.

**Tri-authentication**

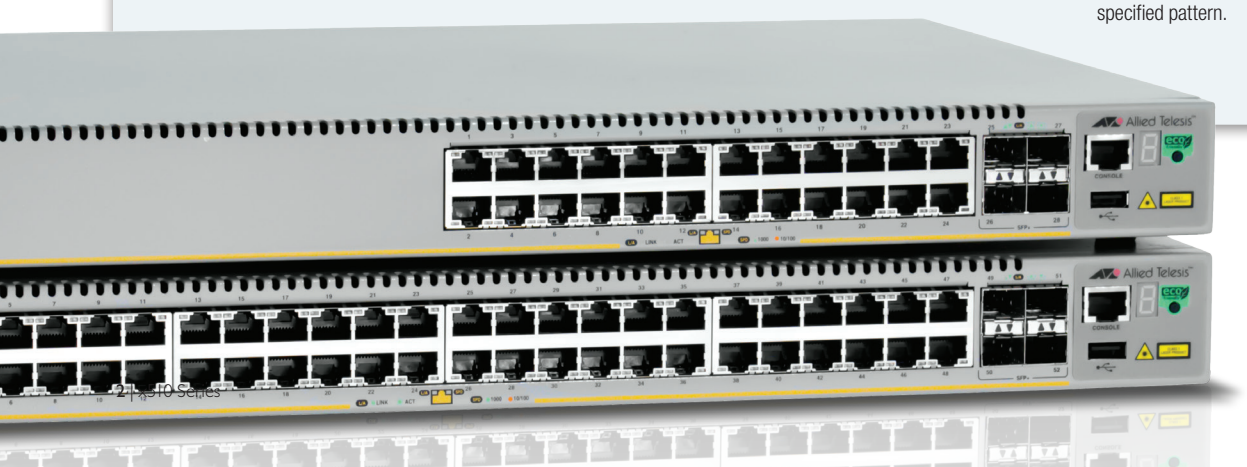
» Authentication options on the x510 Series also include alternatives to IEEE 802.1x port-based authentication, such as web authentication to enable guest access and MAC authentication for endpoints that do not have an IEEE 802.1x supplicant. All three authentication methods—IEEE 802.1x, MAC-based and Web-based—can be enabled simultaneously on the same port for tri-authentication.

**Premium Software License**

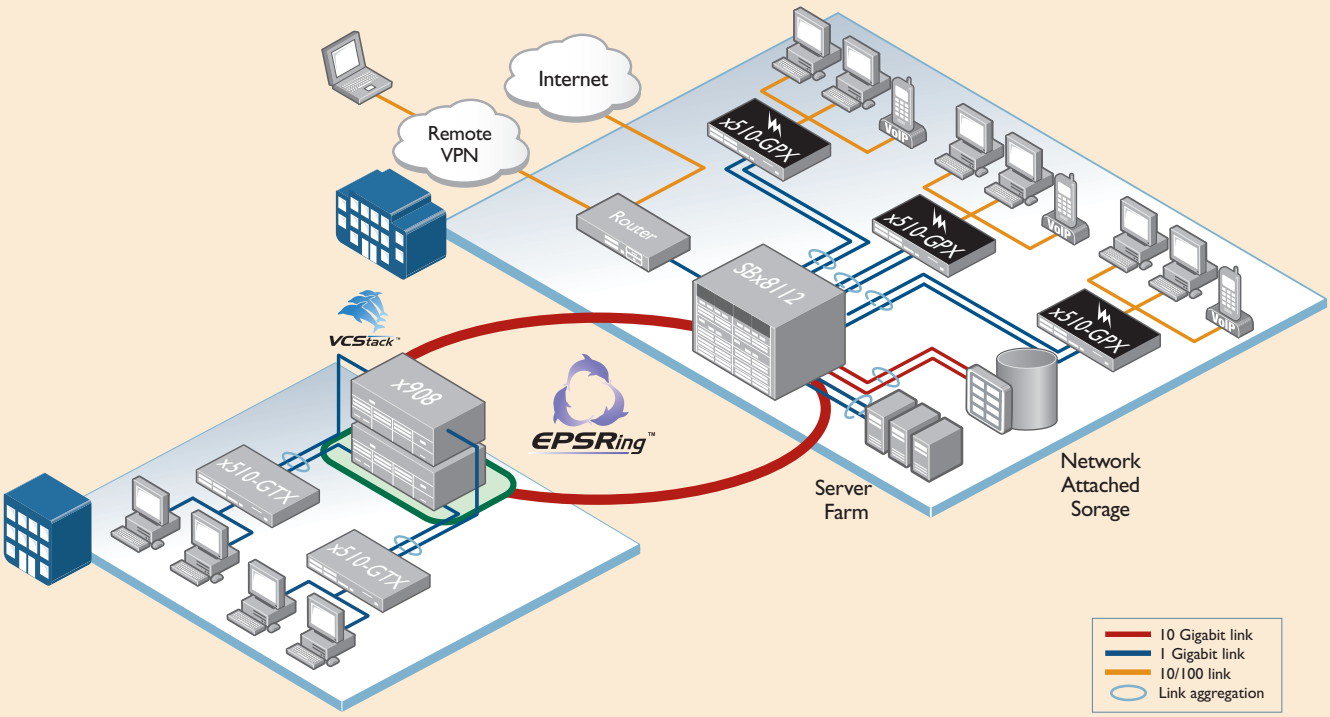
» By default, the x510 Series offers a comprehensive Layer 2+ feature set that includes static Layer 3 routing and IPv6 management features. The feature set can easily be elevated to full Layer 3 by applying the premium software license. This adds dynamic routing protocols and Layer 3 multicasting capabilities.

