Allied Telesis

AT-x220, AT-x320, AT-x950
Secure Management Module

Non-Proprietary FIPS 140-2 Security Policy

Document Version: Rev H

Date: 1 June 2022

Table of Contents

List of Tables

List of Figures

1. Introduction

This document defines the Allied Telesis Security Policy for the AT-x220, AT-x320, AT-x950 Secure Management Module, hereafter denoted the Module. The Module uses standard OpenSSH software to allow secure remote management of AW+ network switches, including the models listed below.

Table 1 – Cryptographic Module Configurations

	Module Name	Customer Order Code	Hardware Part Number	FW Version	Bootloader Version
1	AT-x220-28GS	AT-x220-28GS-F90	990-007791-F90	5.5.1.APCERT-0.3.rel	bl-6.2.26-x220-D522-8F27.kwb
2	AT-x220-52GT	AT-x220-52GT-F90	990-007760-F90		
3	AT-x220-52GP	AT-x220-52GP-F90	990-007758-F90		
4	AT-x320-10GH	AT-x320-10GH-F00	990-007775-F00		bl-6.2.26-x320-D76F-8439.kwb
5	AT-x320-11GPT	AT-x320-11GPT-F90	990-007774-F90		
6	AT-x950-52XSQ	AT-x950-52XSQ-F00	990-007713-F00		bl-6.2.28-x950-C388-345C.bin
7	AT-x950-52XTQm	AT-x950-52XTQm-F00	990-007714-F00		

The Module is intended for use by US Federal agencies or other markets that require FIPS 140-2 validated network switches.

The FIPS 140-2 security levels for the Module are as follows:

Table 2 – Security Level of Security Requirements

Security Requirement	Security Level
Cryptographic Module Specification	2
Cryptographic Module Ports and Interfaces	2
Roles, Services, and Authentication	2
Finite State Model	2
Physical Security	2
Operational Environment	N/A
Cryptographic Key Management	2
EMI/EMC	2
Self-Tests	2
Design Assurance	2
Mitigation of Other Attacks	N/A
Overall	2

1.1 Module Description and Cryptographic Boundary

The Module is a multi-chip standalone embodiment that executes AlliedWare Plus firmware. The cryptographic boundary is defined as the hardware unit chassis encompassing the "top", "left", "front", "right", "back", and "bottom" surfaces of the case (outlined in red in Figure 1 through Figure 7 below).

Figure 1: AT-x220-28GS

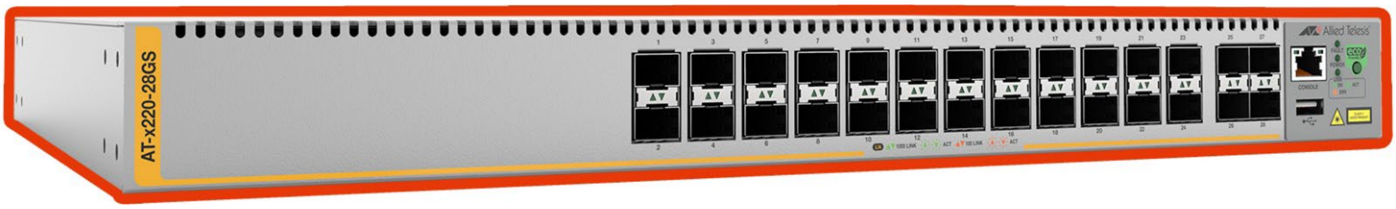


Figure 2: AT-x220-52GT

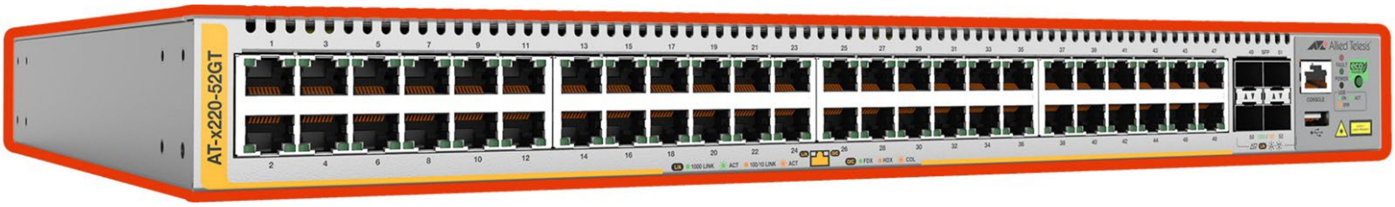


Figure 3: AT-x220-52GP

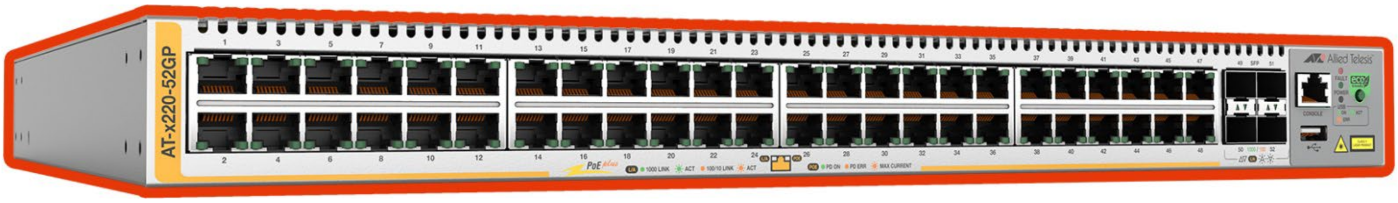


Figure 4: AT-x320-10GH

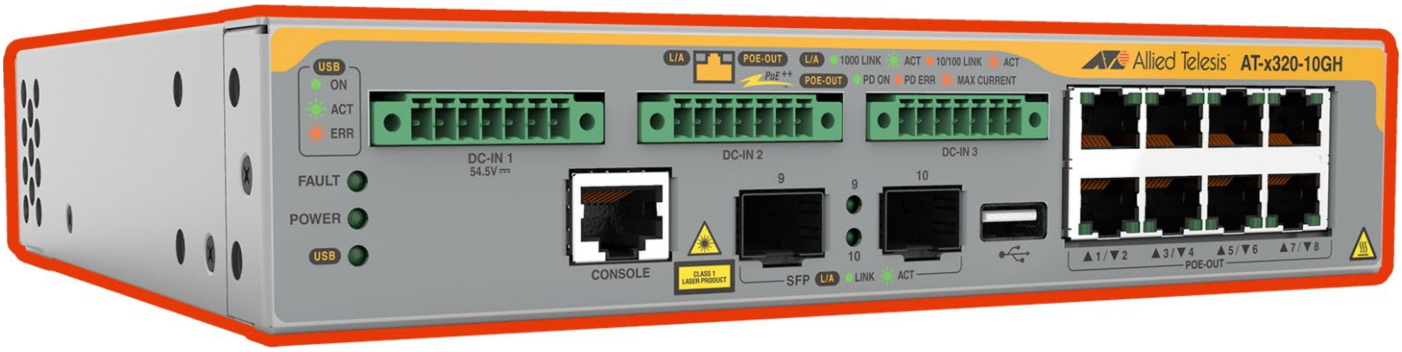


Figure 5: AT-x320-11GPT

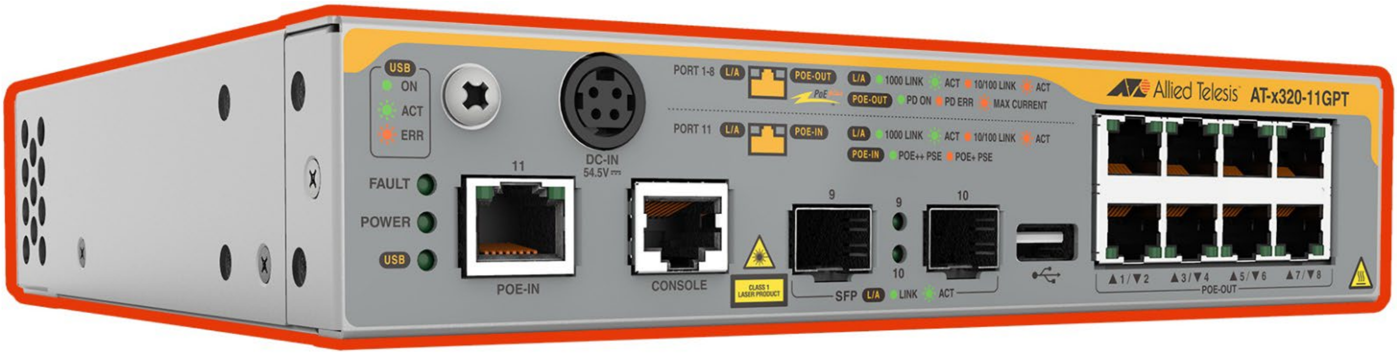


Figure 6: AT-x950-52XSQ

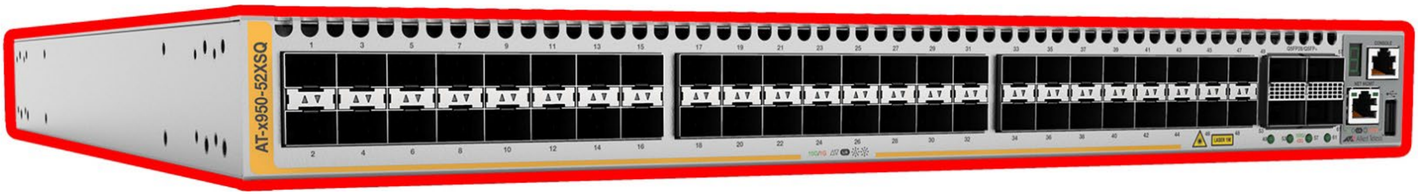
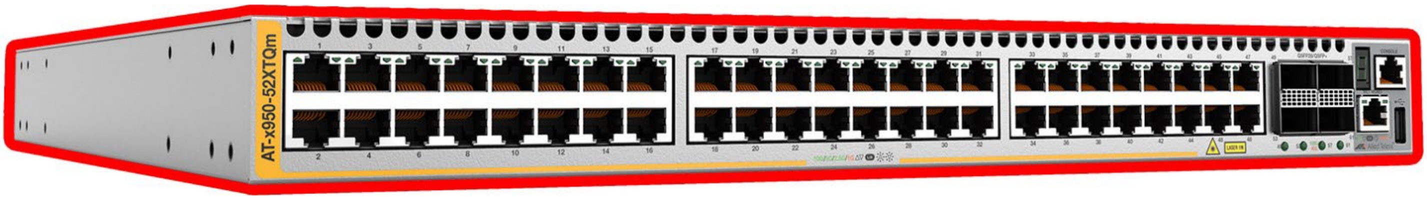


Figure 7: AT-x950-52XTQm



The AT-x950-52XSQ and AT-x950-52XTQm devices support replaceable fans (included in the base product) and redundant power supply (ordered separately) options. The AT-x320-10GH requires an external power supply to be ordered separately. AT-x320-11GPT is shipped with external power supply included in the base product. For the purposes of this certification, the tested configurations are listed below.

Table 3 - AT-x950-52XSQ Tested Configuration

PSU slot	Inserted module	Customer Order Code	Hardware Part Number
1	AT-PWR600-10	AT-PWR600-10	990-006195-10
2	AT-PWR600-10		

Table 4 - AT-x950-52XTQm Tested Configuration

PSU slot	Inserted module	Customer Order Code	Hardware Part Number
1	AT-PWR600-10	AT-PWR600-10	990-006195-10
2	AT-PWR600-10		

Table 5 - AT-x320-10GH Tested Configuration

Device	Power Supply	Customer Order Code	Hardware Part Number
AT-x320-10GH	AT-PWR300-10	AT-PWR300-10	990-006217-10

The device ports and associated FIPS defined logical interface categories are listed in Table 6 and shown in Figure 8 to Figure 21.

Table 6 – Ports and Interfaces

Port	Description	Logical Interface Type
Power	Power port – AC	Power in
Serial Console	RJ45 Serial Console Port	Control in | Status out
Ethernet[1]	LAN communications	Control in | Data in | Data out | Status out
LED Display	7-segment LED display	Status out
LED Network	LEDs for each network port	Status out
LED PoE	Per-port Power over Ethernet (PoE) status LEDs (only for PoE RJ45 on AT-x220-52GP and AT-x320-11GPT)	Status out
LED Power	LEDs for each power supply	Status out
LED Management	LED for the management port (AT-x950-52XSQ and x950-52XTQm only)	Status out
LED Fault	Fault LED	Status out
LED USB	LED for USB port	Status out

[1] Physical interface formats include RJ45, SFP, SFP+, XFP, QSFP and QSFP28.

Port	Description	Logical Interface Type
ECO button	ECO friendly button to reduce power usage	Control in
USB	USB port	Disabled as per physical security policy

