



**Cisco Catalyst 3560-X and 3750-X Switches  
FIPS 140-2 Level 2  
Non-Proprietary Security Policy**

**Overall Level 2 Validation**

**Version 0.5**

**December 17, 2011**

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## Introduction

This is a non-proprietary Cryptographic Module Security Policy for the Cisco Catalyst 3560-X and 3750-X Switches; referred to in this document as the modules or switches. This security policy describes how the modules meet the security requirements of FIPS 140-2 and how to run the modules in a FIPS 140-2 mode of operation and may be freely distributed.

### Models:

- 3560-X and 3750-X switches
  - WS-C3560X-24P
  - WS-C3560X-24T
  - WS-C3560X-48P
  - WS-C3560X-48PF
  - WS-C3560X-48T
  - WS-C3750X-12S
  - WS-C3750X-24P
  - WS-C3750X-24S
  - WS-C3750X-24T
  - WS-C3750X-48P
  - WS-C3750X-48PF
  - WS-C3750X-48T
- With Field Replaceable Uplink (FRUlink) Modules<sup>1</sup>:
  - C3KX-NM-1G
  - C3KX-NM-10G
  - C3KX-NM-BLANK
  - C3KX-NM-10GT
- IOS version 15.0(1)SE

### References

This document deals only with operations and capabilities of the module in the technical terms of a FIPS 140-2 cryptographic module security policy. More information is available on the module from the following sources:

- The Cisco Systems website (<http://www.cisco.com>) contains information on the full line of products from Cisco Systems.
- The NIST Cryptographic Module Validation Program website (<http://csrc.nist.gov/groups/STM/cmvp/index.html>) contains contact information for answers to technical or sales-related questions for the module.
- FIPS 140-2 (Federal Information Processing Standards Publication 140-2 — Security Requirements for Cryptographic Modules) details the U.S. Government requirements for cryptographic modules. More information about the FIPS 140-2

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<sup>11</sup> The FRUlink modules implement no FIPS 140-2 security functions and are considered equivalent for the purposes of this security policy with the exception of physical security opacity requirements.

standard and validation program is available on the NIST website at <http://csrc.nist.gov/groups/STM/cmvp/index.html>.

### ***FIPS 140-2 Submission Package***

The security policy document is one document in a FIPS 140-2 Submission Package. In addition to this document, the submission package includes:

- Vendor Evidence
- Finite State Machine
- Other supporting documentation as additional references

With the exception of this non-proprietary security policy, the FIPS 140-2 validation documentation is proprietary to Cisco Systems, Inc. and is releasable only under appropriate non-disclosure agreements. For access to these documents, please contact Cisco Systems, Inc. See “Obtaining Technical Assistance” section for more information.

## Module Description

Cisco Catalyst 3750-X and 3650-X Series Switches are enterprise-class stackable switches that provide high availability, scalability, security, energy efficiency, and ease of operation with innovative features such as Cisco StackPower, Power over Ethernet Plus (PoE+), optional network modules, redundant power supplies, and MAC security. The Catalyst 3750-X and 3650-X Series Switches meet FIPS 140-2 overall Level 2 requirements as multi-chip standalone modules.

The switches include cryptographic algorithms implemented in IOS software as well as hardware ASICs. The module provides 802.1X-rev with MACSec and MACSec Key Agreement (MKA), RADIUS, TACACS+, HTTPS, SNMPv3 and SSHv2. The module implements Layer 2 MACsec / IEEE 802.1AE on the downlink ports using a hardware cryptographic implementation (MACsec PHY) of AES-GCM. The module's IOS software implements 128 bit AES-CBC, CTR-DRBG, SHA-1, HMAC-SHA-1 and RSA.

Media Access Control Security (MACsec), defined in 802.1AE, provides MAC-layer encryption over wired networks by using out-of-band methods for encryption keying. The MACsec Key Agreement (MKA) Protocol provides the required session keys and manages the required encryption keys. MKA and MACsec are implemented after successful key establishment using the 802.1x Extensible Authentication Protocol (EAP) framework.

## Module Validation Level

The following table lists the level of validation for each area in the FIPS PUB 140-2.