**Find Me**

» In busy server rooms, comprised 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.



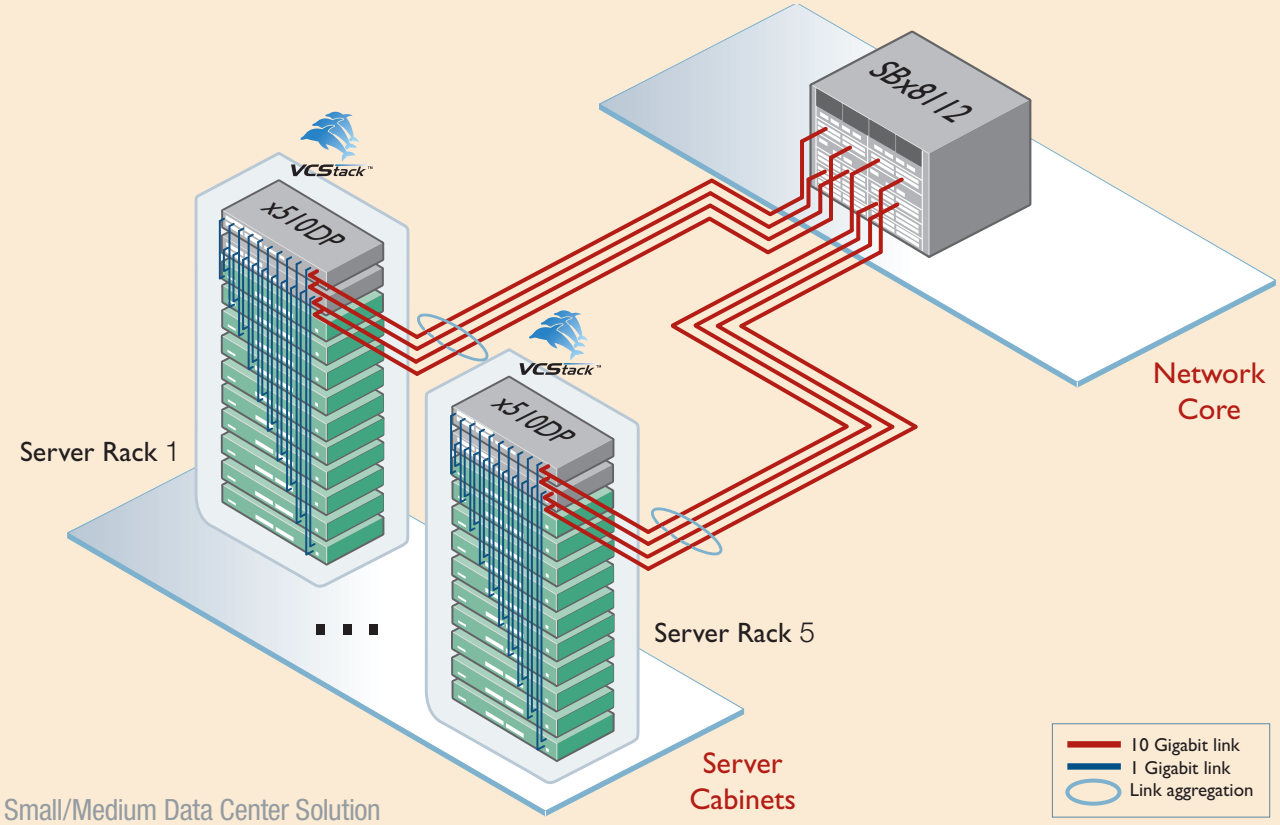
# Key Solutions




## Peace of mind at the network edge

Allied Telesis x510 Series switches make the ideal choice at the network edge where security, resiliency and flexibility are required. In the above diagram, security is enforced using Network Access Control (NAC) combined with tri-authentication to prevent unauthorized users and devices from connecting to the network. Link aggregations are used to provide both resiliency back to the core switches and an increase in available bandwidth over a single link. Flexibility is ensured with the range of interface types and PoE options available on the x510 Series and the ability to stack the switches if required.

# Key Solutions




Small/Medium Data Center Solution

**Powerful high-resiliency data center solutions**

With the world-wide increase in the use of online applications and resources, data center networks have grown at an exponential rate. High resiliency and high reliability solutions are an absolute must-have in these 24/7 always-on networks. The Allied Telesis x510DP-52GTX is an ideal data center Top-of-Rack (ToR) switch, featuring dual hot-swappable load-sharing power supplies and the option of either front-to-back or back-to-front cooling. Along with these high reliability features which maximise uptime, the x510DP switches can also be connected together in a virtual chassis stack (VCStack) which provides a ToR solution with no single point of failure, and complete resiliency. When partnered with other advanced switching products, Allied Telesis has the high demands of the data center well covered with superior solutions.

