

# x510 Series

## Including x510, x510DP and x510L Series Switches

The Allied Telesis x510 Series of stackable Gigabit Layer 3 switches includes a full range of security and resiliency features, coupled with easy management, making them the ideal choice for network access applications.



### Overview

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 1/10Gigabit uplink ports, plus the power of Allied Telesis Virtual Chassis Stacking (VStack™), 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. AMF Guestnode allows third party devices, such as IP phones and security cameras, to be part of an AMF network.

### Network Resiliency

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

Ethernet Protection Switched Ring (EPSRing™) resilient ring protocol ensures distributed networks have high-speed access to online resources and applications.

The x510 Series can form a VStack of up to four units for enhanced resiliency

and simplified device management. Full EPSRing support and VStack 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, 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.

The x510L Series switches enable high-value solutions at the network edge.

### 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 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 1/10 Gigabit uplinks ports and a comprehensive IPv6 feature set, to ensure they are ready for future network traffic demands. All x510 24-port models are Software Defined Networking (SDN) ready and are able to support OpenFlow v1.3.

### 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) Master
- ▶ AMF Guestnode
- ▶ AMF Starter
- ▶ Active Fiber Monitoring
- ▶ OpenFlow for SDN
- ▶ Microsoft Network Load Balancing (MS NLB) support



## 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. Powerful features like centralized management, auto-backup, auto-upgrade, auto-provisioning and auto-recovery enable plug-and-play networking and zero-touch management.
- ▶ Any x510 Series switch can operate as the AMF network master, storing firmware and configuration backups for other network nodes. The AMF master enables auto-provisioning and auto-upgrade by providing appropriate files to new network members. New network devices can be pre-provisioned making installation easy because no on-site configuration is required.
- ▶ 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.

### VCStack (Virtual Chassis Stacking)

- ▶ Create a VCStack of up to four units with 40 Gbps 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

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

### EPSRing (Ethernet Protection Switched Ring)

- ▶ EPSRing and 10 Gigabit Ethernet allow several x510 switches to form high-speed protected rings 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 pan, 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.

### 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 addresses 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.

### 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.

### 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 and basic Layer 3 feature set that includes static 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.

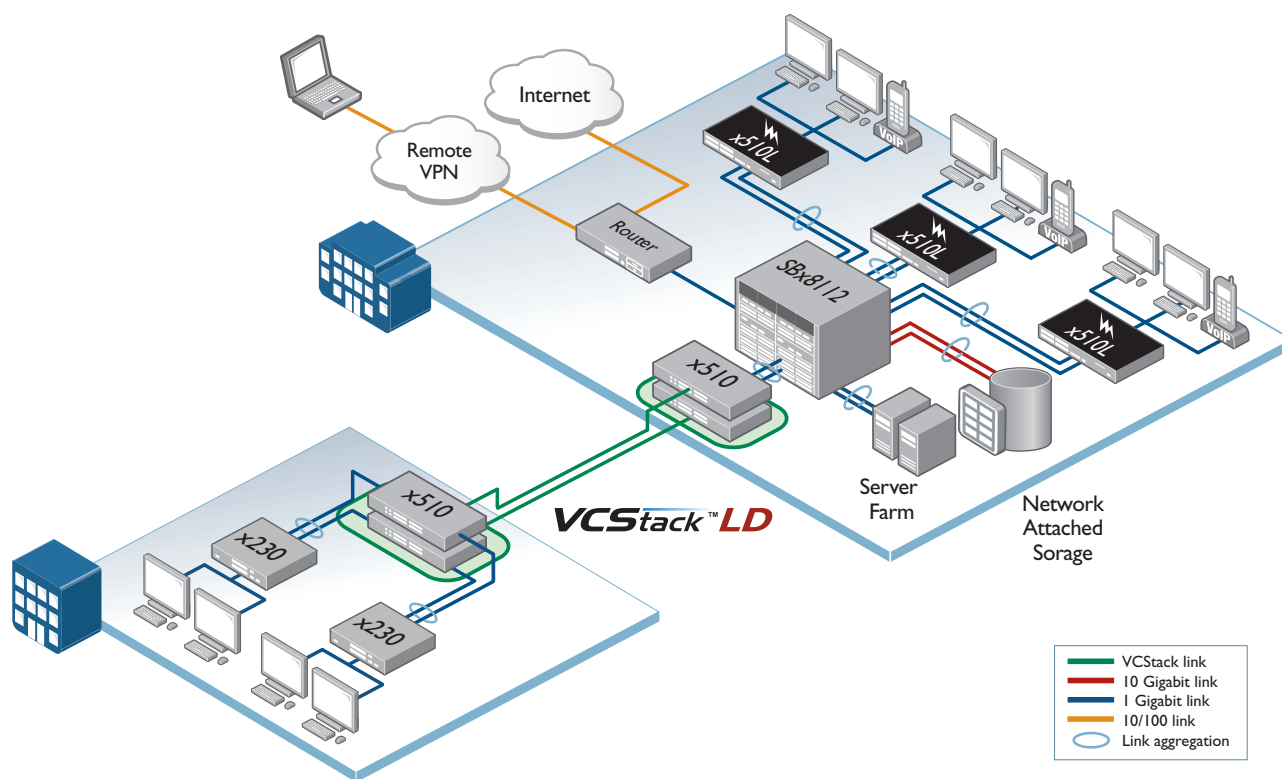
### Software Defined Networking (SDN)