Figure 8: Interfaces on Front of AT-x220-28GS

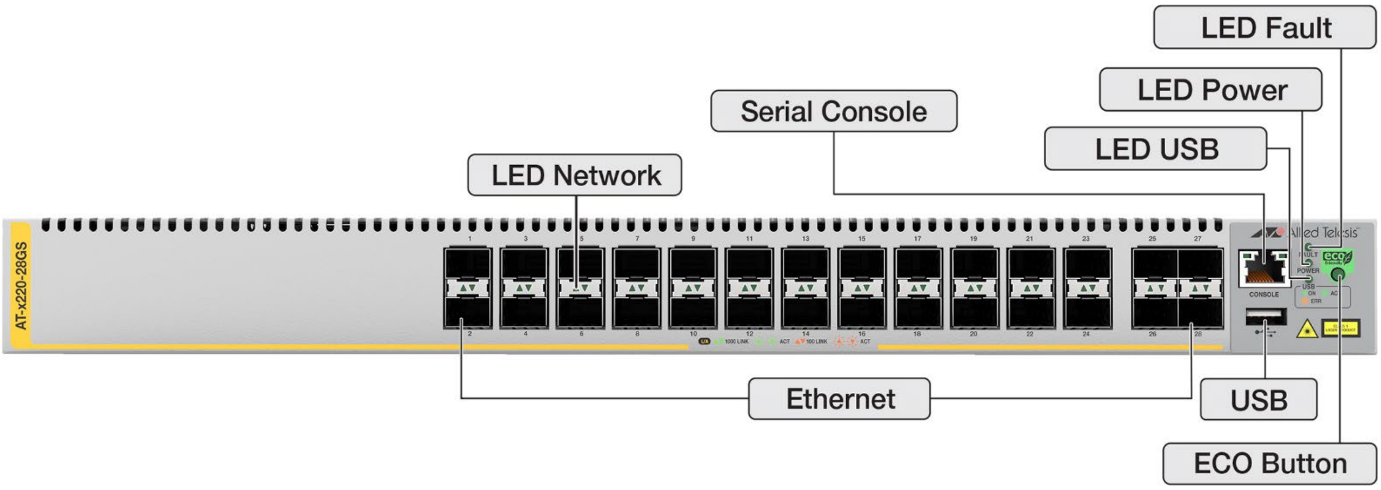


Figure 9: Interfaces on Back of AT-x220-28GS

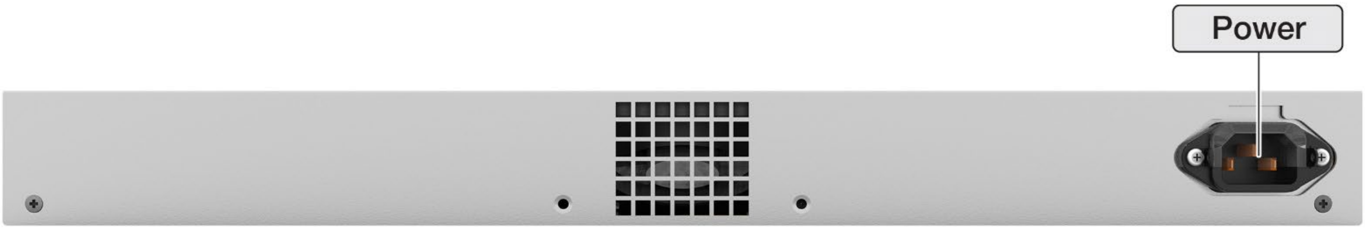


Figure 10: Interfaces on Front of AT-x220-52GT

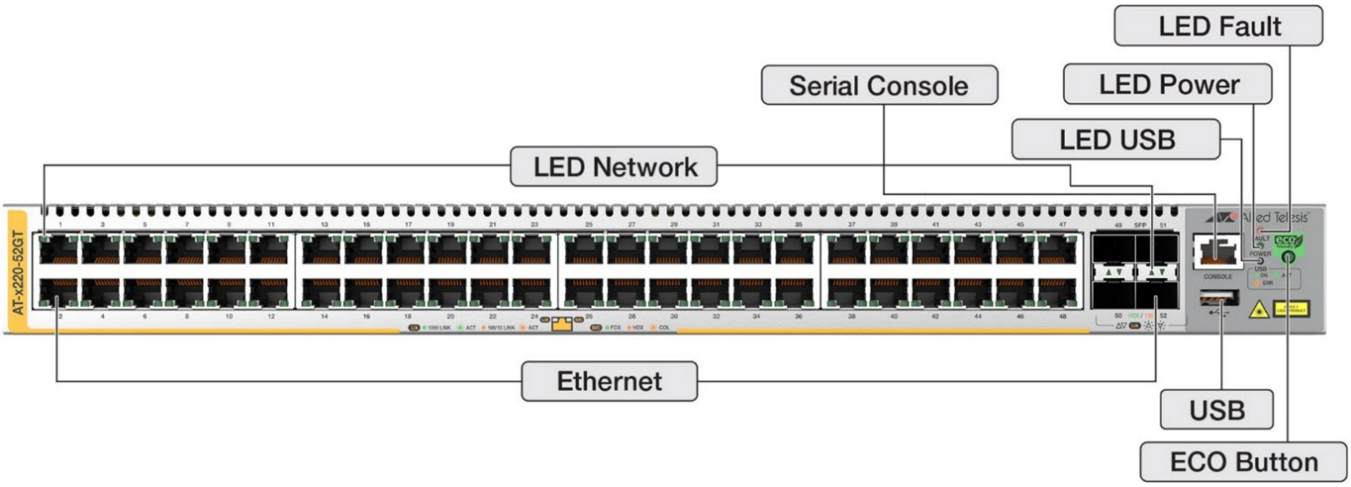


Figure 11: Interfaces on Back of AT-x220-52GT

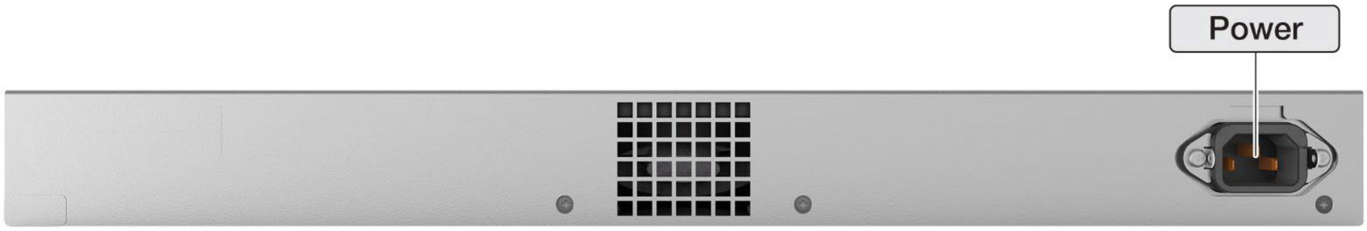


Figure 12: Interfaces on Front of AT- x220-52GP

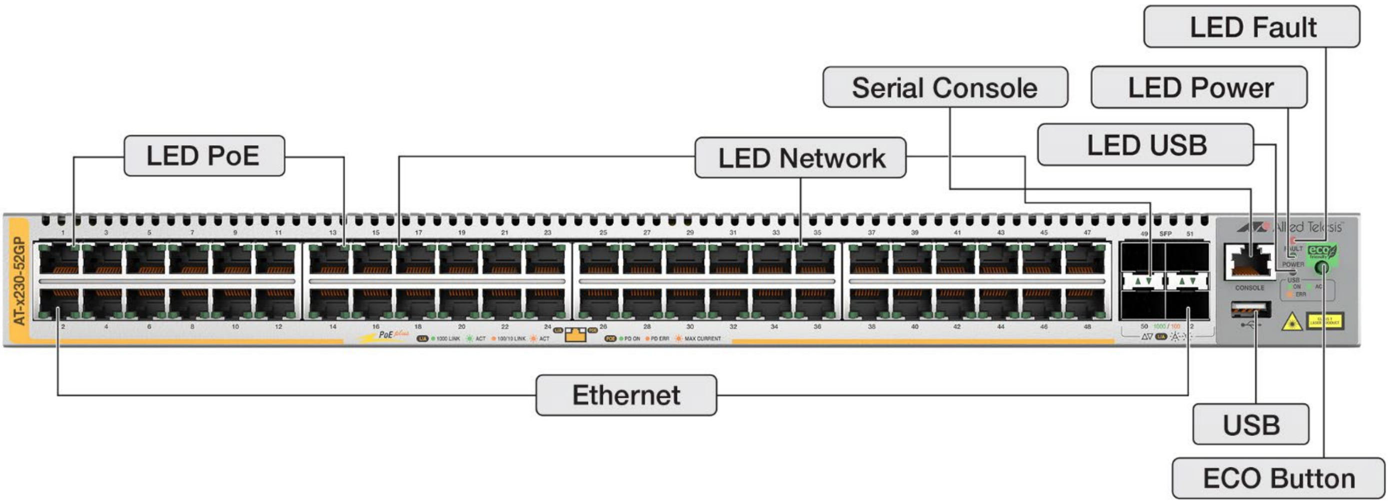


Figure 13: Interfaces on Back of AT- x220-52GP

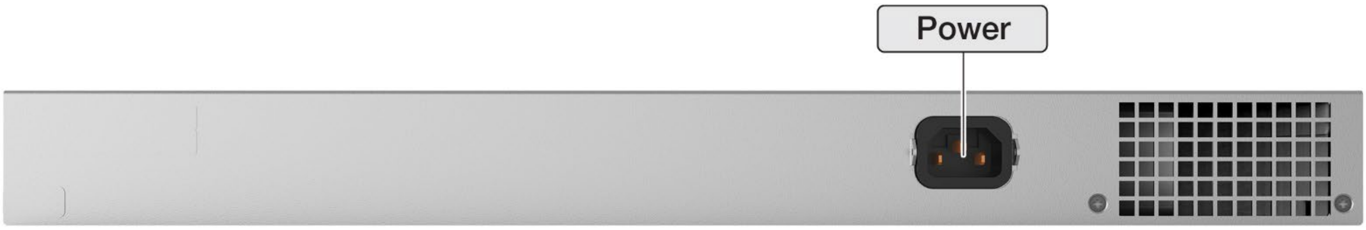


Figure 14: Interfaces on Front of AT-x320-10GH

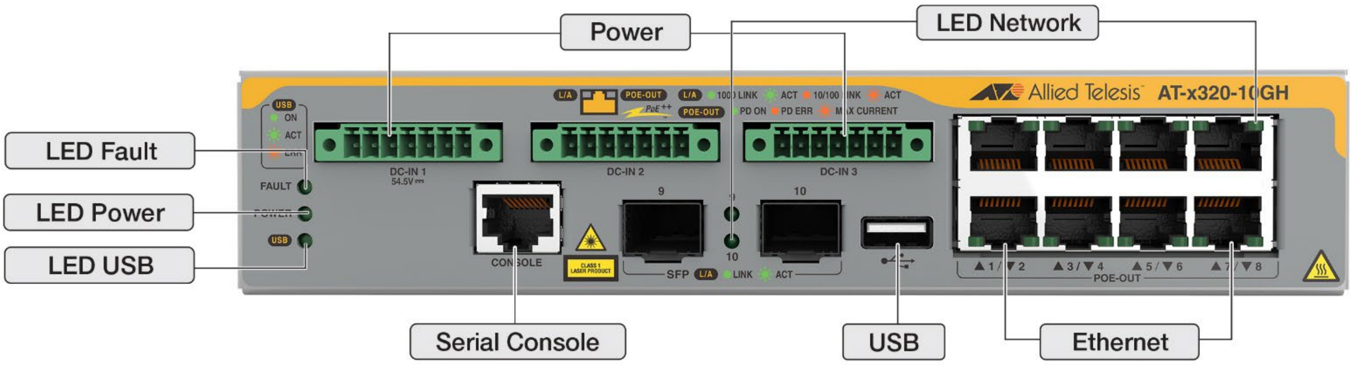


Figure 15: Interfaces on Back of AT-x320-10GH

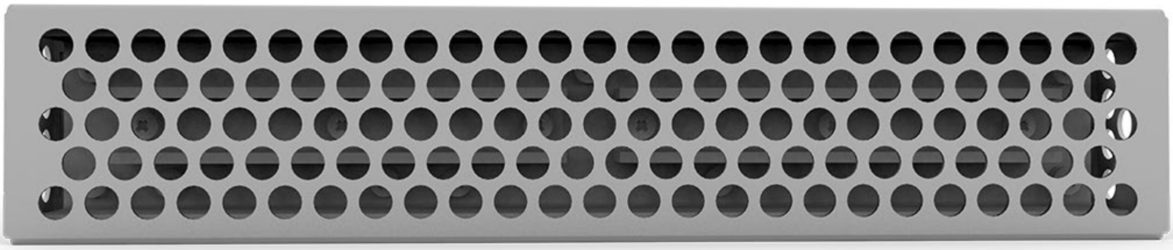


Figure 16: Interfaces on Front of AT-x320-11GPT

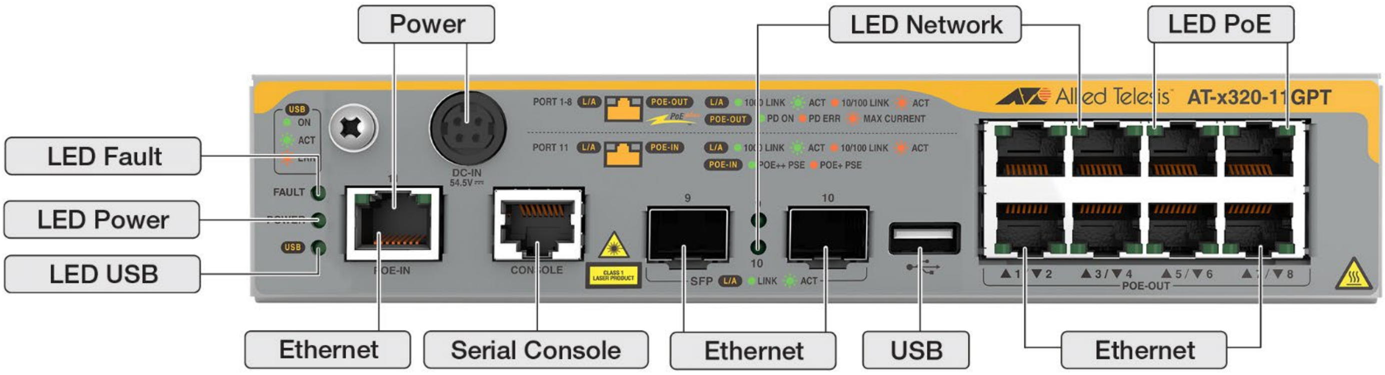


Figure 17: Interfaces on Back of AT-x320-11GPT

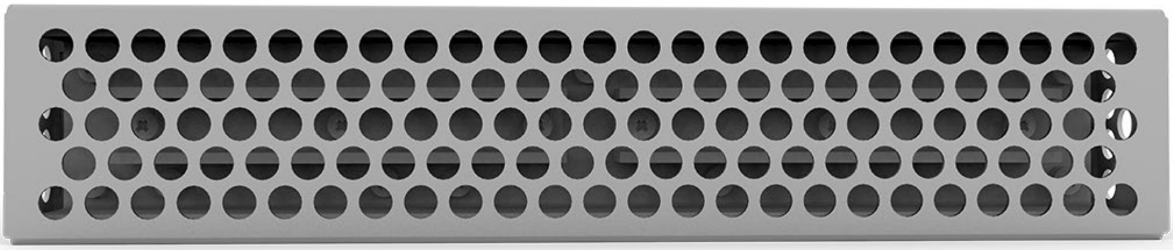


Figure 18: Interfaces on Front of AT-x950-52XSQ

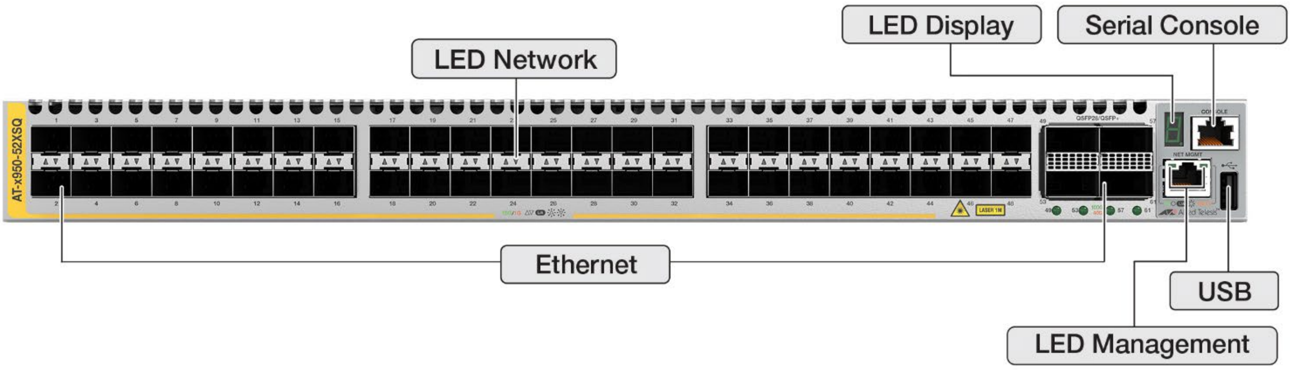


Figure 19: Interfaces on Back of AT-x950-52XSQ

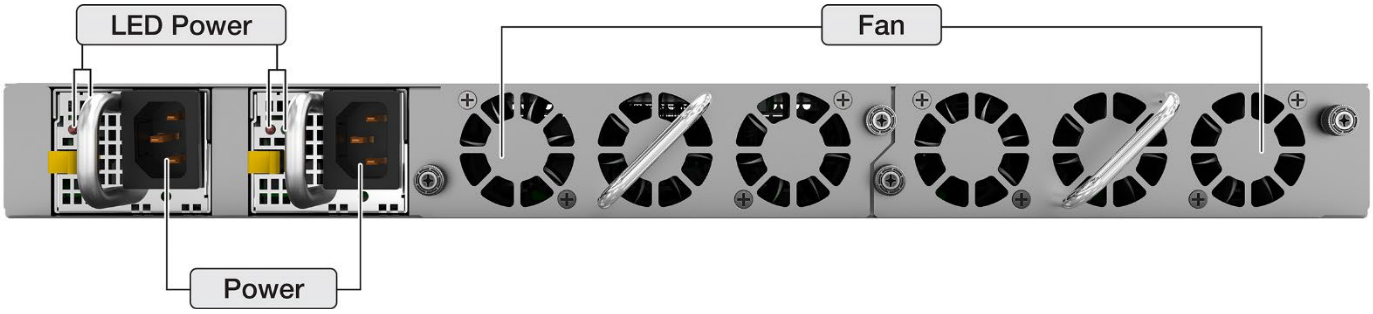


Figure 20: Interfaces on Front of AT-x950-52XTQm

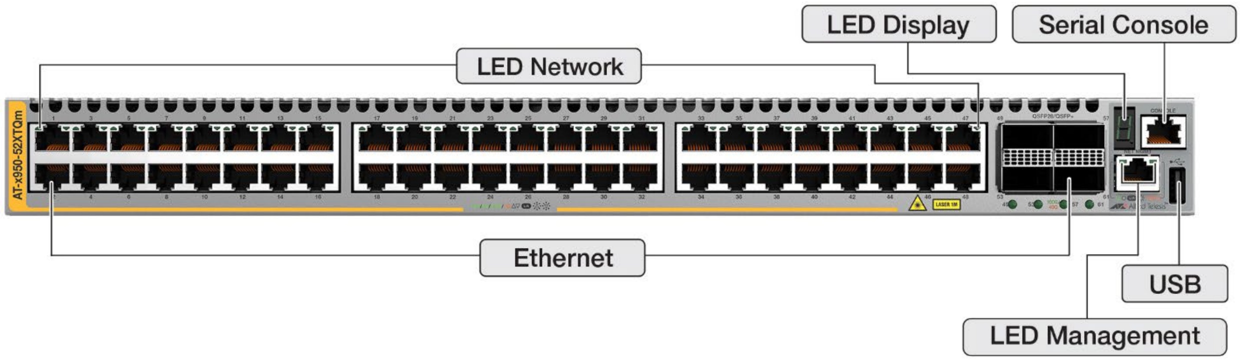
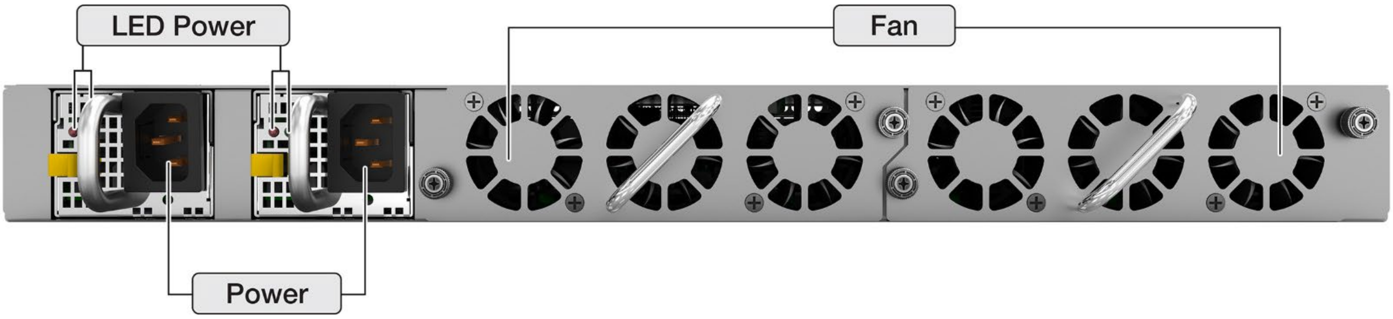


Figure 21: Interfaces on Back of AT-x950-52XTQm



1.2 Modes of Operation

Both FIPS Approved mode of operation and Non-Approved modes of operation are provided. To verify that a module is in the Approved mode of operation, the operator must confirm the module has been configured per the instructions in Section 8 of this Security Policy. The **show secure-mode** command will report the status of the mode, as shown below, but does not enforce all Approved mode restrictions. This command can only be run by the Cryptographic Officer.

```
awplus# show secure-mode
Secure mode is enabled
```

2. Cryptographic Functionality

The Module implements the FIPS Approved and Non-Approved but Allowed cryptographic functions listed in the tables below.