## Specifications

| PRODUCT | 10/100/1000T (RJ-45) COPPER PORTS | 100/1000X SFP PORTS | 1/10 GIGABIT SFP+ PORTS | 10 GIGABIT STACKING PORTS | POE+ ENABLED PORTS | SWITCHING FABRIC | FORWARDING RATE |
|---|---|---|---|---|---|---|---|
| **AT-x510-28GTX** | 24 | - | 4 (2 if stacked) | 2* | - | 128Gbps | 95.2Mpps |
| **AT-x510-28GPX** | 24 | - | 4 (2 if stacked) | 2* | 24 | 128Gbps | 95.2Mpps |
| **AT-x510-28GSX** | - | 24 | 4 (2 if stacked) | 2* | - | 128Gbps | 95.2Mpps |
| **AT-x510-52GTX** | 48 | - | 4 (2 if stacked) | 2* | - | 176Gbps | 130.9Mpps |
| **AT-x510DP-52GTX** | 48 | - | 4 (2 if stacked) | 2* | - | 176Gbps | 130.9Mpps |
| **AT-x510-52GPX** | 48 | - | 4 (2 if stacked) | 2* | 48 | 176Gbps | 130.9Mpps |

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

### Performance
» 40Gbps of stacking bandwidth
» Supports 13KB jumbo frames
» Wirespeed multicasting
» 4094 configurable VLANs
» Up to 16K MAC addresses
» Up to 2K IPv4 routes or up to 1K IPv6 routes
» 512MB DDR SDRAM, 64MB flash memory
» Packet buffer memory: AT-x510-28 - 2MB
AT-x510-52 - 4MB

### Reliability
» Modular AlliedWare Plus operating system
» Internal redundant Power Supply Units (PSUs) load share.
» The x510DP features dual hot-swappable PSUs, providing uninterrupted power and extra reliability.
» Full environmental monitoring of PSUs, fans, temperature and internal voltages. SNMP traps alert network managers in case of any failure