**Table 1: Module Validation Level**

No.	Area Title	Level
1	Cryptographic Module Specification	2
2	Cryptographic Module Ports and Interfaces	2
3	Roles, Services, and Authentication	2
4	Finite State Model	2
5	Physical Security	2
6	Operational Environment	N/A
7	Cryptographic Key management	2
8	Electromagnetic Interface/Electromagnetic Compatibility	2
9	Self-Tests	2
10	Design Assurance	2
11	Mitigation of Other Attacks	N/A
<b>Overall</b>	<b>Overall module validation level</b>	<b>2</b>

## Cryptographic Boundary

The cryptographic boundary for the switches is defined as encompassing the "top," "front," "left," "right," "back," and "bottom" surfaces of the chassis; including the opacity shields.

## Cryptographic Module Ports and Interfaces

Each module provides a number of physical and logical interfaces to the device, and the physical interfaces provided by the module are mapped to four FIPS 140-2 defined logical interfaces: data input, data output, control input, and status output. The module also supports a power interface.

The following table identifies the differences between the models of switches covered by this Security Policy:

**Table 2 - Model Physical Ports**

<b>Model</b>	<b>MACsec 1G Ethernet Ports</b>	<b>StackWise Ports</b>	<b>Console Port</b>	<b>AC Power Supply Rating</b>	<b>PoE Power</b>
WS-C3560X-24P	24	N/A	1	715W	370W
WS-C3560X-24T	24	N/A	1	350W	N/A
WS-C3560X-48P	48	N/A	1	715W	370W
WS-C3560X-48PF	48	N/A	1	1100W	740W
WS-C3560X-48T	48	N/A	1	350W	N/A
WS-C3750X-12S	12	2	1	350 W	N/A
WS-C3750X-24P	24	2	1	715W	370W
WS-C3750X-24S	24	2	1	350 W	N/A
WS-C3750X-24T	24	2	1	350W	N/A
WS-C3750X-48P	48	2	1	715W	370W
WS-C3750X-48PF	48	2	1	1100W	740W
WS-C3750X-48T	48	2	1	350W	N/A

The following table identifies the physical ports on the FRUlink modules:

**Table 3 - FRUlink Physical Ports**

<b>Model</b>	<b>1G SFP Ports</b>	<b>10G SFP+ Ports</b>
C3KX-NM-1G	4	0
C3KX-NM-10G	0	2
C3KX-NM-10GT	0	2
C3KX-NM-BLANK	N/A	N/A

The logical interfaces and their mapping to physical ports are described in the following table:

**Table 4: Physical To Logical Interfaces**

<b>Physical Interface</b>	<b>Logical Interface</b>
MACsec 1G Ethernet Ports, FRUlink 1G SFP Ports, FRUlink 10G SFP+ Ports Stackwise+ ports (only on 3750-x models) Type A USB port Console Port (RJ45 and USB Type B) Mgmt Port	Data Input Interface
MACsec 1G Ethernet Ports, FRUlink 1G SFP Ports, FRUlink 10G SFP+ Ports Stackwise+ ports (only on 3750-x models) Type A USB port Console Port (RJ45 and USB Type B) Mgmt Port	Data Output Interface
Console Port (RJ45 and USB Type B), Mgmt Port MACsec 1G Ethernet Ports, FRUlink 1G SFP Ports, FRUlink 10G SFP+ Ports	Control Input Interface

Stackwise+ ports (only on 3750-x models), Reset Button	
Console Port (RJ45 and USB Type B) Mgmt Port Type A USB port MACsec 1G Ethernet Ports, FRUlink 1G SFP Ports, FRUlink 10G SFP+ Ports, LEDs Stackwise+ ports (only on 3750-x models),	Status Output Interface
Power Plug, PoE+ Ethernet Ports Stackwise+ ports (only on 3750-x models)	Power Interface

## Roles, Services, and Authentication

Authentication is role-based. Each user is authenticated upon initial access to the module. There are two roles in the Switch that may be assumed the Crypto Officer (CO) role and the User role. The administrator of the Switch assumes the CO role in order to configure and maintain the Switch using CO services, while the Users exercise security services over the network.