Table 7 – Approved Algorithms

Cert	Algorithm	Mode	Description	Functions/ Caveats
A2006	AES [197]	CBC [38A]	Key Sizes: 128, 192, 256	Encrypt, Decrypt
		CFB 128 [38A]		
		CTR [38A]		
		GCM[2] [38D]	Key Sizes: 128, 192, 256 Tag Len: 32, 64, 96, 104, 112, 120, 128	Authenticated Encrypt, Authenticated Decrypt, Message Authentication
VA	CKG [IG D.12]	[133] Section 5.1 Asymmetric signature key generation using unmodified DRBG output		Key Generation
		[133] Section 5.2 Asymmetric key establishment key generation using unmodified DRBG output		
		[133] Section 6.1 Direct symmetric key generation using unmodified DRBG output		
A2006	CVL: TLS [135]	v1.2	HMAC-SHA-256	Key Derivation
	CVL: SNMP [135]	v3	SHA-1	
A2007	CVL: SSH [135]	v2	SHA (1, 256, 512)	Key Derivation
A2006	DRBG [90A]	CTR	CTR DRBG (AES-256) with Derivation Function and no Prediction Resistance	Deterministic Random Bit Generation Security Strength = 256
A2006	ECDSA [186-4]		P-256, P-384, P-521 (ExtraRandomBits +TestingCandidates)	KeyGen
			P-192, K-163, B-163, P-224, K-233, B-233, P-256, K-283, B-283, P-384, K-409, B-409, P-521, K-571, B-571	PKV
			P-256 SHA (256, 384, 512) P-384 SHA (256, 384, 512) P-521 SHA (256, 384, 512)	SigGen
			P-256 SHA (256, 384, 512)	SigVer

[2] AES-GCM is only used in TLS 1.2 GCM cipher suites listed in Security Policy. The IV is constructed per the TLS 1.2 protocol [RFC5246] within the module, and the TLS client operations are fully contained within the cryptographic boundary of the module, as per IG A.5 and SP 800-52.

The module implementation ensures that the keys for the client and server negotiated in the handshake process are compared and the module aborts the session if the key values are identical. When the IV exhausts the maximum number of possible values for a given session key, the client implementation will trigger a handshake to establish a new encryption key in accordance with RFC 5246.

Cert	Algorithm	Mode	Description	Functions/ Caveats
			P-384 SHA (256, 384, 512) P-521 SHA (256, 384, 512)	
	ENT (NP) [90B]		Non-Deterministic RNG; minimum of 4800 bits per access. The output is used to seed the FIPS Approved DRBG.	Entropy generation
A2006	HMAC [198]	SHA-1	Key Sizes: *Minimum 112 bits*	Message Authentication, KDF Primitive, Password Obfuscation
		SHA-256	Key Sizes: *Minimum 112 bits*	
		SHA-384	Key Sizes: *Minimum 112 bits*	
		SHA-512	Key Sizes: *Minimum 112 bits*	
A2006	KAS-SSC [56Ar3] ECC	Ephemeral Unified	P-256, P-384, P-521	Key Agreement
N/A	KTS [IG D.9]		AES CBC or CTR Cert. #A2006 and HMAC Cert. #A2006; key establishment methodology provides between 128 and 256 bits of encryption strength	Key Transport

A2006	RSA [186-4]	X9.31	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)[3]
			n = 8192 SHA (256, 384, 512)[3]
			n = 16384 SHA (256, 384, 512)[3]
				KeyGen

		X9.31	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigGen

		PKCS1_v1.5	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigGen

		PSS	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigGen

		X9.31	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigVer

		PKCS1_v1.5	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigVer

		PSS	n = 2048 SHA (256, 384, 512)
			n = 3072 SHA (256, 384, 512)
			n = 4096 SHA (256, 384, 512)
				SigVer

A2008	SHA-3 [202]	SHA3-256		Message Digest Generation; SP800-90B Conditioner
A2006	SHS [180]	SHA-1 SHA-256 SHA-384 SHA-512		Message Digest Generation, Password Obfuscation

[3] As per IG A.14

The module supports RADIUS over TLSv1.2 and Syslog over TLSv1.2 in the Approved mode. The module only runs TLS as client and only allows ephemeral ECDH key exchange-based TLS cipher suites as listed below:

- TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

The module supports the use of SSHv2 to perform module configuration and administration. The supported algorithms in each mode are as listed in the table below.

Table 8 – SSH Security Methods Available in Each Mode

SSH Security Methods	In Approved Mode	In Non-Approved Mode
Key Exchange		
diffie-hellman-group1-sha1		X
diffie-hellman-group14-sha1		X
diffie-hellman-group-exchange-sha1		X
diffie-hellman-group-exchange-sha256		X
ecdh-sha2-nistp256	X	X
ecdh-sha2-nistp384	X	X
ecdh-sha2-nistp521	X	X
SSH key		
ssh-rsa	X	X
ssh-dss		X
ecdsa-sha2-nistp256	X	X
ecdsa-sha2-nistp384	X	X
ecdsa-sha2-nistp521	X	X
SSH Digest		
hmac-sha1	X	X
hmac-sha1-96		X
hmac-sha2-256	X	X
hmac-sha2-512	X	X
hmac-md5		X
hmac-md5-96		X

SSH Cipher		
3des-cbc		X
blowfish-cbc		X
cast128-cbc		X
arcfour		X
arcfour128/256		X
aes128-cbc	X	X
aes192-cbc	X	X
aes256-cbc	X	X
aes128-ctr	X	X
aes192-ctr	X	X
aes256-ctr	X	X

Table 9 – Non-Approved but Allowed Cryptographic Functions

Algorithm	Description
HMAC-MD5	No security claimed. IG 1.23, Example Scenario 2a. Used in RADIUS for operator authentication only (TLS protocol is used between the module and the RADIUS server)
SHA-256 (glibc implementation)	No security claimed. IG 1.23, Example Scenario 1. Used for verifications of passwords (Glibc SHA256 implementation is not FIPS validated)

Table 10 – Security Relevant Protocols Used in FIPS Mode

Protocol	Key Exchange	Server/ Host Auth	Cipher	Integrity
SSHv2[4] [IG D.8 and SP 800-135]	ECDH-sha2-nistp256 ECDH-sha2-nistp384 ECDH-sha2-nistp521	SSH-RSA (key size 2048) SSH-DSS (key size 2048) ECDSA-sha2-nistp256 ECDSA-sha2-nistp384 ECDSA-sha2-nistp521	AES-CBC-128/192/256 AES-CTR-128/192/256	HMAC-SHA-1 HMAC-SHA2-256 HMAC-SHA2-512
TLSv1.2[5] [IG D.8 and SP 800-135]	ECDH	RSA (key size 2048) ECDSA (P256, P384, P521)	AES-CBC-128/256 AES-GCM-128/256	SHA-256 SHA-384
SNMPv3[6]	Configured	HMAC-SHA-1	AES-CFB-128	HMAC-SHA1

Non-Allowed cryptographic functions disabled when the module is used in an Approved mode of operation:

[4] No parts of this protocol, other than the KDF, have been tested by the CAVP and CMVP.

[5] No parts of this protocol, other than the KDF, have been tested by the CAVP and CMVP.

[6] No parts of this protocol, other than the KDF, have been tested by the CAVP and CMVP.

- ARCFOUR
- Blowfish
- Cast-128
- MD5 and keyed MD5
- RSA with key size < 2048
- RC4
- DES

2.1 Critical Security Parameters

All CSPs used by the Module are described in this section. All usage of these CSPs by the Module (including all CSP lifecycle states) are described in the services detailed in Section3.3. While operating in a FIPS-compliant manner, the module contains the following CSPs. Unless otherwise noted, all keys are generated using FIPS approved algorithms.

The module does not store the SNMP authentication and privacy passphrases in clear text, but instead only stores SHA-256 hashes of the passphrases.

Table 11 – Critical Security Parameters (CSPs)

CSPs		Description / Usage
TLS CSPs	TLS-SENC	TLS Session Encryption Keys. AES-CBC or AES-GCM 128/256-bitkey for TLS message encrypt/decrypt
	TLS-SMAC	TLS Session Authentication Keys. HMAC-SHA-256 (256-bit) session key for TLS message authentication
	TLS-PMS	TLS pre-master secret (384 bits) used to derive TLS-SENC and TLS-SMAC
	TLS-MS	TLS Master Secret (384-bit secret key material)
	TLS-ECDH-Priv	ECDH ephemeral P-256/384/521 private key
SSHv2 CSPs	SSH-ECDH-Priv	SSHv2 ECDH ephemeral P-256/384/521 private key
	SSH-Priv	SSHv2 Private Key. RSA (2048) or ECDSA (P-256/384/521) private key
	SSH-SENC	SSHv2 Session Encryption Key. AES-CBC-128/192/256 or AES-CTR-128/192/256 key for SSH message encrypt/decrypt
	SSH-SMAC	SSHv2 Session Authentication Key. HMAC-SHA-1, HMAC-SHA2-256 or HMAC-SHA2-512 session key
DRBG-EI		DRBG entropy input: a block of 600 bytes of random data from JENT (jitter entropy) used for seeding and reseeding
DRBG-State		SP800-90A CTR_DRBG Internal State (V and Key)
Password		Eight (8) minimum character user authentication password, stored as a SHA-256 hash
NTP-Secret		8-16-character password for NTP peer authentication, stored AES-CBC-256 encrypted
RADIUS-Secret		8-64-character RADIUS authentication password, stored AES-CBC-256 encrypted
SNMP-PP		(SNMP Passphrase) eight (8) minimum character authentication password, eight (8) minimum character privacy password, stored AES-CBC-256 encrypted
SNMP-SENC		(SNMP Encryption) AES CFB 128 bit key
SNMP-SMAC		(SNMP Authentication) HMAC-SHA-1 160-bit key

CSPs	Description / Usage
HOSTKEY	Per-device random key (256 bytes) used to encrypt (with AES-CBC-256) other CSPs for protected storage
FW Integrity Key	HMAC-SHA256 used to verify firmware integrity

2.2 Public Keys

Table 12 – Public Keys

Key	Description / Usage
SSH-Peer-Pub	(SSHv2 Peer Key) RSA (2048) or ECDSA (P-256/384/521) public key used for client authentication
SSH-Pub	(SSHv2 Public Key) RSA (2048) or ECDSA (P-256/384/521) public key for session establishment
SSH-ECDH-CLI-Pub	SSHv2 ECDH client public key (P-256/384/521)
SSH-ECDH-SRV-Pub	SSHv2 ECDH server public key (P-256/384/521)
SSH-CAC-Pub	(SSHv2 CAC Key) RSA (2048) or ECDSA (P-256/384/521) public key used for operator authentication
TLS-ECDH-CLI-Pub	TLS ECDH client public key (P-256/384/521)
TLS-ECDH-SRV-Pub	TLS ECDH server public key (P-256/384/521)
TLS-Host-Pub	TLS host key. RSA (2048) or ECDSA (P-256/384/521) public key used for TLS session establishment
CA-Pub	Certification Authority RSA-2048 public key for verifying syslog or RADIUS server over TLS

3. Roles, Authentication and Services

3.1 Assumption of Roles

The module supports two distinct operator roles, User and Cryptographic Officer (CO). The cryptographic module enforces the separation of roles using the OS and user authentication capabilities within the module. A role is explicitly selected at authentication. Authentication status is cleared at power down and a session shall timeout after a configurable period. At the end of a session, the operator may logout. In order to re-establish communication after an operator logout or timeout, an operator must re-authenticate. The module does not support a Maintenance role or bypass capability.

To assume the Cryptographic Officer role, a user will log in and authenticate to an account that was configured to have privilege 15. To assume the User role, a user will log in and authenticate to an account that was configured to privilege 1. For specific details on the commands used to create and configure users, please refer to the Command Reference [CR] for that specific device.

Table 13 lists all operator roles supported by the module. The Module supports concurrent operators. Concurrent operator support and policy for managing previous authentications is on a per authentication basis. The protection of authentication data during entry against unauthorized disclosure on the console is by physical access and for SSH it is by encryption.

Table 13 – Roles Description

Role	Role Description	Authentication Type	Authentication Data
CO	Cryptographic Officer – responsible for the configuration, device management, and monitoring of privileged information	Role-based	Via Console: Username and password Via SSHv2: Password
		Digital Signature Verification	Signature (RSA 2048 bit or ECDSA certificate) via SSHv2
User	User – monitoring of unprivileged information and use cryptographic functions for the SSH access to the switch	Role-based	Via Console: Username and password Via SSHv2: Password
		Digital Signature Verification	Signature (RSA 2048 bit or ECDSA certificate) via SSHv2

3.2 Authentication Methods

Role-based Authentication

Username and password are used for authentication. The rationale for strength of the authentication method is based on the length and restrictions of the passwords as specified in the configuration. As per the configuration guidance provided below, the module requires passwords with characters from the set (a-z, A-Z, 0-9, printable ASCII except '?') and a minimum password length of eight (8) characters. The limiting factor for authentications in a one-minute period is configurable to one try every three (3) seconds – interval can be increased, but not reduced.

FIPS requires probability of a correct password guess of less than 1/1,000,000 and probability of a successful sequence of guesses within one (1) minute of less than 1/100,000. The password rules given implies that there are (26 + 26 + 10 + 31 = 93) possible characters available for passwords, for an overall limit of ($93^8 = 5.595\times10^{15}$) possible passwords. Therefore, the probability of a correct guess is $1/93^8$, which is less than 1/1,000,000.

With a base setting of one (1) password attempt per three (3) seconds, an attacker can theoretically attempt up to 20 passwords within one minute. Therefore, the probability of guessing the password within a minute is $20/93^8$, which is less than 1/100,000.

In addition, an optional “enable” password may be configured on a device, providing an extra layer of authentication between logging in and accessing privileged commands for an already authenticated operator. The enable password for a device requires 8-32 characters from the set (a-z, A-Z, 0-9, printable ASCII except ‘?’), providing similar characteristics to the login passwords outlined above.

The module also supports SNMPv3 username and password authentication, similar to that outlined above, with strength of the authentication method based on the length of the password. The module enforces a minimum SNMP password length of eight (8) characters from the character set (a-z, A-Z, 0-9, printable ASCII except ‘?’). The password rules given implies that there are (26 + 26 + 10 + 31 = 93) possible characters available for passwords, for an overall limit of ($93^8 = 5.595\times10^{15}$) possible passwords. Therefore, the probability of a correct guess is less than 1/1,000,000.

In order to guess the SNMP password at a probability of 1/100,000 within a minute, an attacker would have to be capable of (93^8 / 100,000 / 60 = 932 x 10^6) attempts per second. This is significantly beyond the packet rate (less than 250,000 packets per second) that the module can process. Assume the module can support 250,000 packets per second, the module would then support 15,000,000 packets per minute, which results in a probability of 15,000,000/93^8, which is far less than 1/100,000.

Digital Signature Authentication

The digital signature authentication method, used for SSH client-side authentication, is based on the verification of a 2048-bit RSA or ECDSA digital signature, which has a minimum equivalent computational resistance to attack of 2^{112}. The probability of a successful random attempt is 1/ (2^{112}), which is less than 1/1,000,000.

Brute-forcing the digital signature with a probability of success of better than 1/100,000 within a minute would require in excess of 5x10^{28} attempts. The AW+ devices relevant to this Policy have been tested to have an upper performance limit of less than 250,000 packets per second, short of the required rate per minute by a factor of 3x10^{21}. Assume the module can support 250,000 packets per second, the module would then support 15,000,000 packets per minute, which results in a probability of 15,000,000/2^112, which is far less than 1/100,000.