### Power Characteristics
» AC voltage: 90 to 260V (auto-ranging)
» Frequency: 47 to 63Hz

### Expandability
» Stack up to four units in a VCStack
» Premium license option for additional features

### Flexibility and Compatibility
» SFP ports on AT-x510-28GSX switch support any combination of 10/100/1000T, 100FX, 100BX, 1000SX, 1000LX, 1000ZX or 1000ZX CWDM SFPs
» SFP+ ports will support any combination of 1000X, 1000SX, 1000LX, 1000ZX, 1000ZX CWDM SFPs or 10G-SR, 10G-LR SFP+ modules
» Stacking ports can be configured as 10G Ethernet ports
» Port speed and duplex configuration can be set manually or by auto-negotiation

### Diagnostic Tools
» Built-In Self Test (BIST)
» Find-me device locator
» Optical Digital Diagnostic Monitoring (DDM)
» Ping polling for IPv4 and IPv6
» Port mirroring
» TraceRoute for IPv4 and IPv6

### General Routing
» Black hole routing
» Directed broadcast forwarding
» DNS relay
» Equal Cost Multi Path (ECMP) routing
» Policy-based routing
» Route redistribution (OSPF, RIP)
» UDP broadcast helper (IP helper)

### IPv6 Features
» 6to4 tunneling
» DHCPv6 relay
» DNSv6
» IPv4 and IPv6 dual stack
» Device management over IPv6 networks with SNMPv6, Telnetv6 and SSHv6
» NTPv6

### Management
» Allied Telesis Management Framework (AMF) enables powerful centralized management and zero-touch device installation.
» Front panel 7-segment LED provides at-a-glance status and fault information
» 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
» Powerful CLI scripting engine
» Comprehensive SNMP MIB support for standards-based device management
» Built-in text editor
» Event-based triggers allow user-defined scripts to be executed upon selected system events
» USB interface allows software release files, configurations and other files to be stored for backup and distribution to other devices

### Quality of Service
» 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

### Resiliency Features
» Stacking ports can be configured as 1G/10G Ethernet ports
» 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)
» EPSR enhanced recovery
» Long-Distance stacking (LD-VCStack)
» Loop protection mechanisms: loop detection and thrash limiting
» PVST+ compatibility mode
» STP root guard
» VCStack fast failover minimizes network disruption

### Security Features
» Access Control Lists (ACLs)
» Configurable auth-fail and guest VLANs
» Authentication, Authorisation and Accounting (AAA)
» 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 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)
» Strong password security and encryption
» Tri-authentication: MAC-based, web-based and IEEE 802.1x

### Environmental Specifications
» Operating temperature range:
0°C to 45°C (32°F to 113°F)
Derated by 1°C per 305 meters (1,000 ft)
» Storage temperature range:
-25°C to 70°C (-13°F to 158°F)
» Operating relative humidity range:
5% to 90% non-condensing
» Storage relative humidity range:
5% to 95% non-condensing
» Operating altitude:
3,048 meters maximum (10,000 ft)

### Electrical Approvals and Compliances

» EMC: EN55022 class A, FCC class A, VCCI class A, ICES-003 class A

» Immunity: EN55024, EN61000-3-levels 2 (Harmonics), and 3 (Flicker) – AC models only