### ***User Role***

The role assumed by users obtaining general security services. From a logical view, user activity exists in the data-plane. Users are authenticated using EAP methods and 802.1X-REV, and their data is protected with 802.1AE protocols.

EAP and 802.1X-REV can use password based credentials for User role authentication – in such a case the user passwords must be at least eight (8) characters long, including at least one letter and at least one number character, in length (enforced procedurally). If six (6) integers, one (1) special character and one (1) alphabet are used without repetition for an eight (8) digit PIN, the probability of randomly guessing the correct sequence is one (1) in 832,000,000. In order to successfully guess the sequence in one minute would require the ability to make over 13,000,000 guesses per second, which far exceeds the operational capability of the console port. Including the rest of the alphanumeric characters drastically decreases the odds of guessing the correct sequence.

EAP and 802.1X-REV can also authenticate User role via certificate credentials by using 1024 bit RSA keys – in such a case the security strength is 80 bits, so an attacker would have a 1 in  $2^{80}$  chance of a successful authentication which is much stronger than the one in a million chance required by FIPS 140-2. To exceed a one in 100,000 probability of a successful random key guess in one minute, an attacker would have to be capable of



approximately  $1.8 \times 10^{21}$  attempts per minute, which vastly exceeds the operational capabilities of the module to support.

## CO Role

The role assumed by an authorized CO connecting to the switch via CLI through the console port and performing management functions and module configuration. Additionally the stack master (in stacking scenario for 3750-X switches) is considered CO for stack members. From a logical view, CO activity exists only in the control plane. IOS prompts the CO for their username and password, if the password is validated against the CO's password in IOS memory, the user is allowed entry to the IOS executive program. A CO can assign permission to access the CO role to additional accounts, thereby creating additional COs. The module supports RADIUS and TACACS+ for authentication of COs.

CO passwords must be at least eight (8) characters long, including at least one letter and at least one number character, in length (enforced procedurally). If six (6) integers, one (1) special character and one (1) alphabet are used without repetition for an eight (8) digit PIN, the probability of randomly guessing the correct sequence is one (1) in 832,000,000. In order to successfully guess the sequence in one minute would require the ability to make over 13,000,000 guesses per second, which far exceeds the operational capability of the console port. Including the rest of the alphanumeric characters drastically decreases the odds of guessing the correct sequence.

Additionally on a stack, the CO is authenticated via possession of SESA Authorization key that is 128 bits long. So an attacker would have a 1 in  $2^{128}$  chance of a successful authentication which is much stronger than the one in a million chance required by FIPS 140-2. To exceed a one in 100,000 probability of a successful random key guess in one minute, an attacker would have to be capable of approximately  $3.4 \times 10^{38}$  attempts per minute, which vastly exceeds the operational capabilities of the module to support.

## Services

Table 5 - Services

Role	Authentication Method	Services
User	EAP and 802.1X-REV Authentication, Local database, TACACS+ or RADIUS	MACsec Network Functions: authentication, access control, confidentiality and data integrity services provided by the MACsec protocol.
Cryptographic Officer	Local database, TACACS+ or RADIUS, SESA	Configure the switch: define network interfaces and settings, create command aliases, set the protocols the switch will support, enable interfaces and network services, set system date and time, and load authentication information.  Management protocols: remote access to the switch via TLS or

		<p>SSH.</p> <p>Status functions: view the switch configuration, routing tables, and active sessions; view health, temperature, memory status, voltage, and packet statistics; review accounting logs, and view physical interface status.</p> <p>Set Encryption/Bypass: Place module into Encryption or Bypass state.</p> <p>Perform Self Tests: Perform the FIPS 140 start-up tests on demand</p>
<b>Unauthenticated</b>	<b>N/A</b>	<p>Show status (viewing LEDs), passing traffic through the device, power-cycling the device.</p> <p>Perform Self Tests: occurs upon system startup</p>

## Cryptographic Key/CSP Management

The module securely administers both cryptographic keys and other critical security parameters such as passwords. The tamper evidence seals provide physical protection for all keys. All keys are also protected by the password-protection on the CO role login, and can be zeroized by the CO. Keys are exchanged and entered electronically. Persistent keys are entered by the CO via the console port CLI, transient keys are generated or established and stored in DRAM.