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

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

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

## Key Solutions



### Resilient distribution switching

Allied Telesis x510 Series switches are ideal for distribution solutions, where resiliency and flexibility are required. In the above diagram, distribution switches utilize long-distance Virtual Chassis Stacking (VCSStack-LD) to create a single virtual unit out of multiple devices. By using fiber stacking connectivity, units can be kilometers apart – perfect for a distributed environment.

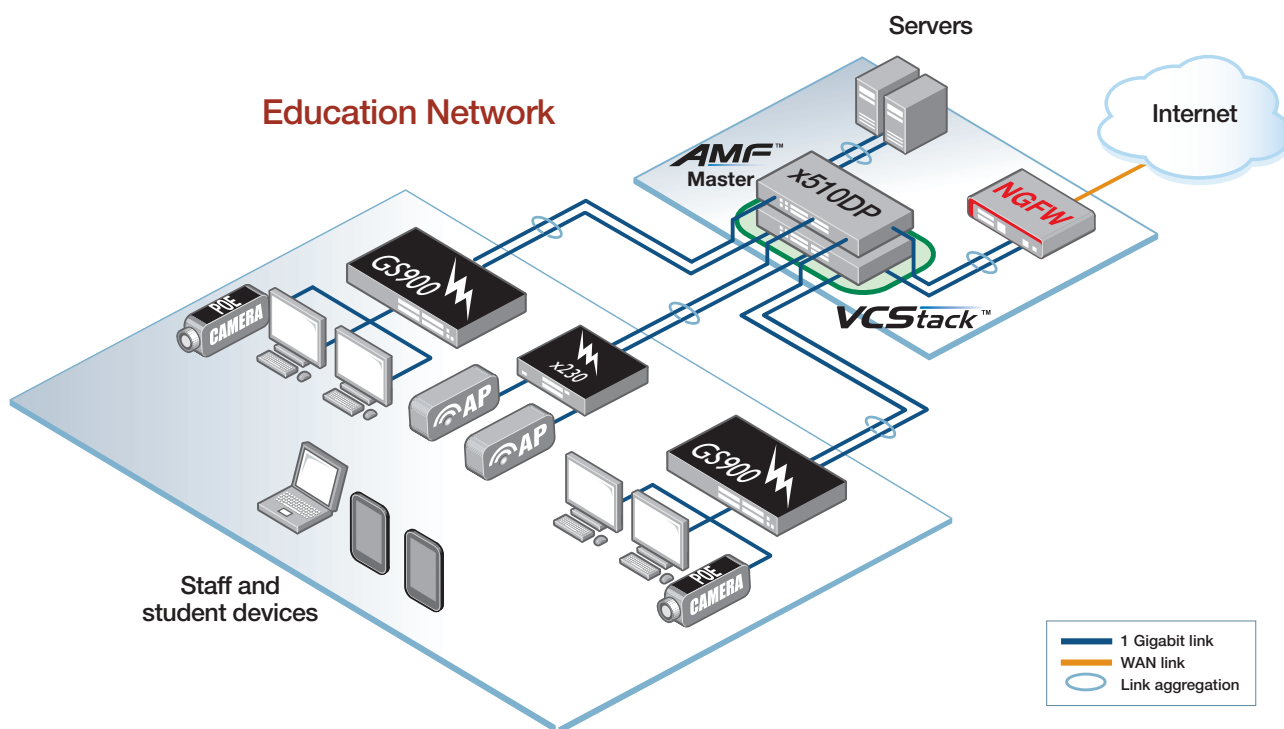
When combined with link aggregation, VCSStack provides a solution with no single point of failure that fully utilizes all network bandwidth.