### Safety

» Standards: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950.1

» Certification: UL, cUL, TUV

### Restrictions on Hazardous Substances (RoHS) Compliance

» EU RoHS compliant

» China RoHS compliant

### Country of Origin

» Singapore

### Physical Specifications

| PRODUCT | WIDTH | DEPTH | HEIGHT | MOUNTING | WEIGHT | |
|---|---|---|---|---|---|---|
| | | | | | UNPACKAGED | PACKAGED |
| AT-x510-28GTX | 440 mm (17.32 in) | 325 mm (12.80 in) | 44 mm (1.73 in) | Rack-mount | 4.3 kg (9.48 lb) | 6.3 kg (13.89 lb) |
| AT-x510-28GPX | 440 mm (17.32 in) | 400 mm (15.75 in) | 44 mm (1.73 in) | Rack-mount | 5.8 kg (12.79 lb) | 7.8 kg (17.20 lb) |
| AT-x510-28GSX | 440 mm (17.32 in) | 325 mm (12.80 in) | 44 mm (1.73 in) | Rack-mount | 4.8 kg (10.58 lb) | 6.8 kg (14.99 lb) |
| AT-x510-52GTX | 440 mm (17.32 in) | 325 mm (12.80 in) | 44 mm (1.73 in) | Rack-mount | 5.2 kg (11.47 lb) | 7.2 kg (15.88 lb) |
| AT-x510DP-52GTX | 440 mm (17.32 in) | 480 mm (18.89 in) | 44 mm (1.73 in) | Rack-mount | 5.7 kg (12.57 lb) | 7.7 kg (16.98 lb) |
| AT-x510-52GPX | 440 mm (17.32 in) | 400 mm (15.75 in) | 44 mm (1.73 in) | Rack-mount | 6.2 kg (13.67 lb) | 8.2 kg (18.08 lb) |

### Power and Noise Characteristics

| PRODUCT | NO POE LOAD | | | FULL POE+ LOAD | | | MAX POE POWER | MAX 15.4W POE PORTS | MAX 30W POE+ PORTS |
|---|---|---|---|---|---|---|---|---|---|
| | MAX POWER CONSUMPTION | MAX HEAT DISSIPATION | NOISE | MAX POWER CONSUMPTION | MAX HEAT DISSIPATION | NOISE | | | |
| AT-x510-28GTX | 52W | 180 BTU/h | 45 dBA | - | - | - | - | - | - |
| AT-x510-28GPX | 67W | 230 BTU/h | 45 dBA | 530W | 1800 BTU/h | 55 dBA | 370W | 24 | 12 |
| AT-x510-28GSX | 74W | 252 BTU/h | 45 dBA | - | - | - | - | - | - |
| AT-x510-52GTX | 86W | 290 BTU/h | 45 dBA | - | - | - | - | - | - |
| AT-x510DP-52GTX | 95W | 330 BTU/h | 44 dBA | - | - | - | - | - | - |
| AT-x510-52GPX | 93W | 320 BTU/h | 45 dBA | 550W | 1900 BTU/h | 55 dBA | 370W | 24 | 12 |

Noise: tested to ISO7779; front bystander position

### Latency (microseconds)

| PRODUCT | PORT SPEED | | | |
|---|---|---|---|---|
| | 10MBPS | 100MBPS | 1GBPS | 10GBPS |
| AT-x510-28GTX | 117µs | 14.4µs | 4.4µs | 3.1µs |
| AT-x510-52GTX | 119µs | 16.8µs | 6.7µs | 4.9µs |
| AT-x510DP-52GTX | 119µs | 16.8µs | 6.7µs | 4.9µs |
| AT-x510-28GSX | 116µs | 14.5µs | 4.4µs | 3.1µs |
| AT-x510-28GPX | 117µs | 14.4µs | 4.4µs | 3.1µs |
| AT-x510-52GPX | 119µs | 16.8µs | 6.7µs | 4.9µs |

## Standards and Protocols

### AlliedWare Plus Operating System

Version 5.4.3 - 3.7

### Authentication

RFC 1321 MD5 Message-Digest algorithm
RFC 1828 IP authentication using keyed MD5

### Encryption

FIPS 180-1 Secure Hash standard (SHA-1)
FIPS 186 Digital signature standard (RSA)
FIPS 46-3 Data Encryption Standard (DES and 3DES)

### Ethernet

IEEE 802.1AX Link aggregation (static and LACP)
IEEE 802.2 Logical Link Control (LLC)
IEEE 802.3 Ethernet
IEEE 802.3ab 1000BASE-T
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 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

AT Enterprise 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 1724 RIPv2 MIB extension
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 3164 Syslog protocol
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 6527 Definitions of managed objects for VRRPv3