Note that the command **fips zeroize all** will zeroize all CSPs.

The module supports the following secret and private keys and critical security parameters (CSPs):

**Table 6 – Secret and private keys and CSPs**

ID	Algorithm	Size	Description	Storage	Zeroization Method
<b>General Keys/CSPs</b>					
User Password	Password	Variable (8+ characters)	Used to authenticate local users	NVRAM (plaintext)	Zeroized by overwriting with new password
Enable Password	Password	Variable (8+ characters)	Used to authenticate local users at a higher privilege level	NVRAM (plaintext)	Zeroized by overwriting with new password
RADIUS secret	Shared Secret	Variable (8+ characters)	The RADIUS Shared Secret	NVRAM (plaintext)	# no radius-server key
RADIUS Key wrap key	AES	128/256 bits	Used to protect SAK	DRAM (plaintext)	Zeroized when data structure is freed
TACACS+ secret	Shared Secret	Variable (8+ characters)	The TACACS+ shared secret	NVRAM (plaintext)	# no tacacs-server key
RNG Seed	ANSI X9.31 Appendix 2.4 using 3-key TDES	16 bytes	This is the seed for ANSI X9.31 RNG	DRAM (plaintext)	power cycle the device
RNG Seed Key	ANSI X9.31 Appendix 2.4 using 3-key TDES	24 bytes	This is the seed key for ANSI X9.31 RNG	DRAM (plaintext)	power cycle the device
Diffie-Hellman private exponent	DH	1024-4096 bits	The private exponent used in Diffie-Hellman (DH) exchange.	DRAM (plaintext)	Automatically after shared secret generated.

Diffie-Hellman Shared Secret	DH	1024-4096 bits	This is the shared secret agreed upon as part of DH exchange	DRAM (plaintext)	Zeroized upon deletion
<b>SSH</b>					
SSH RSA private key	RSA	1024/1536/2048 bits modulus	SSH key	NVRAM (plaintext)	# fips zeroize all
SSH session key	Triple-DES/AES	168-bits/256-bits	This is the SSH session symmetric key.	DRAM (plaintext)	Automatically when SSH session terminated
SSH session authentication key	HMAC SHA-1	160-bits	This is the SSH session authentication key	DRAM (plaintext)	Automatically when SSH session terminated
<b>TLS</b>					
TLS Server RSA private key	RSA	1024/1536/2048 bits modulus	Identity certificates for module itself and also used in TLS negotiations.	NVRAM (plaintext)	# fips zeroize all
TLS pre-master secret	Shared Secret	384-bits	Shared secret created using asymmetric cryptography from which new HTTPS session keys can be created.	DRAM (plaintext)	Automatically when session terminated.
TLS session key	Triple-DES/AES	168-bits/256-bits	This is the TLS session key	DRAM (plaintext)	Automatically when session terminated.
<b>MacSec</b>					
MACsec Security Association Key (SAK)	AES-GCM	128/256 bits	Used for creating Security Associations (SA) for encrypting/decrypting the MACSec traffic in the MACSec hardware.	MACsec PHY (plaintext)	Automatically when session expires
MACsec Connectivity Association Key (CAK)	AES-GCM	128/256 bits	A secret key possessed by members of a MACSec connectivity association.	MACsec PHY (plaintext)	Automatically when session expires
MACsec KEK	AES-GCM	128/256 bits	Used to transmit SAKs to other members of a MACSec connectivity association	MACsec PHY (plaintext)	Automatically when session expires
MACsec ICK	secret	128/256 bits	Used to verify the integrity and authenticity of MPDUs	MACsec PHY (plaintext)	Automatically when session expires
<b>SESA</b>					

SESA Authorization Key	AES	128 bits	Used to authorize members of a single stack on Incredible Units. Used as input to SP800-108 derivation methods to derive four additional 128 fields to transfer the Master Session Key and additional aggressive exchange material	NVRAM (plaintext)	"no fips authorization-key"
SESA Master Session Key	AES	128 bits	Used to derive SESA session key	DRAM (plaintext)	Upon completion of key exchange
SESA Derived Session Keys	AES and HMAC-SHA-1	128 bits and 192 bits	Used to protect traffic over stacking ports	DRAM (plaintext)	Upon bringing down the stack

The services accessing the CSPs, the type of access and which role accesses the CSPs are listed below.