Allied Telesis x510 Series switches support Enterprises and their use of business-critical online resources and applications, with a resilient and reliable distribution solution.

### Peace of mind at the network edge

Allied Telesis x510L 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 chassis, 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 x510L Series.

## Key Solutions



### Resilient small network core

The x510DP models have two hot-swappable load-sharing PSUs for the ultimate in reliability and ease of maintenance. The x510DP switches also feature the power of Virtual Chassis Stacking (VCS), removing any single point of failure from the network, and making them perfect for small business or education solutions.

The diagram shows a pair of x510DP switches in an education environment, where link aggregation between the VCS core and servers, the firewall, and edge switches provides resilient connectivity.

Allied Telesis edge switches connect and power access points for wireless network connectivity for staff and students, as well as IP security cameras to ensure a safe learning environment.

The Allied Telesis Management Framework (AMF) simplifies and automates many day to day administration tasks, easing the burden of network management. The x510DP switches act as the AMF master, automatically backing up the entire network, and providing plug-and-play network growth and zero-touch unit replacement.

## 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-x510-28GSX-80	-	24	4 (2 if stacked)	2**	-	128Gbps	95.2Mpps
AT-x510-52GTX	48	-	4 (2 if stacked)	2**	-	228Gbps	130.9Mpps
AT-x510-52GPX	48	-	4 (2 if stacked)	2**	48	228Gbps	130.9Mpps
AT-x510DP-28GTX	24	-	4 (2 if stacked)	2**	-	128Gbps	95.2Mpps
AT-x510DP-52GTX	48	-	4 (2 if stacked)	2**	-	228Gbps	130.9Mpps
AT-x510L-28GT	24	-	4 (2 if stacked)*	2**	-	128Gbps	95.2Mpps
AT-x510L-28GP	24	-	4 (2 if stacked)*	2**	24	128Gbps	95.2Mpps
AT-x510L-52GT	48	-	4 (2 if stacked)*	2**	-	228Gbps	130.9Mpps
AT-x510L-52GP	48	-	4 (2 if stacked)*	2**	48	228Gbps	130.9Mpps

\* A feature license is required on x510L Series switches to upgrade uplink ports from 1G to 10G

\*\* 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 256 OpenFlow v1.3 entries
- ▶ 512MB DDR SDRAM, 64MB flash memory
- ▶ Packet buffer memory: AT-x510-28 - 2MB  
AT-x510-52 - 4MB

### Reliability

- ▶ Modular AlliedWare Plus™ operating system
- ▶ The x510 features dual internal redundant PSUs
- ▶ The x510-28GSX-80 features dual DC PSUs
- ▶ The x510DP features dual hot-swappable PSUs, providing uninterrupted power and extra reliability
- ▶ The x510L has a single internal PSU
- ▶ 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
- ▶ DC voltage (x510-28GSX-80): -48/-60V

### Expandability

- ▶ Stack up to four units in a VCStack
- ▶ Premium license option for additional features
- ▶ 10G upgrade license for using uplink ports at 10Gbps (x510L models only)

### Flexibility and Compatibility

- ▶ Gigabit SFP ports on x510-28GSX 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
- ▶ Built-In Self Test (BIST)
- ▶ Find-me device locator
- ▶ Automatic link flap detection and port shutdown
- ▶ Optical Digital Diagnostic Monitoring (DDM)
- ▶ Ping polling and TraceRoute for IPv4 and IPv6
- ▶ Port mirroring
- ▶ Cable fault locator (TDR)
- ▶ UniDirectional Link Detection (UDLD)

### 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

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

### Management

- ▶ Front panel 7-segment LED provides at-a-glance status and fault information
- ▶ 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
- ▶ 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

- ▶ 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
- ▶ 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

- ▶ Stacking ports can be configured as 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 for extra resiliency

\* License required for 10G operation on x510L models

## x510 Series | Stackable Gigabit Layer 3 Switches

- ▶ Long-Distance stacking (VStack-LD)
- ▶ Loop protection: loop detection and thrash limiting
- ▶ PVST+ compatibility mode
- ▶ STP root guard
- ▶ VStack fast failover minimizes network disruption