Table 14 – Authentication Description

Authentication Method	Probability	Justification
Password	< $1/93^8$ < $20/93^8$ per minute < 15,000,000/93^8 per minute for SNMP	Number of character type complexity and the number of characters
Digital Signature Authentication	< 1/ 2^{112} < 15,000,000/2^112	2048-bit RSA, or ECDSA (P-256/384/521) 512-bit to 1042-bit signature depending on the curve used

3.3 Services

All services implemented by the Module are listed in the tables below:

Table 15 – Authenticated Services

Service	Description	CO	U
Module Reset	Module initialization via reboot. This service executes the suite of self-tests required by FIPS 140-2. The process does not access CSPs.	X	
Zeroization	Destroys all CSPs. There is no CSP that cannot be destroyed. Requires physical access via console port.	X	X
Show Status	Displays the current status, contents of which depend on the role of the authenticated identity.	X	X
SSHv2	Establish, maintain, and terminate SSHv2 sessions.	X	X
RADIUS / TLS	RADIUS user authentication (protected by TLS v1.2).	X	X
Syslog / TLS	Syslog remote logging (protected by TLS v1.2).	X	X
Configure security	Cryptographic Module configuration.	X	
Configure	Non-security relevant configuration.	X	
Console access	Serial console monitoring and control. Requires physical access via console port.	X	X
SNMPv3	Remote system management.	X	X
NTP	Network Time Protocol.	X	

Table 16 – Unauthenticated Services

Service	Description
Module Reset (Self-test)	Reset the Module by power cycle.
Network Traffic	Traffic forwarding requiring no cryptographic services.

3.4 Non-Approved Services

In addition to the above listed services available in FIPS mode, there are services permitted only in Non-Approved mode. These services are not supported in FIPS mode.

Table 17 – Authenticated Services in Non-FIPS Mode

Service	Description	CO	U
AMF	AlliedWare+ Management Framework	X	X
HTTP	HTTP/HTTPS server	X	X
PKI	Public Key Infrastructure	X	
SSH (non-compliant)	SSH using Non-Approved algorithms	X	X
TACACS+	TACACS+	X	
TFTP	File upload and download	X	
Telnet	Remote manage via TCP in plaintext	X	X
SNMPv1/v2	Configuration, administration and monitoring	X	X

Neither the User nor the Crypto Officer are permitted to operate any of these services while in FIPS mode of operation.

All services available can be found in the AlliedWare Plus Feature Overview and Configuration Guides.

Table 18 defines the relationship between access to Security Parameters and the different module services. The modes of access shown in the table are defined as:

- G = Generate: The service generates the CSP.
- O = Output: The service outputs the CSP.
- E = Execute: The service uses the CSP in an algorithm.
- I = Input: The service inputs the CSP.
- Z = Zeroize: The service zeroizes the CSP.

Table 18 – Security Parameters Access by Service

Service	CSPs and Public Keys																				
	FW Integrity Key	TLS CSPs	SSHv2 CSPs	DRBG-EI	DRBG-STATE	Password	NTP-Secret	RADIUS-Secret	SNMP-PP	SNMP-SENC	SNMP-SMAC	HOSTKEY	SSH-ECDH-CLI-Pub	SSH-ECDH-SRV-Pub	SSH-CAC-Pub	SSH-Peer-Pub	SSH-Pub	TLS-Host-Pub	SSH-ECDH-CLI-Pub	SSH-ECDH-SRV-	CA-Pub
Module Reset	E	Z	Z	GE	G	--	--	--	--	Z	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z
Zeroization	--	Z	Z	Z	Z	--	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
Show Status	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SSHv2	--	-	GEZ	GE	GE	E	E	E	--	--	--	--	IE Z	GEOZ	E	E	E	--	--	--	--
RADIUS / TLS	--	GZ	-	GE	GE	E	E	E	--	--	--	IE	--	--	--	--	--	EI	G Z	G Z	EI
Syslog / TLS	--	GZ	-	GE	GE	E	E	E	--	--	--	--	--	--	--	--	--	EI	G Z	G Z	EI

Service	CSPs and Public Keys																				
	FW Integrity Key	TLS CSPs	SSHv2 CSPs	DRBG-EI	DRBG-STATE	Password	NTP-Secret	RADIUS-Secret	SNMP-PP	SNMP-SENC	SNMP-SMAC	HOSTKEY	SSH-ECDH-CLI-Pub	SSH-ECDH-SRV-Pub	SSH-CAC-Pub	SSH-Peer-Pub	SSH-Pub	TLS-Host-Pub	SSH-ECDH-CLI-Pub	SSH-ECDH-SRV-	CA-Pub
Configure Security	E	--	--	--	--	GE	GE	G	G	--	--	E	--	--	I	I	G	--	--	--	--
Configure	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Console Access	--	--	--	--	--	E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SNMPv3	--	--	--	GE	GE	E	E	--	E	GE Z	GE Z	--	--	--	--	--	--	--	--	--	--
NTP	--	--	--	--	--	--	E	--	--	--	--	EI	--	--	--	--	--	--	--	--	--
Module Reset (Self-Test)	E	Z	Z	GE	G	--	--	--	--	Z	Z	G	Z	Z	Z	Z	Z	Z	Z	Z	Z
Network Traffic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

4. Self-Tests

The module performs self-tests to ensure the proper operation of the module. According to FIPS 140-2, these are categorized as either power-up self-tests or conditional self-tests. Power up self–tests are available on demand by power cycling the module.

All algorithm Known Answer Tests (KATs) must be completed successfully prior to any other use of cryptography by the Module. All data output via the data output interface is inhibited when an error state exists and during self-tests. Successful completion of self-tests is indicated by the message, "Power-up self-test successful", on the console. If one of the KATs fails, the Module outputs error diagnostic messages, enters the "Error" state and reboots. If the module continues to fail subsequent power-up self-tests, the module is considered to be malfunctioning or compromised and the module should be sent to Allied Telesis for repair or replacement.

The module performs the following algorithm KATs on power-up.

Table 19 – Power-up KAT Tests

Test Target	Description
Firmware Integrity Check	KAT: HMAC-SHA-256 (Firmware) KAT: SHA-256 (Bootloader)
AES	KATs: Encryption, Decryption Modes: CBC and GCM Key sizes: 256 bits
DRBG	KAT: CTR_DRBG (AES-256) with derivation function Security Strength: 256 bits
ECDSA	KATs: Signature Generation, Signature Verification Curves/Key sizes: P-256
ENT (NP)	APT and RCT
HMAC	KATs: Generation, Verification SHA sizes: SHA-1, SHA-256, SHA-384, SHA-512
KAS-SSC	KAT: Shared secret calculation per SP 800-56A §5.7.1.2, IG 9.6

RSA	KATs: Signature Generation, Signature Verification Key sizes: 2048 bits (SHA-256, PSS)
SHS	KAT: Output Verification SHA sizes: SHA-1
SHA-3	KAT: Output Verification SHA sizes: SHA-3-256
SSH KDF	KAT: SP800-135 SSH KDF shared secret calculation Key size: 256 bits
TLS KDF	KAT: TLS v 1.2 KDF shared secret calculation Key size: 256 bits
SNMP KDF	KAT: SNMP KDF shared secret calculation

The module performs the following conditional self-tests:

- ENT (NP): Continuous SP800-90B Health Tests (APT and RCT)
- DRBG: SP800-90A CTR_DRBG Health Tests (Instantiate, Generate, Reseed)
- ECDSA Pairwise consistency test on each ECDSA key pair generation
- RSA Pairwise consistency test on each RSA key pair generation
- Manual Key Entry Test: Duplicate key entries check

Conditional self-tests are performed by the module whenever a new random number is generated or when a new RSA or ECDSA key pair is generated. Pairwise consistency tests are performed for both possible modes of use, e.g., Sign/Verify and Encrypt/Decrypt. If any of the above self-tests fail, the module will log the error and reboot the system, ensuring that there is no data output.

5. Physical Security Policy

The module conforms to the EMI/EMC requirements specified by 47 Code of Federal Regulations, Part 15, Subpart B, Unintentional Radiators, Digital Devices, Class A (i.e., for business use).

The Cryptographic Officer is responsible for:

- Assuring the tamper-evident packaging tape has not been tampered with prior to installation.
- Assuring the product is installed in a secure location and setting.
- Adding required tamper-evident seals and USB port plug to the product as required by this procedure and recording the location and serial numbers of the tamper-evident seals and the USB port plug.
- Securely storing unused tamper-evident seals.
- Monthly reviews and assurance that the tamper-evident seals and USB port plug installed to the product do not show evidence of tampering and the serial numbers of the tamper-evident seals and USB port plug match the serial numbers in the security log.
- Reporting any instance of tamper evidence and taking appropriate actions.

5.1 Product Physical Security

Product physical security is achieved by two means:

1. Tamper-Evident Seals

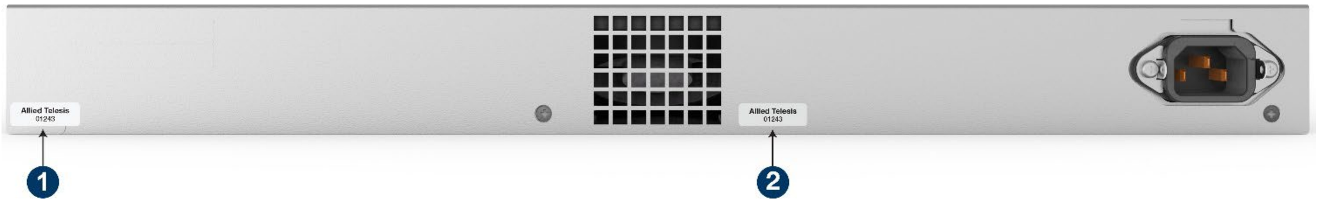
   These holographic seals measure 1-inch x 0.33 inches printed with ‘Allied Telesis’ and non-repeating serial numbers.

2. One-time use USB port plug, with serial number.

5.1.1 AT-x220-28GS

The AT-x220-28GS is shipped from the manufacturer with two (2) tamper-evident seals ('1' and '2') attached over two of the four screw heads at the rear of the unit, as shown in the image below. When completely configured, the AT-x220-28GS will have a total of two (2) tamper-evident seals and a USB port plug.

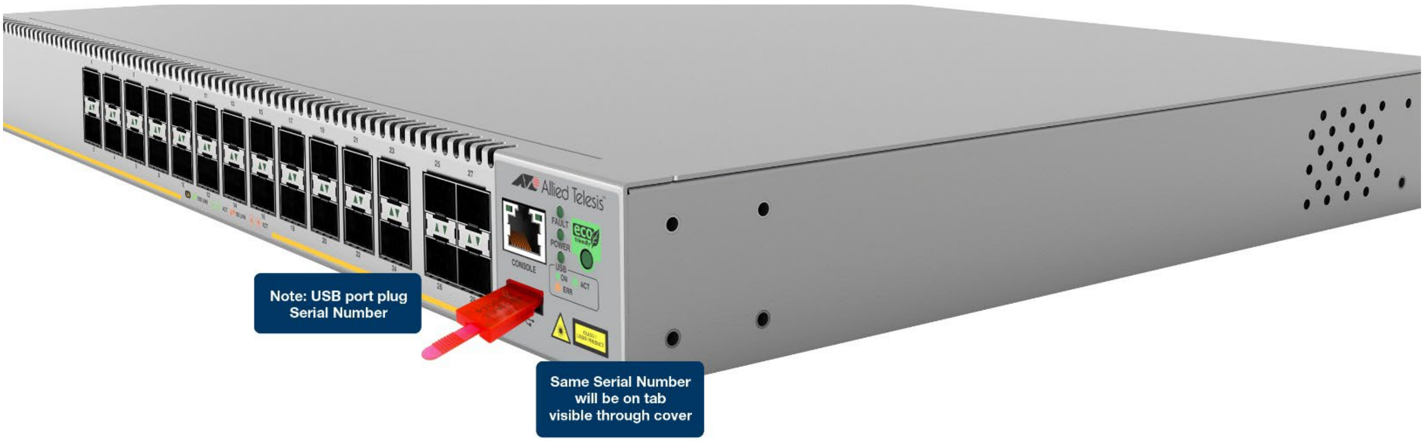
Figure 22: Tamper-Evident Seals on Rear of x220-28GS



The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled "Tamper-Evident Seal Integrity"
- After product setup, install a USB port plug in the USB slot, as shown in Figure 23, and according to the requirements in Section 5.1.10 below, "Applying the USB Port Lock".
- Record the serial number of each tamper-evident seal in the security log.
- Record the USB port plug's serial number in the security log.

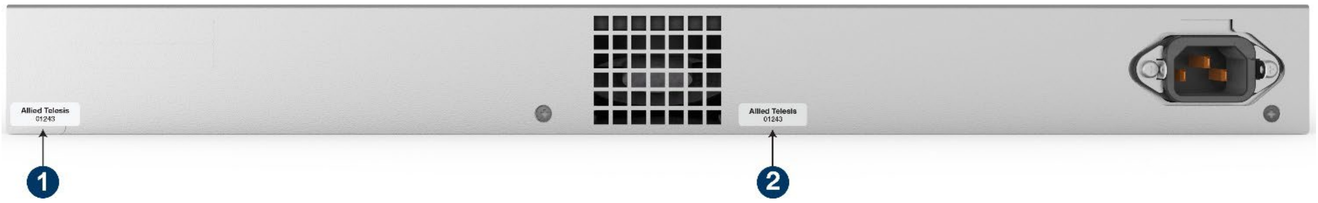
Figure 23: Location of USB Port Plug for x220-28GS


Allied Telesis
Note: USB port plug Serial Number
Same Serial Number will be on tab visible through cover

5.1.2 AT-x220-52GT

The AT-x220-52GT is shipped from the manufacturer with two (2) tamper-evident seals ('1' and '2') attached over two of the four screw heads at the rear of the unit, as shown in the image below. When completely configured, the AT-x220-52GT will have a total of two (2) tamper-evident seals and a USB port plug.

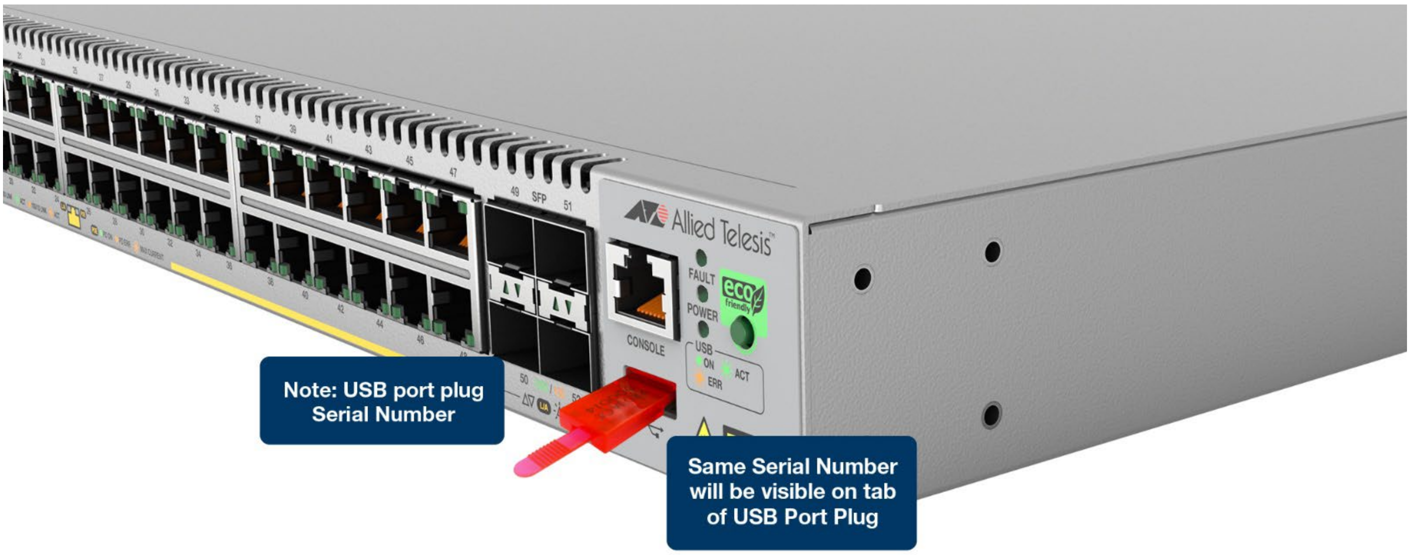
Figure 24: Tamper-Evident Seals on Rear of x220-52GT



The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled "Tamper-Evident Seal Integrity"
- After product setup, install a USB port plug in the USB slot, as shown in Figure 25, and according to the requirements in Section 5.1.10 below, "Applying the USB Port Lock".
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug's serial number in the security log.

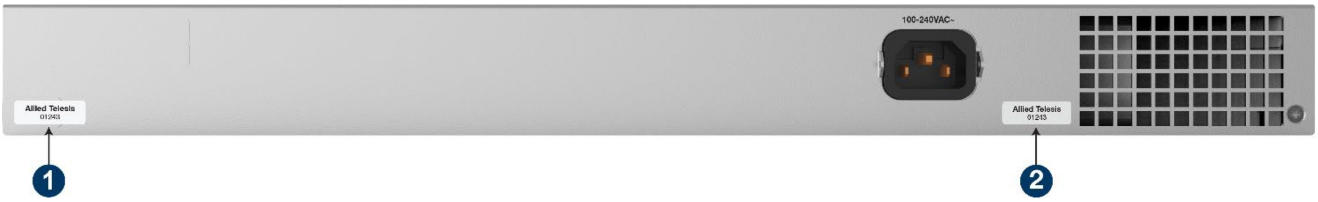
Figure 25: Location of USB Port Plug for x220-52GT


Allied Telesis
FAULT
POWER
CONSOLE
USB
ON
ERR
ACT
eco friendly
SFP
Note: USB port plug Serial Number
Same Serial Number will be visible on tab of USB Port Plug

5.1.3 AT-x220-52GP

The AT-x220-52GP is shipped from the manufacturer with two (2) tamper-evident seals ('1' and '2') attached over two of the four screw heads at the rear of the unit, as shown in the image below. When completely configured, the AT-x220-52GP will have a total of two (2) tamper-evident seals and a USB port plug.