**Table 7: Role CSP Access**

Role	Service	Critical Security Parameters
User Role	MACsec Network Functions	RNG Seed, RNG Seed key, DH private exponent, DH Shared Secret MACsec Security Association Key, MACsec Connectivity Association Key, MACsec KEK, MACsec ICK <b>(X)</b>
Crypto-Officer Role	Manage the Switch	TLS Server RSA private key, SSH RSA private key, RADIUS secret, TACACS+ secret, RADIUS key wrap key, User Password, Enable Password, SESA Authorization Key <b>(R/W/D)</b>
Crypto-Officer Role	Management Protocols	TLS Server RSA private key, TLS pre-master secret, TLS session key, SSH RSA private key, SSH session key, RADIUS secret, TACACS+ secret, SESA Master Session Key, SESA Derived Session key <b>(X)</b>

R=Read, W=Write, D=Zeroize, X=Execute

## Cryptographic Algorithms

### *Approved Cryptographic Algorithms*

The Cisco Switches support many different cryptographic algorithms. However, only FIPS approved algorithms may be used while in the FIPS mode of operation. The following table identifies the approved algorithms included in the Switches for use in the FIPS mode of operation.

**Table 8: FIPS-Approved Algorithms for use in FIPS Mode**

<b>Algorithm</b>	<b>Modes</b>	<b>Implementation</b>	<b>CAVP Certificate</b>
AES	CBC GCM	CBC – IOS Software ECB – MACsec PHY GCM – MACsec PHY	1749 1024 1275
HMAC	SHA-1	IOS Software	1026
RNG	X9.31, 3- Key Triple- DES	IOS Software	932
RSA	Sign Verify	PKCS #1, v1.5, 1024-2048 mod size, SHA-1, SHA-256, SHA-512 - IOS software	869
SHS	SHA-1, SHA-256, SHA-512	IOS Software	1536
Triple-DES	CBC	IOS Software	1133

### **Non-Approved Algorithms**

The cryptographic module implements the following non-approved algorithms that are not permitted for use in FIPS 140-2 mode of operations:

- DES
- HMAC-MD5
- MD5
- RC4

In addition, the modules support the following key establishment schemes allowed in FIPS mode:

- Diffie-Hellman (key agreement; key establishment methodology provides between 80 and 156 bits of encryption strength).
- RSA (key wrapping; key establishment methodology provides between 80 and 112 bits of encryption strength)
- AES (Cert. #1749, key wrapping; key establishment methodology provides 128 bits or 256 bits of encryption strength)

### **Self-Tests**

The modules include an array of self-tests that are run during startup and periodically during operations to prevent any secure data from being released and to ensure all components are functioning correctly. The modules implement the following power-on self-tests:

- IOS Known Answer Tests:
  - AES KAT
  - AES-CMAC KAT
  - HMAC-SHA-1 KAT
  - RNG KAT
  - SHA-1/SHA-256/SHA-512 KAT
  - RSA (sign/verify) KAT
  - Triple-DES KAT
  
- MAC PHY crypto Known Answer Tests:
  - AES-GCM KAT
  
- Firmware Integrity Test (32-bit EDC)

The modules perform all power-on self-tests automatically at boot. All power-on self-tests must be passed before any operator can perform cryptographic services. The power-on self-tests are performed after the cryptographic systems are initialized but prior any other operations; this prevents the module from passing any data during a power-on self-test failure.

In addition, the modules also provide the following conditional self-tests:

- Continuous Random Number Generator Test for the FIPS-approved RNG
- Continuous Random Number Generator Test for the non-approved RNG
- Pairwise Consistency Test for generation of RSA keys
- Conditional Bypass Test

## Physical Security

This module is a multi-chip standalone cryptographic module.

The FIPS 140-2 level 2 physical security requirements for the modules are met by the use of opacity shields covering the front and side panels of modules to provide the required opacity and tamper evident seals to provide the required tamper evidence. The following sections illustrate the physical security provided by the module.