### Multicast Support

Bootstrap Router (BSR) mechanism for PIM-SM
IGMP query solicitation
IGMP snooping
IGMP/MLD multicast forwarding (IGMP/MLD proxy)
MLD snooping (v1 and v2)
PIM for IPv6
RFC 2236 Internet Group Management Protocol v2 (IGMPv2)
RFC 2710 Multicast Listener Discovery (MLD) for IPv6
RFC 3376 IGMPv3
RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6
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
OSPF restart signaling
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

IEEE 802.1D MAC bridges
IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
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 authentication
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 2246 TLS protocol v1.0
RFC 2865 RADIUS
RFC 2866 RADIUS accounting
RFC 2868 RADIUS attributes for tunnel protocol support
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

### 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 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 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 802.3ac VLAN tagging

### Voice over IP (VoIP)

LLDP-MED ANSI/TIA-1057
Voice VLAN

## Ordering Information

### Feature Licenses

| NAME | DESCRIPTION | INCLUDES |
|---|---|---|
| AT-FL-x510-01 | x510 premium license | » RIP<br>» OSPF<br>» PIMv4-SM, DM and SSM<br>» EPSR master<br>» VLAN double tagging (Q-in-Q)<br>» RIPng<br>» OSPFv3<br>» MLDv1 and v2<br>» PIMv6-SM |

### Switches

AT-x510-28GTX-xx
24-port 10/100/1000T stackable switch with
4 SFP+ ports and 2 fixed power supplies

AT-x510-28GPX-xx
24-port 10/100/1000T PoE+ stackable switch with
4 SFP+ ports and 2 fixed power supplies

AT-x510-28GSX-xx
24-port 100/1000X SFP stackable switch with
4 SFP+ ports and 2 fixed power supplies

AT-x510-52GTX-xx
48-port 10/100/1000T stackable switch with
4 SFP+ ports and 2 fixed power supplies

AT-x510DP-52GTX-00
48-port 10/100/1000T stackable switch with 4 SFP+ ports and 2 hot-swappable power supplies**

AT-x510-52GPX-xx
48-port 10/100/1000T PoE+ stackable switch with
4 SFP+ ports and 2 fixed power supplies

Where xx = 10 for US power cord
20 for no power cord
30 for UK power cord
40 for Australian power cord
50 for European power cord

** Power supplies ordered separately

### Power Supplies (for the x510DP-52GTX)

AT-PWR100R-xx
100W AC system power supply (reverse airflow)

AT- PWR250-xx
250W AC system power supply

AT-PWR250R-80
250W DC system power supply (reverse airflow)

### 1000Mbps SFP Modules

AT-SPTX*
1000T 100 m copper
*AT-SPTX is supported only on Gigabit Fiber ports of AT-x510-28GSX, and it is not supported on the 10G Ports of any x510 model.

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

AT-SPEX
1000X GbE multi-mode 1310 nm 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

### 100Mbps SFP Modules

AT-SPFX/2
100FX multi-mode 1310 nm fiber up to 2 km

AT-SPFX/15
100FX single-mode 1310 nm fiber up to 15 km

AT-SPFXBD-LC-13
100BX Bi-Di (1310 nm Tx, 1550 nm Rx) fiber up to 10 km

AT-SPFXBD-LC-15
100BX Bi-Di (1550 nm Tx, 1310nm Rx) fiber up to 10 km

100Mbps SFP modules are only compatible with the SFP ports on the AT-x510-28GSX switch.

### 10GbE SFP+ Modules

AT-SP10SR
10GSR 850 nm short-haul, 300 m with MMF

AT-SP10LR
10GLR 1310 nm medium-haul, 10 km with SMF

AT-SP10ER40/I
10GER 1550 nm long-haul, 40 km with SMF

AT-SP10TW1
1 meter SFP+ direct attach cable

AT-SP10TW3
3 meter SFP+ direct attach cable

AT-SP10TW7
7 meter SFP+ direct attach cable

### Stacking Modules

AT-StackXS/1.0
1 meter stacking cable
(includes 2 stacking modules)

AT-StackOP/0.3
Optical stacking module
850 nm short-haul, 300 m with MMF
(two modules required per switch)

AT-StackOP/9.0
Optical stacking module
1310 nm medium-haul, 9 km with SMF
(two modules required per switch)

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