### Security Features

- ▶ Access Control Lists (ACLs) based on layer 3 and 4 headers
- ▶ Configurable ACLs for management traffic
- ▶ Auth-fail and guest VLANs
- ▶ 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 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
- ▶ RADIUS group selection per VLAN or port

### 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 (TUV is on all models except the AT-x510DP-52GTX)

### Restrictions on Hazardous Substances (RoHS) Compliance

- ▶ EU RoHS compliant
- ▶ China RoHS compliant

### Country of Origin

- ▶ China

## 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-x510-28GSX-80	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-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)
AT-x510DP-28GTX	440 mm (17.32 in)	480 mm (18.89 in)	44 mm (1.73 in)	Rack-mount	5.3 kg (11.68 lb)	7.3 kg (16.09 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-x510L-28GT	440 mm (17.32 in)	325 mm (12.80 in)	44 mm (1.73 in)	Rack-mount	4.2 kg (9.26 lb)	6.2 kg (13.67 lb)
AT-x510L-28GP	440 mm (17.32 in)	400 mm (15.75 in)	44 mm (1.73 in)	Rack-mount	5.2 kg (11.47 lb)	7.2 kg (15.88 lb)
AT-x510L-52GT	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-x510L-52GP	440 mm (17.32 in)	400 mm (15.75 in)	44 mm (1.73 in)	Rack-mount	5.7 kg (12.57 lb)	7.7 kg (16.98 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	177 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510-28GPX	67W	229 BTU/h	45 dBA	530W	605 BTU/h	55 dBA	370W	24	12
AT-x510-28GSX	74W	252 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510-28GSX-80	74W	252 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510-52GTX	86W	293 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510-52GPX	93W	317 BTU/h	45 dBA	550W	620 BTU/h	55 dBA	370W	24	12
AT-x510DP-28GTX	66W	225 BTU/h	44 dBA	-	-	-	-	-	-
AT-x510DP-52GTX	95W	324 BTU/h	44 dBA	-	-	-	-	-	-
AT-x510L-28GT	52W	177 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510L-28GP	67W	229 BTU/h	45 dBA	290W	330 BTU/h	55 dBA	185W	12	6
AT-x510L-52GT	86W	293 BTU/h	45 dBA	-	-	-	-	-	-
AT-x510L-52GP	93W	317 BTU/h	45 dBA	320W	365 BTU/h	55 dBA	185W	12	6

Noise: tested to ISO7779; front bystander position

Latency (microseconds)

PRODUCT	PORT SPEED			
	10MBPS	100MBPS	1GBPS	10GBPS
AT-x510-28GTX	66µs	9.3µs	3.9µs	3.0µs
AT-x510-28GSX	65µs	9.4µs	3.9µs	3.0µs
AT-x510-28GPX	66µs	9.3µs	3.9µs	3.0µs
AT-x510-28GSX-80	66µs	9.3µs	3.9µs	3.0µs
AT-x510-52GTX	68µs	11.7µs	6.2µs	4.8µs
AT-x510-52GPX	68µs	11.7µs	6.2µs	4.8µs
AT-x510DP-28GTX	66µs	9.3µs	3.9µs	3.0µs
AT-x510DP-52GTX	68µs	11.7µs	6.2µs	4.8µs
AT-x510L-28GT	66µs	9.3µs	3.9µs	3.0µs
AT-x510L-28GP	66µs	9.3µs	3.9µs	3.0µs
AT-x510L-52GT	68µs	11.7µs	6.2µs	4.8µs
AT-x510L-52GP	68µs	11.7µs	6.2µs	4.9µs

Standards and Protocols

AlliedWare Plus Operating System  
Version 5.4.6

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 802.1AXLink aggregation (static and LACP)

IEEE 802.2 Logical Link Control (LLC)

IEEE 802.3 Ethernet

IEEE 802.3ab1000BASE-T

IEEE 802.3adStatic and dynamic link aggregation

IEEE 802.3ae10 Gigabit Ethernet

IEEE 802.3af Power over Ethernet (PoE)

IEEE 802.3at Power over Ethernet Plus (PoE+)

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

AT Enterprise MIB

AMF MIB and traps

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 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 4022 SNMPv2 MIB for TCP using SMIv2