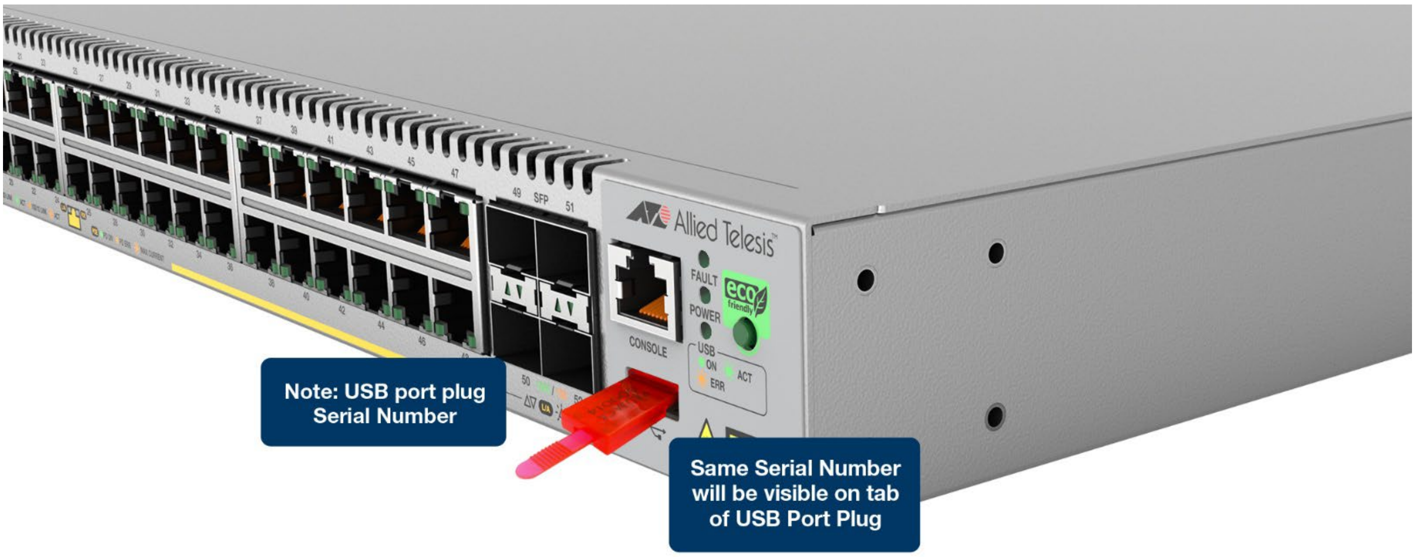
Figure 26: Tamper-Evident Seals on Rear of x220-52GP



The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled "Tamper-Evident Seal Integrity"
- After product setup, install a USB port plug in the USB slot, as shown in Figure 27, and according to the requirements in Section 5.1.10 below, "Applying the USB Port Lock".
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug's serial number in the security log.

Figure 27: Location of USB Port Plug for x220-52GP

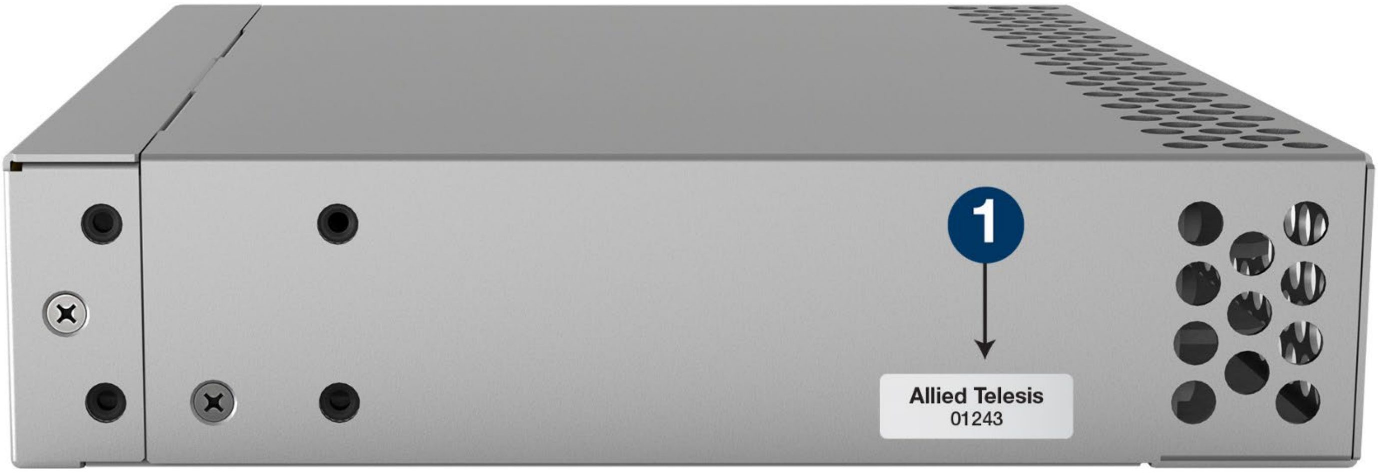

Allied Telesis
FAULT
POWER
eco friendly
CONSOLE
USB
ON
ERR
ACT
SFP
Note: USB port plug Serial Number
Same Serial Number will be visible on tab of USB Port Plug

5.1.4 AT-x320-10GH

The AT-x320-10GH is shipped from the manufacturer with three (3) tamper-evident seals ('1', '2', and '3') as shown:

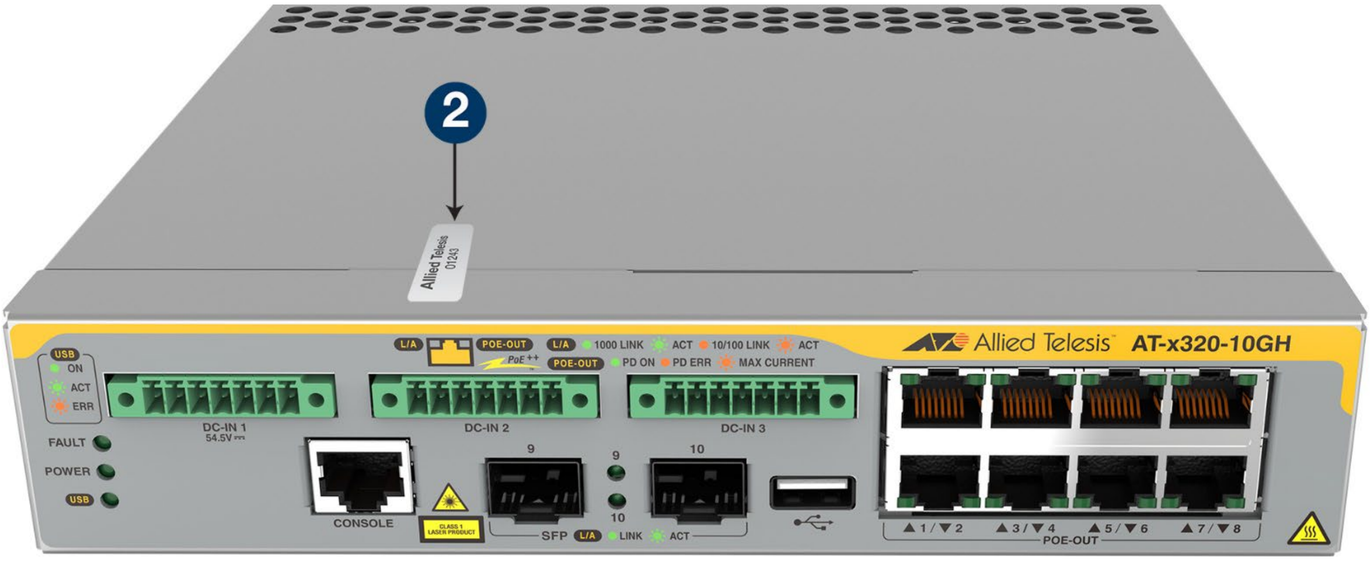
- '1' is attached to the screw head on the lower rear right side of the chassis.

Figure 28: Tamper-Evident Seal on Right Side of x320-10GH



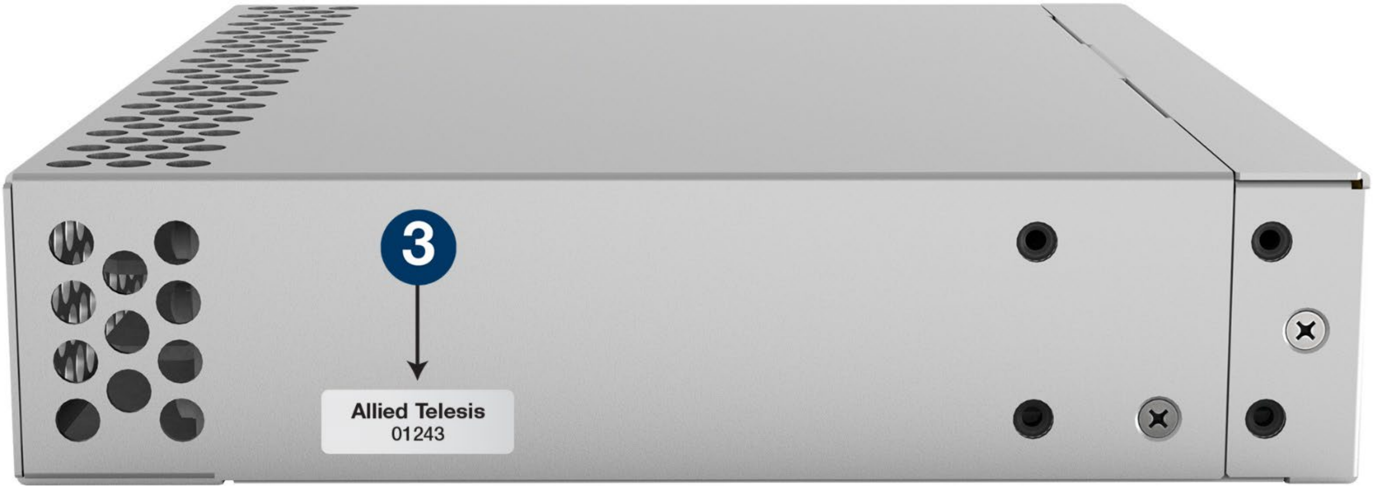
- '2' is attached on the top of the chassis straddling the front panel and the top cover.

Figure 29: Tamper-Evident Seal on Front Top of x320-10GH



- '3' is attached to the screw head on the lower rear left side of the chassis.

Figure 30: Tamper-Evident Seal on Left Side of x320-10GH

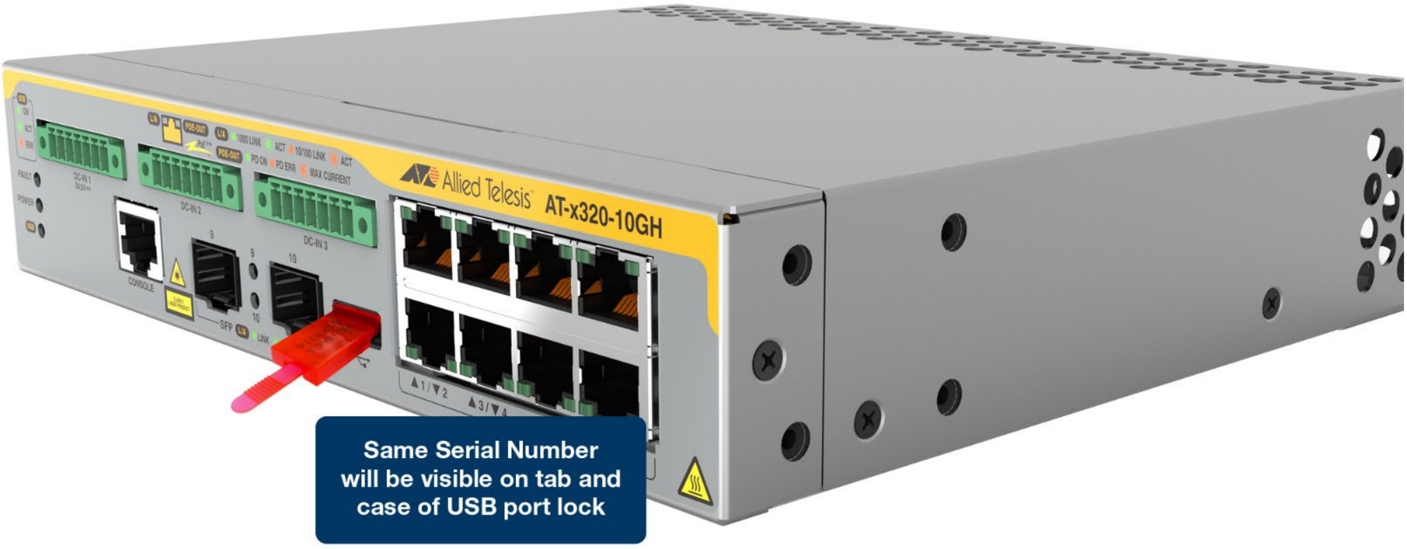


When completely configured, the AT-x320-10GH will have a total of three (3) tamper-evident seals and a USB port plug.

The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled "Tamper-Evident Seal Integrity"
- After product setup, install a USB port plug in the USB slot, as shown in Figure 31, and according to the requirements in Section 5.1.10 below, "Applying the USB Port Lock".
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug's serial number in the security log.

Figure 31: Location of USB Port Plug for x320-10GH

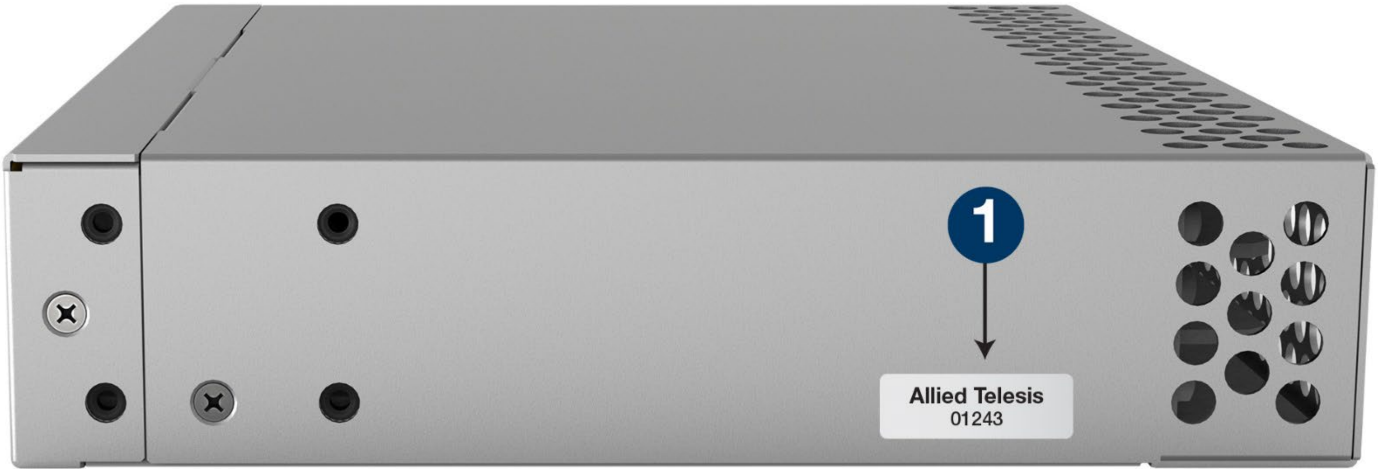

Allied Telesis
AT-x320-10GH
Same Serial Number will be visible on tab and case of USB port lock

5.1.5 AT-x320-11GPT

The AT-x320-11GPT is shipped from the manufacturer with three (3) tamper-evident seals (‘1’, ‘2’, and ‘3’) as shown:

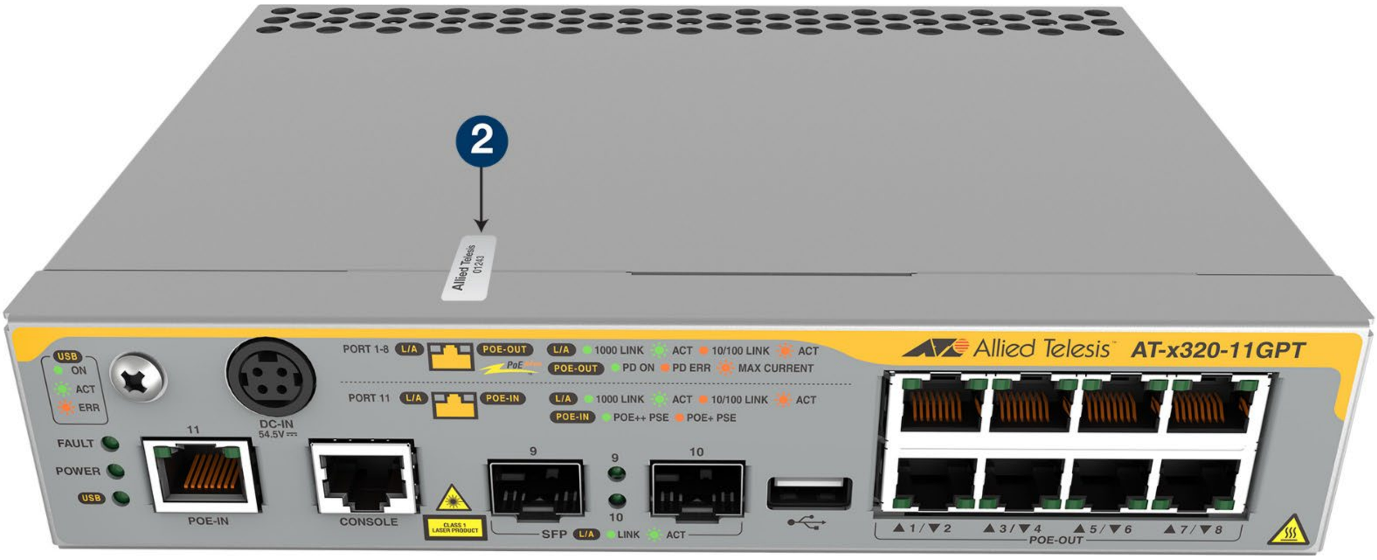
- ‘1’ is attached to the screw head on the lower rear right side of the chassis.