The following table shows the number of tamper evident labels and opacity shields that shall be installed for the module to operate in a FIPS approved mode of operation. The CO is responsible for securing and having control at all times of any unused tamper evident labels.

**Table 9 - Tamper Evident Labels and Opacity Shields – All Models**

Face	Tamper Evident Labels	Opacity Shields
Front	5	2 <sup>2</sup>
Left	6	2
Right	6	2
Back	5	N/A
Total	22	6

### ***Module Opacity***

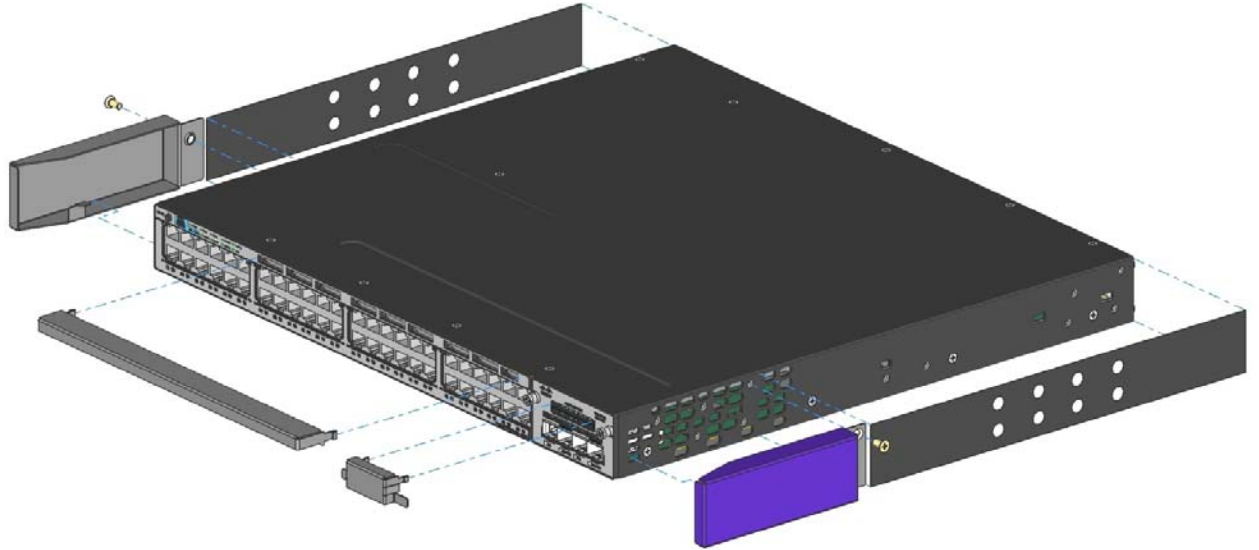
To install an opacity shield on the Catalyst 3560-X and 3750-X switches, follow these steps:

1. Open the FIPS kit (part number: FIPS Kit (C3KX-FIPS-KIT)). The kit contains:
  - a. Opacity shields for front and sides
  - b. Tamper evident labels
2. Apply the opacity shields as per the diagram below

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<sup>2</sup> WS-C3750X-12S and WS-C3750X-24S modules do not need opacity shields on the front face