RFC 4113 SNMPv2 MIB for UDP using SMIv2

RFC 4293 SNMPv2 MIB for IP using SMIv2

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 (v1, v2 and v3)	
IGMP/MLD multicast forwarding (IGMP/MLD proxy)	
MLD snooping (v1 and v2)	
PIM for IPv6 and SSM for IPv6	
RFC 2236	Internet Group Management Protocol v2 (IGMPv2)
RFC 2710	Multicast Listener Discovery (MLD) for IPv6
RFC 2818	HTTP over TLS ("HTTPS")
RFC 3280	Internet X.509 PKI Certificate and Certificate Revocation List (CRL) profile
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-suplicant authentication	
IEEE 802.1X port-based network access control	
RFC 2818	HTTP over TLS ("HTTPS")
RFC 2865	RADIUS
RFC 2866	RADIUS accounting
RFC 2868	RADIUS attributes for tunnel protocol support
RFC 3280	Internet X.509 PKI Certificate and Certificate Revocation List (CRL) profile
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	TLS v1.2

### 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 802.3acVLAN tagging	

### Voice over IP (VoIP)

LLDP-MED ANSI/TIA-1057	
Voice VLAN	

## Ordering Information

NAME	DESCRIPTION	INCLUDES	STACK LICENSING
<b>AT-FL-x510-01</b>	x510 premium license	<ul style="list-style-type: none"> <li>▶ RIP (256 routes)</li> <li>▶ OSPF (256 routes)</li> <li>▶ PIMv4-SM, DM and SSM</li> <li>▶ EPSR master</li> <li>▶ VLAN double tagging (Q-in-Q)</li> <li>▶ RIpNg (256 routes)</li> <li>▶ OSPFv3 (256 routes)</li> <li>▶ MLDv1 and v2</li> <li>▶ PIMv6-SM</li> <li>▶ UDLD</li> </ul>	▶ One license per stack member
<b>AT-FL-x510L-10G</b>	10G upgrade license (x510L only)	▶ Upgrades the 1G uplink ports to 1G/10G on x510L for Ethernet operation. License not required to enable stacking.	▶ One license per stack member
<b>AT-FL-x510-AM20</b>	AMF Master license	▶ AMF Master for networks of up to 20 nodes	▶ One license per stack
<b>AT-FL-x510-OPEN</b>	OpenFlow license (for 24-port models only)	▶ OpenFlow v1.3	▶ Not supported on a stack

## x510 Series | Stackable Gigabit Layer 3 Switches

### 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-x510-28GSx-80

24-port 100/1000X SFP stackable switch with 4 SFP+ ports and 2 fixed DC power supplies

#### AT-x510-52GTx-xx

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

#### AT-x510-52GPx-xx

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

#### AT-x510DP-28GTx-00

24-port 10/100/1000T stackable switch with 4 SFP+ ports and 2 hot-swappable power supplies\*

#### AT-x510DP-52GTx-00

48-port 10/100/1000T stackable switch with 4 SFP+ ports and 2 hot-swappable power supplies\*

#### AT-x510L-28GT-xx

24-port 10/100/1000T switch with 4x1G SFP uplink ports (software upgradeable to 10G SFP+ ports) and a single fixed PSU

#### AT-x510L-28GP-xx

24-port 10/100/1000T PoE+ switch with 4x1G SFP uplink ports (software upgradeable to 10G SFP+ ports) and a single fixed PSU

#### AT-x510L-52GT-xx

48-port 10/100/1000T switch with 4x1G SFP uplink ports (software upgradeable to 10G SFP+ ports) and a single fixed PSU

#### AT-x510L-52GP-xx\*\*

48-port 10/100/1000T PoE+ switch with 4x1G SFP uplink ports (software upgradeable to 10G SFP+ ports) and a single fixed PSU

#### AT-RKMT-SL01

Sliding rack mount kit for x510DP models

### Power Supplies (for the x510DP Series)

#### 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-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

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

#### 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

### 10GbE SFP+ Modules

#### 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-SP10TW1

1 meter SFP+ direct attach cable

#### AT-SP10TW3

3 meter SFP+ direct attach cable

#### AT-SP10TW7

7 meter SFP+ direct attach cable

\* Power supplies ordered separately

\*\* AT-x510L-52GP not available in NA

\*\*\* These modules support dual-rate 1G/10G operation

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



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