Figure 32: Tamper-Evident Seal on Right Side of x320-11GPT



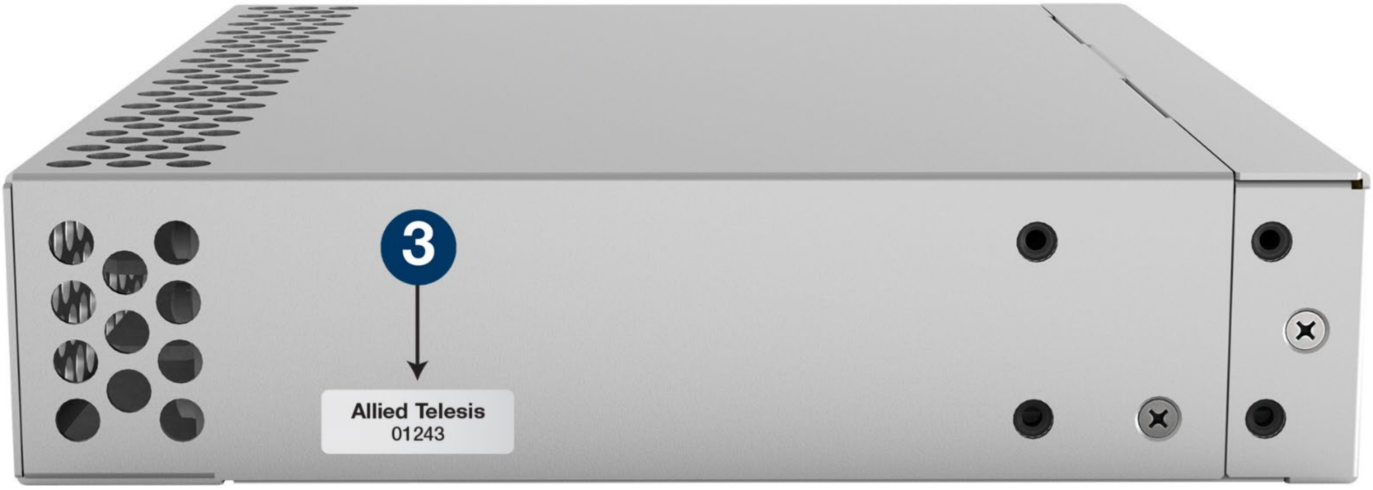
- ‘2’ is attached on the top of the chassis straddling the front panel and the top cover.

Figure 33: Tamper-Evident Seal on Front Top of x320-11GPT



- ‘3’ is attached to the screw head on the lower rear left side of the chassis.

Figure 34: Tamper-Evident Seal on Left Side of x320-11GPT

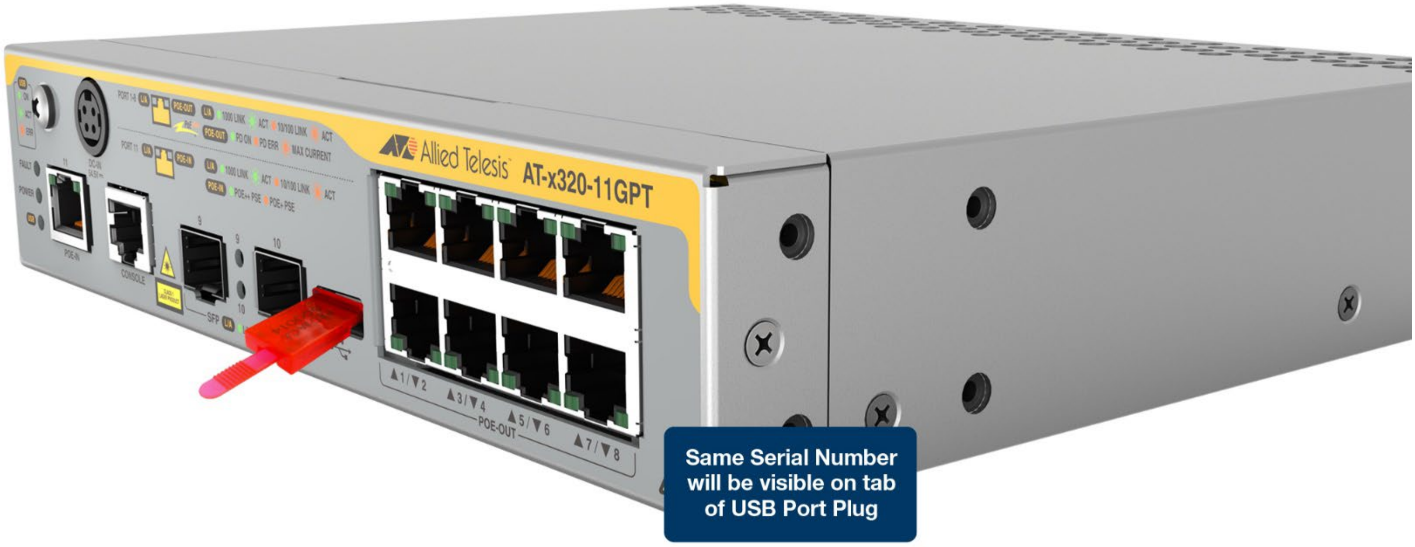


When completely configured, the AT-x320-11GPT will have a total of three (3) tamper-evident seals and a USB port plug.

The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled “Tamper-Evident Seal Integrity”
- After product setup, install a USB port plug in the USB slot, as shown in Figure 35, and according to the requirements in Section 5.1.10 below, “Applying the USB Port Lock”.
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug’s serial number in the security log.

Figure 35: Location of USB Port Plug for x320-11GPT



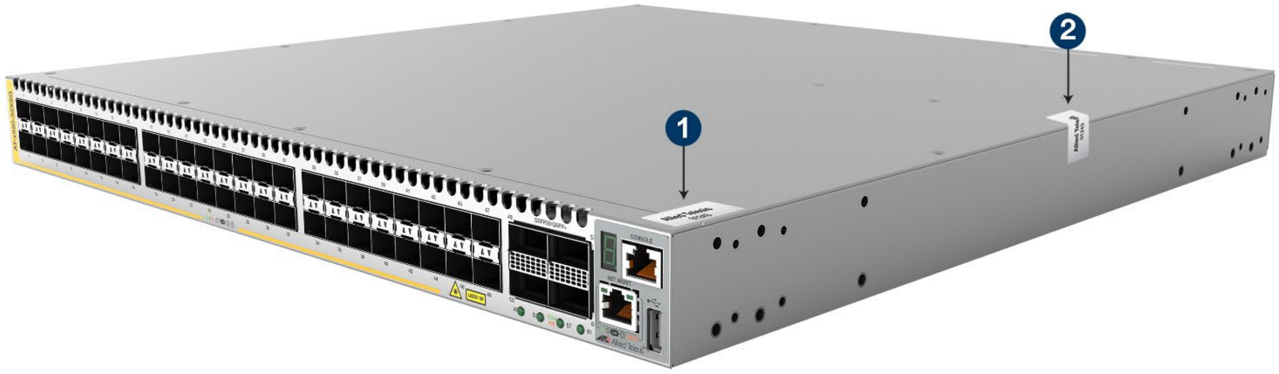
5.1.6 AT-x950-52XSQ

The AT-x950-52XSQ will be shipped from the manufacturer with six (6) tamper-evident seals attached on the top cover and fan assemblies as shown in Figure 36 to Figure 38. When completely configured, the AT-x950-52XSQ will have a total of eight (8) tamper-evident seals and a USB port plug.

Tamper-evident seal '1' will be located over front right screw head of the top cover, and onto the front panel.

Tamper-evident seal '2' will be located over the third screw head on the top cover from the front right side, and onto the right side of the chassis.

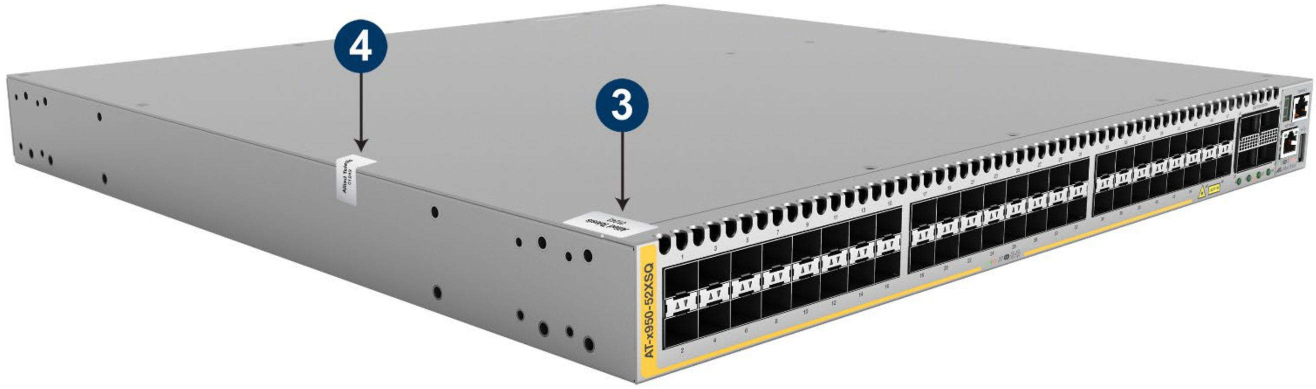
Figure 36: Tamper-Evident Seals on Top Right Side for AT-x950-52XSQ



Tamper-evident seal '3' will be located over the front left screw head of the top cover, and onto the front panel.

Tamper-evident seal '4' will be located over the second screw head on the top cover from the front left side, and onto the left side of the chassis.

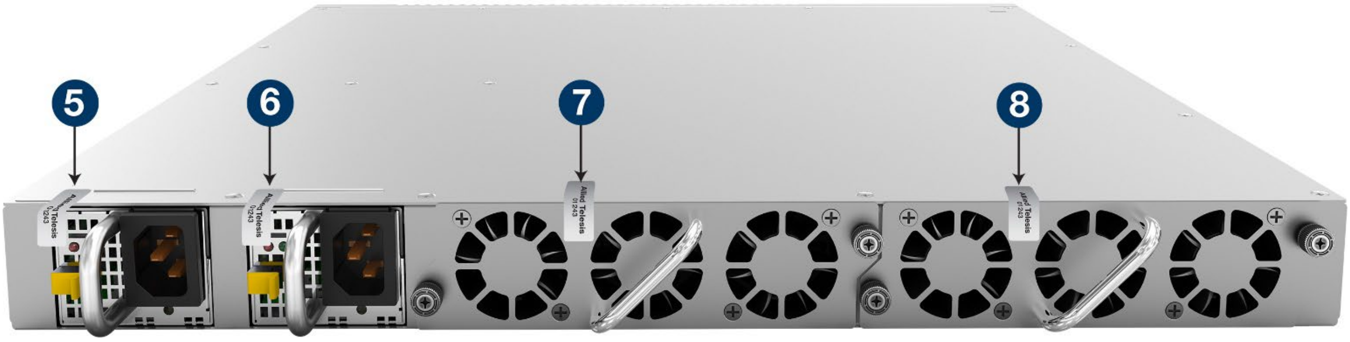
Figure 37: Tamper-Evident Seals on Top Left Side for AT-x950-52XSQ



Tamper-evident seal '7' will be located between the left fan unit, and onto the top cover.

Tamper-evident seal ‘8’ will be located between the right fan unit, and onto the top cover.

Figure 38: Tamper-Evident Seals on Top Cover & Back Near Fan Units for AT-x950-52XSQ



The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled “Tamper-Evident Seal Integrity”
- After product setup, install tamper-evident seals to the locations on back of the unit, as shown in Figure 38.
- After product setup, install a USB port plug in the USB slot, as shown in Figure 39, and according to the requirements in Section 5.1.10 below, “Applying the USB Port Lock”.
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug’s serial number in the security log.

The Cryptographic Officer shall complete the setup of the AT-x950-52XSQ with the appropriate power supply and then apply the appropriate tamper-evident seals.

Power Supply:

One or two power supplies can be installed in the AT-x950-52XSQ.

If **one** power supply is required for the setup, the Cryptographic Officer shall install the required power supply and apply tamper-evident seals to the power supply and the Power Supply Blank panel.

Apply seal ‘5’ to the power supply, aligned above and to the left of the power supply LEDs and onto the top cover. This tamper-evident seal will overlap from the power supply to the chassis (see Figure 38).

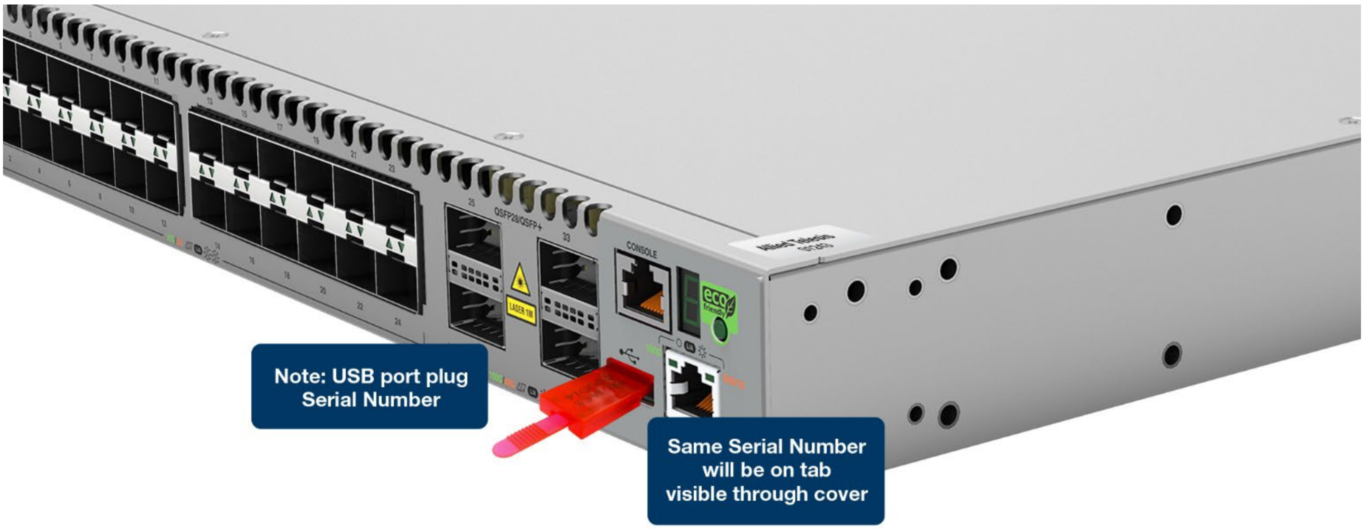
Apply seal ‘6’ to the top left edge of the Power Supply Blank panel and onto the top cover (see Figure 38).

Note: The power supply can be installed in either PSU A or PSU B slot. Whatever slot the power supply is installed in, follow directions for seal ‘5’ for the power supply and seal ‘6’ for the Power Supply Blank panel.

If **two** power supplies are required for the setup, the Cryptographic Officer shall install the required power supplies and apply tamper-evident seals to them.

Apply seal ‘5’ and seal ‘6’ to each power supply, aligned above and to the left of the power supply LEDs and onto the top cover. The tamper-evident seals will overlap from the power supply to the chassis (see Figure 38).