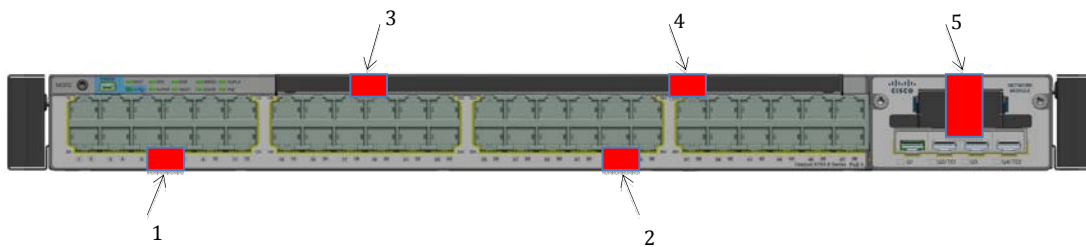


**Figure 1 - Opacity Shields<sup>3</sup>**

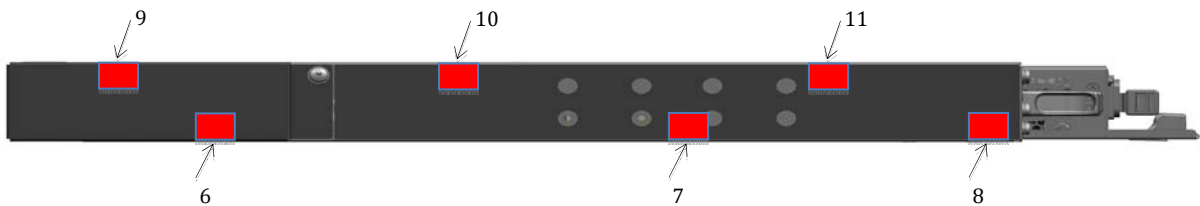
### ***Tamper Evidence***

Once the module has been configured to meet overall FIPS 140-2 Level 2 requirements, the module cannot be accessed without signs of tampering. The CO shall inspect for signs of tampering periodically.

To seal the system, apply serialized tamper-evidence labels as depicted in the figures below. This label placement is applicable to all models included in this validation.

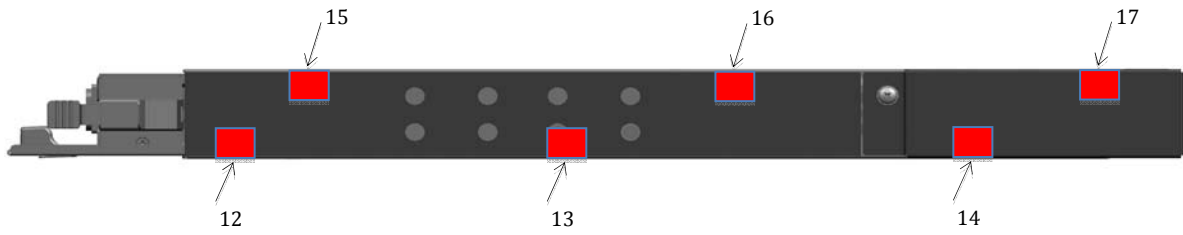


**Figure 2 - Front face**

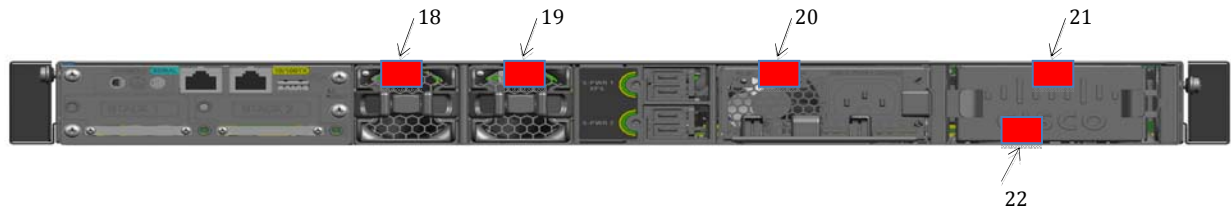


**Figure 3 - Right side**

<sup>3</sup> WS-C3750X-12S and WS-C3750X-24S modules do not need opacity shields on the front face



**Figure 4 - Left side**



**Figure 5 - Rear face<sup>4</sup>**

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<sup>4</sup> TEL #20 is used to protect the power supply unit

## Secure Operation

The switches meet all the overall Level 2 requirements for FIPS 140-2. Follow the setup instructions provided below to place the module in FIPS-approved mode. Operating this Switch without maintaining the following settings will remove the module from the FIPS approved mode of operation.