Figure 39: Location of USB Port Plug for x950-52XSQ



Note: USB port plug Serial Number

Same Serial Number will be on tab visible through cover

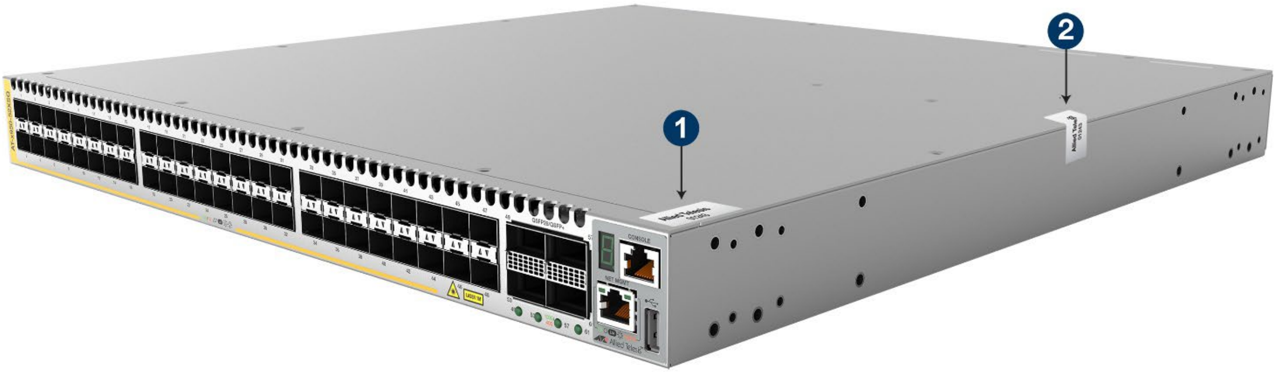
5.1.7 AT-x950-52XTQm

The AT-x950-52XTQm will be shipped from the manufacturer with six (6) tamper-evident seals attached on the top cover and fan assemblies as shown in Figure 40 to Figure 42. When completely configured, the AT-x950-52XTQm will have a total of eight (8) tamper-evident seals and a USB port plug.

Tamper-evident seal ‘1’ will be located over front right screw head of the top cover, and onto the front panel.

Tamper-evident seal ‘2’ will be located over the third screw head on the top cover from the front right side, and onto the right side of the chassis.

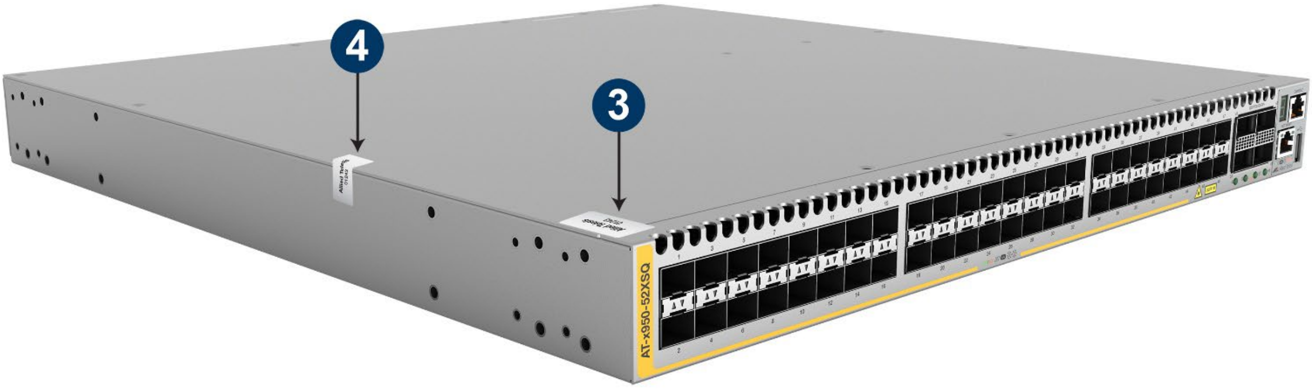
Figure 40: Tamper-Evident Seals on Top Right Side for AT-x950-52XTQm



Tamper-evident seal ‘3’ will be located over the front left screw head of the top cover, and onto the front panel.

Tamper-evident seal ‘4’ will be located over the second screw head on the top cover from the front left side, and onto the left side of the chassis.

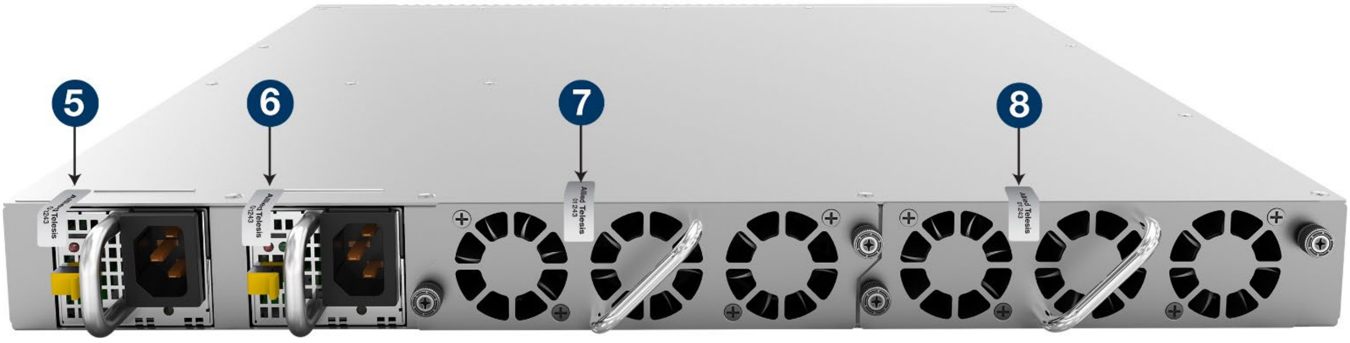
Figure 41: Tamper-Evident Seals on Top Left Side for AT-x950-52XTQm



Tamper-evident seal ‘7’ will be located between the left fan unit, and onto the top cover.

Tamper-evident seal ‘8’ will be located between the right fan unit, and onto the top cover.

Figure 42: Tamper-Evident Seals on Top Cover & Back Near Fan Units for AT-x950-52XTQm



The Cryptographic Officer shall:

- Verify the integrity of the tamper-evident seals, according to the requirements in Section 5.1.8 below entitled “Tamper-Evident Seal Integrity”
- After product setup, install tamper-evident seals to the locations on the back of the unit, as shown in Figure 42.
- After product setup, install a USB port plug in the USB slot, as shown in Figure 43, and according to the requirements in Section 5.1.10 below, “Applying the USB Port Lock”.
- Record the serial number of each of the tamper-evident seals in the security log.
- Record the USB port plug’s serial number in the security log.

The Cryptographic Officer shall complete the setup of the AT-x950-52XTQm with the appropriate power supply and then apply the appropriate tamper-evident seals.

Power Supply:

One or two power supplies can be installed in the AT-x950-52XTQm.

If **one** power supply is required for the setup, the Cryptographic Officer shall install the required power supply and apply tamper-evident seals to the power supply and the Power Supply Blank panel.

Apply seal ‘5’ to the power supply, aligned above and to the left of the power supply LEDs and onto the top cover. This tamper-evident seal will overlap from the power supply to the chassis (see Figure 42).

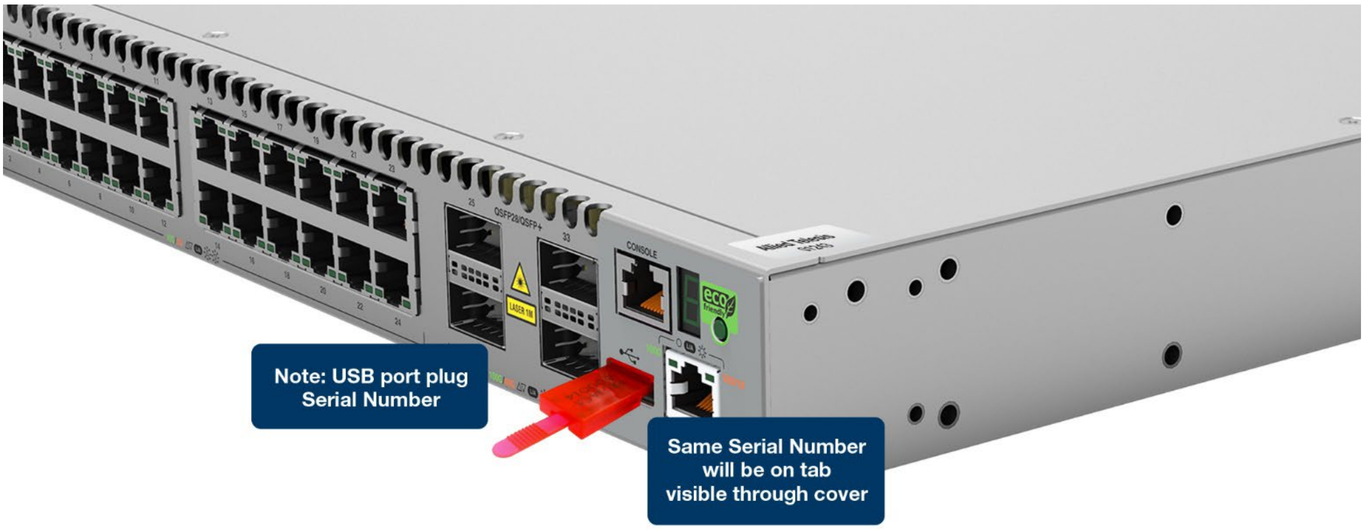
Apply seal ‘6’ to the top left edge of the Power Supply Blank panel and onto the top cover (see Figure 42).

Note: The power supply can be installed in either PSU A or PSU B slot. Whatever slot the power supply is installed in, follow directions for seal ‘5’ for the power supply and seal ‘6’ for the Power Supply Blank panel.

If **two** power supplies are required for the setup, the Cryptographic Officer shall install the required power supplies and apply tamper-evident seals to them.

Apply seal ‘5’ and seal ‘6’ to each power supply, aligned above and to the left of the power supply LEDs and onto the top cover. The tamper-evident seals will overlap from the power supply to the chassis (see Figure 42).

Figure 43: Location of USB Port Plug for x950-52XTQm



5.1.8 Tamper-Evident Seal Integrity

The tamper-evident seals are produced from a special thin gauge vinyl (or security film) with self-adhesive backing.

Any attempt to remove covers or Modules to gain access to the product's internals will damage the tamper-evident seals.

Since the tamper-evident seals have non-repeating serial numbers, the seals can be inspected for damage and compared against the applied serial numbers to verify that the product has not been tampered with. Tamper-evident seals can also be inspected for signs of tampering, which include the following: curled corners, bubbling, crinkling, rips, tears, and slices.

The word "Opened" (or a geometric pattern) can appear if the seal was peeled back.

5.1.9 Applying Tamper-Evident Seals

Surfaces must be cleaned with alcohol to remove surface contaminants before affixing the seal:

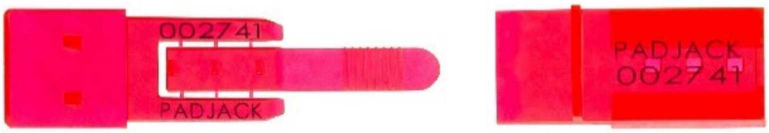
- Use 90% (or higher) Isopropyl Alcohol
- Apply alcohol to a clean paper towel and wipe the intended surface to remove contaminants
- Dry the surface with another clean paper towel (some contaminants will remain on the surface if the alcohol is allowed to air dry)
- Apply the seal to the clean surface

5.1.10 Applying the USB Port Lock

The USB Port lock will come in two (2) pieces. Note that identical serial numbers will be on both pieces.

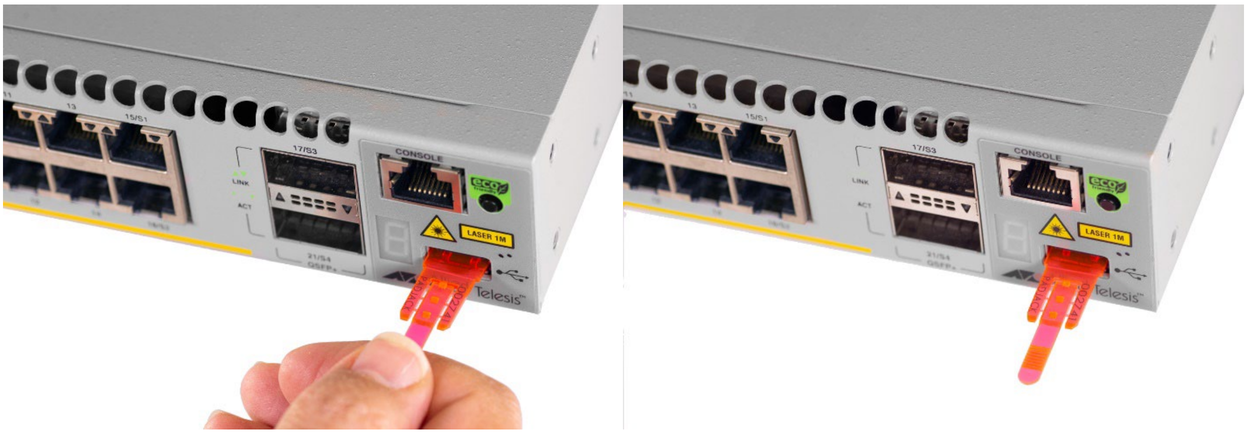
Figures presented in this section use an x550 Series unit. The process is identical for the other products.

Figure 44: The Two Pieces of USB Port Lock (Tab and Housing)



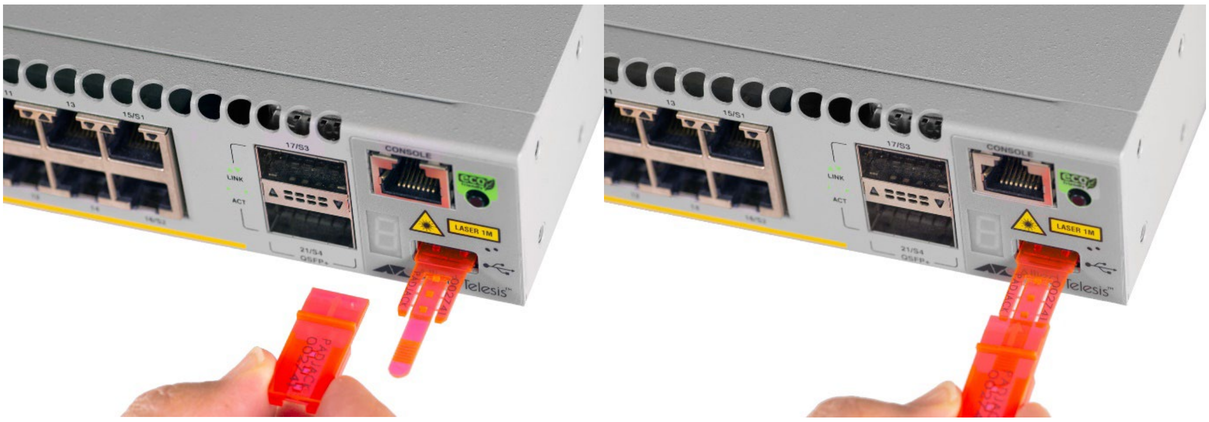
Step 1: Install the piece with the tab into the USB port.

Figure 45: Putting USB Port Lock Tab into USB Port



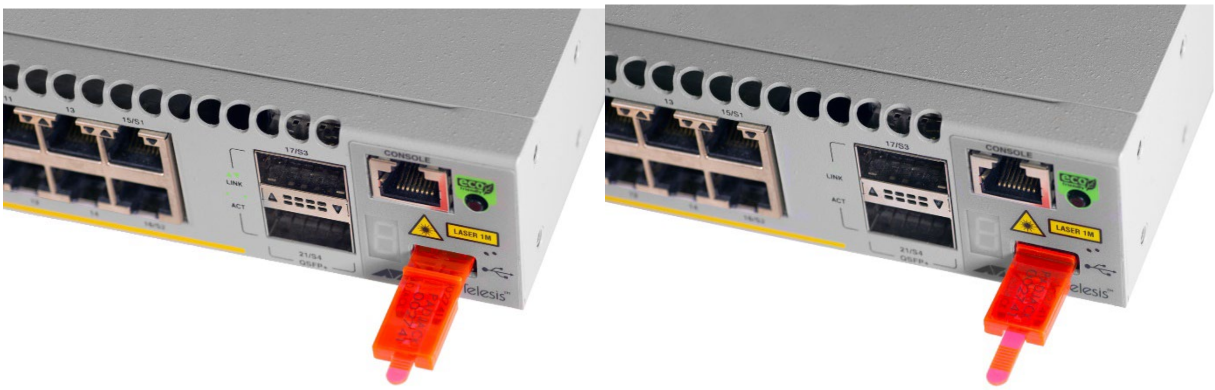
Step 2: Slide the housing over the tab as far as possible.

Figure 46: Sliding the Housing Over USB Port Lock Tab



Make sure the housing is fully inserted as shown in Figure 47.

Figure 47: The Difference Between a Partly and Fully Inserted Housing Over Tab

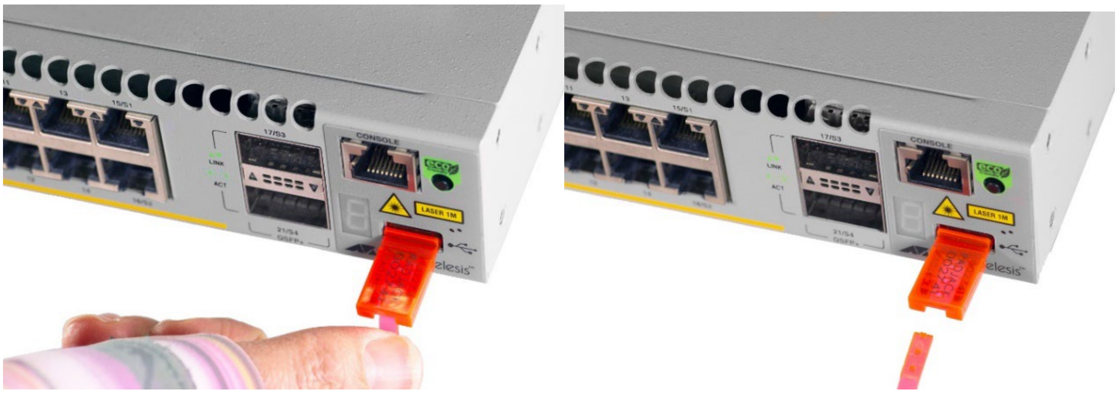


5.1.11 Removing the USB Port Lock

To remove USB Port Lock, break off the tab and remove all pieces. Note that doing so will deviate from the configuration outlined in this Security Policy and invalidate Approved mode. This should only be done once all CSPs have been zeroized.

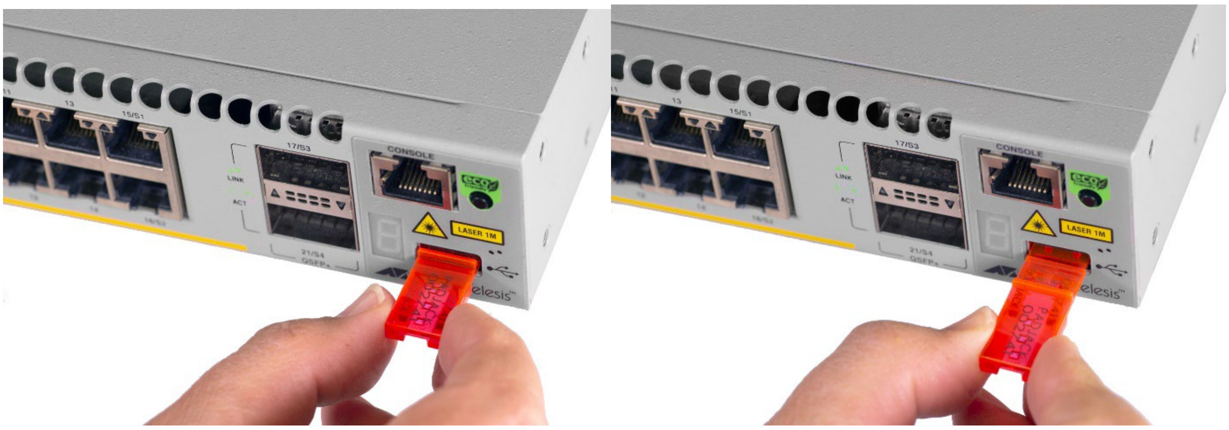
Step 1: Bend the tab downward and remove:

Figure 48: Breaking the Tab on USB Port Lock



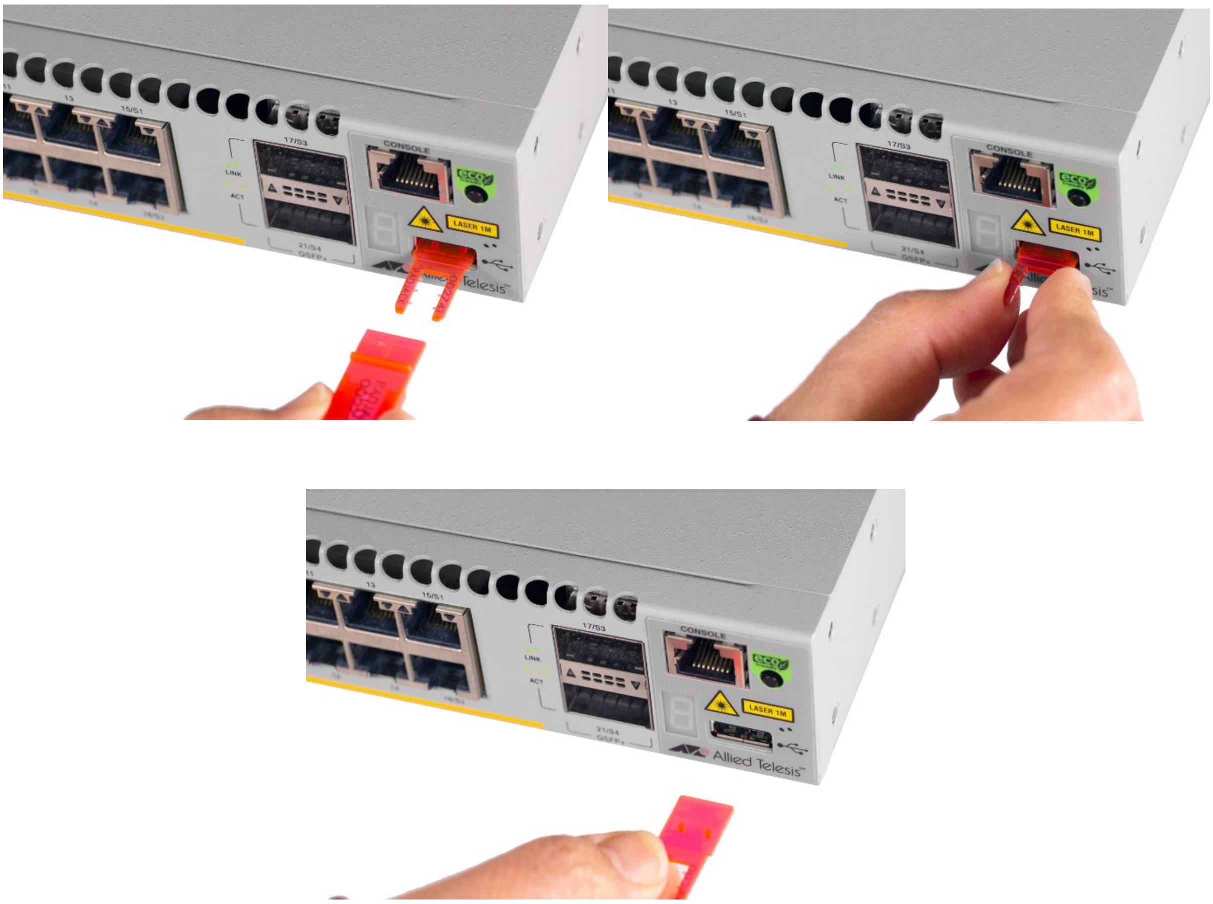
Step 2: Firmly grasp the housing and remove it:

Figure 49: Removing the Housing from USB Port Lock



Step 3: Push the last section upwards and remove it:

Figure 50: Removing the Last Section of USB Port Lock



6. Operational Environment

The Module has a non-modifiable operational environment under the FIPS 140-2 definitions. Firmware versions validated through the FIPS 140-2 CMVP will be explicitly identified on a validation certificate. Any firmware not identified in this Security Policy does not constitute the Module defined by this Security Policy or covered by this validation.

7. Mitigation of Other Attacks Policy

The devices have no additional implemented mitigations against attacks on the cryptographic module.

8. Module configuration

For the Module to enter FIPS approved mode, the following configuration procedure must be followed. Please refer to the Installation Guide [COG], Getting Started with AlliedWare Plus [GSAW+] and Command Reference [UG] documents for more detail on the commands provided and how to execute specific steps. Note that passwords and shared secrets must not be reused for multiple functions.

1. If the device had previously been used, follow the “How to Return to the Factory Defaults” procedure outlined in the Getting Started with AlliedWare Plus [GSAW+] document.
2. Install correct firmware version and set to boot.
3. Boot and log into unit Username = manager, Password = friend
4. Enter privileged level by using the command: "enable"
5. Ensure that any required additional licenses have been installed, as per the Command Reference [UG]
6. Enter configuration mode by entering the command: "configure terminal"
7. Enable secure mode and verify it using the commands: "crypto secure-mode", “crypto verify signed”, and “crypto verify bootrom” as per the Command Reference [UG].
8. Enter the command "no autoboot enable"
9. Enter the command "service password-encryption"
10. Enter the command "no service telnet"
11. Enter the command "no service http"
12. Enter the command "no stack 1 enable"
13. Enter the command "no atmf enable"
14. Disable crash/core files by entering the command: "no debug core-file"
15. Enter the command "security-password minimum-length 8"
16. Save configuration to Flash, set to boot
17. Update login details, i.e., user/manager passwords, as per the Getting Started with AlliedWare Plus [GSAW+] document
18. Save updated configuration
19. Apply tamper-evident seals as per Section 5.1, “Product Physical Security”
20. Reboot

In order to leave Approved mode, the device will require a configuration change and reboot. Before taking those steps, ensure that all keys are zeroized and follow the “How to Return to the Factory Defaults” procedure outlined in the Getting Started with AlliedWare Plus [GSAW+] document. To zeroize keys, the following commands should be used:

- ‘crypto secure-mode delete hostkey’ – destroys encryption key securing NTP and RADIUS secrets
- ‘crypto key zeroize all’ – destroys SSH stored keys
- ‘reboot’ – destroys volatile CSPs

9. Security Rules and Guidance

This section documents the security rules for the secure operation of the cryptographic module to implement the security requirements of FIPS 140-2.

1. The Module provides two distinct operator roles: User and Cryptographic Officer.
2. The Module provides role-based authentication.
3. The Module clears previous authentications on power cycle.
4. An operator does not have access to any cryptographic services prior to assuming an authorized role.
5. Operator passwords must conform to requirements outlined above (eight (8) characters from the set a-z, A-Z, 0-9, and special characters) for both local authentication and remote RADIUS authentication.
6. The Module allows the initiation of power-up self-tests by power cycling power or resetting the Module. The logical reset can only be done by the CO.
7. Power-up self-tests do not require any operator action.
8. Key generation, zeroization and self-tests can only be performed by a Cryptographic Officer.
9. Data output is inhibited during key generation, self-tests, zeroization, manual key entry, and error states.
10. Status information available to a user does not contain CSPs or sensitive data that if misused could lead to a compromise of the Module.
11. Zeroization can be performed by invoking relevant commands, as per Configuration Guide. The CO is required to maintain physical control of the device during this process.
12. The Module does support concurrent operators.
13. The Module does not support a maintenance interface or role.
14. The Module does support manual key entry.
15. The Module does not have any proprietary external input/output devices used for entry/output of data.
16. The Module supports the entry of plaintext CSPs by an authenticated CO.
17. The Module does store plaintext CSPs.
18. The Module does not output intermediate key values.
19. The tamper-evident seals and security devices must be installed (as per Section 5.1, “Product Physical Security”) for the module to operate in the approved mode of operation.
20. The Module does not provide bypass services or ports/interfaces.
21. While the module allows RSA keys larger than 3072 bits to be generated, RSA must be used with either 2048-bit keys or 3072-bit keys to comply with the requirements of FIPS 140-2.

10. References and Definitions

The following standards are referred to in this Security Policy.

Table 20 – References

Abbreviation	Full Specification Name
[FIPS140-2]	*Security Requirements for Cryptographic Modules*, May 25, 2001
[IG]	*Implementation Guidance for FIPS PUB 140-2 and the Cryptographic Module Validation Program, August 28, 2020*
[131Ar2]	*NIST Special Publication 800-131A Rev. 2, Transitions: Recommendation for Transitioning the Use of Cryptographic Algorithms and Key Lengths, March 2019*
[133]	*NIST Special Publication 800-133 Rev. 2, Recommendation for Cryptographic Key Generation, June 2020*
[135]	*National Institute of Standards and Technology, Recommendation for Existing Application-Specific Key Derivation Functions, Special Publication 800-135rev1, December 2011.*
[186-4]	*National Institute of Standards and Technology, Digital Signature Standard (DSS), Federal Information Processing Standards Publication 186-4, July 2013.*
[197]	*National Institute of Standards and Technology, Advanced Encryption Standard (AES), Federal Information Processing Standards Publication 197, November 26, 2001*
[198]	*National Institute of Standards and Technology, The Keyed-Hash Message Authentication Code (HMAC), Federal Information Processing Standards Publication 198-1, July, 2008*
[180]	*National Institute of Standards and Technology, Secure Hash Standard, Federal Information Processing Standards Publication 180-4, August, 2015*
[38A]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation, Methods and Techniques, Special Publication 800-38A, December 2001*
[38B]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation: The CMAC Mode for Authentication, Special Publication 800-38B, October 2016*
[38C]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation: The CCM Mode for Authentication and Confidentiality, Special Publication 800-38C, August 2007*
[38D]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation: Galois/Counter Mode (GCM) and GMAC, Special Publication 800-38D, November 2007*
[38E]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation: The XTS-AES Mode for Confidentiality on Storage Devices, Special Publication 800-38E, January 2010*
[38F]	*National Institute of Standards and Technology, Recommendation for Block Cipher Modes of Operation: Methods for Key Wrapping, Special Publication 800-38F, December 2012*
[56Ar3]	*NIST Special Publication 800-56A Revision 3, Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography, April 2018*
[67r2]	*National Institute of Standards and Technology, Recommendation for the Triple Data Encryption Algorithm (TDEA) Block Cipher, Special Publication 800-67 Revision 2, November 2017*
[90Ar1]	*National Institute of Standards and Technology, Recommendation for Random Number Generation Using Deterministic Random Bit Generators, Special Publication 800-90A Revision 1, June 2015.*

Abbreviation	Full Specification Name
[90B]	*National Institute of Standards and Technology, Recommendation for the Entropy Sources Used for Random Bit Generation, Special Publication 800-90B, January 2018.*
SSH	*Ylonen, T. and C. Lonvick, "The Secure Shell (SSH) Connection Protocol", RFC 4252/4253/4254, Internet Engineering Task Force, January 2006.* *D. Bider, "Use of RSA Keys with SHA-256 and SHA-512 in the Secure Shell (SSH) Protocol", RFC 8332, Internet Engineering Task Force, March 2018.*
TLS	*Dierks, T., and E. Rescoria, "The Transport Layer Security (TLS) Protocol Version 1.2". RFC 5246, Internet Engineering Task Force, August 2008.*
[SP]	Security Policy (this document)
[COG]	Platform Installation Guide, per platform: **AT-x220-28GS, AT-x220-52GT, AT-x220-52GP:** *x220 Series Installation Guide. ati-x220series-ig.pdf, Allied Telesis Inc, Document number 613-002649 Rev. B, 22 March 2019* *https://www.alliedtelesis.com/en/documents/installation-guide-x220-28gs* **AT-x320-10GH, AT-x320-11GPT:** *x320 Series Installation Guide. ati-x320series-ig.pdf, Allied Telesis Inc, Document number 613-002760 Rev. C, 2 July 2020* *https://www.alliedtelesis.com/en/installation-guide/x320-series* **AT-x950-52XSQ, AT-x950-52XTQm:** *x950 Series Switches Installation Guide for Stand-alone Switches. ati-x950series-standalone-switch-ig.pdf, Allied Telesis Inc, Document number 613-002642 Rev. D, 23 October 2020* https://www.alliedtelesis.com/en/install/x950-stand-alone-switches
[GSAW+]	*Getting Started with AlliedWare Plus. getting_started_aw_feature_overview_guide.pdf, Allied Telesis Inc, Document number C613-22045-00 Rev H, 26 July 2021* *https://www.alliedtelesis.com/documents/getting-started-alliedware-plus-feature-overview-and-configuration-guide*

Abbreviation	Full Specification Name
[UG]	Platform Command Reference, per platform: **AT-x220-28GS, AT-x220-52GT, AT-x220-52GP:** *x220 Series Command Reference for AlliedWare Plus™ Version 5.5.1.APCERT-0.3. x220_command_ref_551apcert-03.pdf, Allied Telesis Inc, Document number C613-50508-01 Rev A, 13 August 2021* https://www.alliedtelesis.com/documents/documentation-for-sec-cert **AT-x320-10GH, AT-x320-11GPT:** *x320 Series Command Reference for AlliedWare Plus™ Version 5.5.1.APCERT-0.3. x320_command_ref_551apcert-03.pdf, Allied Telesis Inc, Document number C613-50507-01 Rev A, 13 August 2021* https://www.alliedtelesis.com/documents/documentation-for-sec-cert **AT-x950-52XSQ, AT-x950-52XTQm:** *x950 Series Command Reference for AlliedWare Plus™ Version 5.5.1.APCERT-0.3. x950_command_ref_551apcert-03.pdf, Allied Telesis Inc, Document number C613-50506-01 Rev A, 13 August 2021* https://www.alliedtelesis.com/documents/documentation-for-sec-cert *Note: link is accessible only to customers through the Allied Telesis service portal*

Table 21 – Acronyms and Definitions

Acronym	Definition
AW+	AlliedWare Plus Operating System
AMF	Allied Telesis Management Framework