### *Initial Setup*

1. The CO must apply opacity shield and tamper evidence labels as described above.

### *System Initialization and Configuration*

1. The value of the boot field must be 0x0102. This setting disables break from the console to the ROM monitor and automatically boots. From the “configure terminal” command line, the CO enters the following syntax:

**config-register 0x0102**

2. The CO must create the “enable” password for the CO role. Procedurally, the password must be at least 8 characters, including at least one letter and at least one number, and is entered when the CO first engages the “enable” command. The CO enters the following syntax at the “#” prompt:

**Switch(config)# enable secret [PASSWORD]**

3. The CO must always assign passwords (of at least 8 characters, including at least one letter and at least one number) to users. Identification and authentication on the console/auxiliary port is required for Users. From the “configure terminal” command line, the CO enters the following syntax:

**Switch(config)# line con 0**

**Switch(config)# password [PASSWORD]**

**Switch(config)# login local**

4. To ensure all FIPS 140-2 logging is received, set the log level:  
**Switch(config)# logging console error**
5. The CO enables FIPS mode using the following command:  
**Switch(config)# fips mode**
6. The CO enables secure stacking (SESA) but configuring the Authorization key:  
**Switch(config)# fips authorization-key <128 bit, i.e, 16 hex byte key>**
7. The CO may configure the module to use RADIUS or TACACS+ for authentication. If the module is configured to use RADIUS, the Crypto-Officer must define RADIUS or shared secret keys that are at least 8 characters long, including at least one letter and at least one number.
8. To enable MACsec:
  - a. First configure the MKA Protocol:  
**Switch(config)# mka policy *policy-name***  
**Switch(config-mka-policy)# replay-protection window-size 300**  
**Switch(config-mka-policy)# end**
  - b. Then configure MACsec on the desired interfaces:  
**Switch(config-if)# macsec**  
**Switch(config-if)# authentication host-mode multi-domain**  
**Switch(config-if)# authentication linksec policy must-secure**  
**Switch(config-if)# authentication port-control auto**  
**Switch(config-if)# authentication violation protect**  
**Switch(config-if)# mka policy *policy-name***  
**Switch(config-if)# dot1x pae authenticator**  
**Switch(config-if)# end**
9. Firmware update is not allowed in FIPS mode.
10. The CO shall only assign users to a privilege level 1 (the default).
11. The CO shall not assign a command to any privilege level other than its default.

## **Remote Access**

1. Remote access is permitted via SSHv2 and TLS. While in FIPS 140-2 Mode of Operations the switches will enforce use of Approved algorithms for the management protocols.
2. SNMPv3 is allowed in FIPS mode of operation. SNMPv3 uses FIPS approved cryptographic algorithms however from a FIPS perspective SNMPv3 is considered to

be a plaintext session since the key derivation used as by SNMPv3 is not FIPS compliant.

## Related Documentation

This document deals only with operations and capabilities of the security appliances in the technical terms of a FIPS 140-2 cryptographic device security policy. More information is available on the security appliances from the sources listed in this section and from the following source:

- The NIST Cryptographic Module Validation Program website (<http://csrc.nist.gov/groups/STM/cmvp/index.html>) contains contact information for answers to technical or sales-related questions for the security appliances.

## Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

### ***Cisco.com***

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/techsupport>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

### ***Product Documentation DVD***

Cisco documentation and additional literature are available in the Product Documentation DVD package, which may have shipped with your product. The Product Documentation DVD is updated regularly and may be more current than printed documentation.

The Product Documentation DVD is a comprehensive library of technical product documentation on portable media. The DVD enables you to access multiple versions of hardware and software installation, configuration, and command guides for Cisco products and to view technical documentation in HTML. With the DVD, you have access to the same documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .pdf versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD=) from Cisco Marketplace at this URL:

<http://www.cisco.com/go/marketplace/>

## **Ordering Documentation**

Beginning June 30, 2005, registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

<http://www.cisco.com/go/marketplace/>

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at [tech-doc-store-mkpl@external.cisco.com](mailto:tech-doc-store-mkpl@external.cisco.com) or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

## **Documentation Feedback**

You can rate and provide feedback about Cisco technical documents by completing the online feedback form that appears with the technical documents on Cisco.com.

You can send comments about Cisco documentation to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems  
Attn: Customer Document Ordering  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

## **Cisco Product Security Overview**

Cisco provides a free online Security Vulnerability Policy portal at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

[http://www.cisco.com/en/US/products/products\\_psirt\\_rss\\_feed.html](http://www.cisco.com/en/US/products/products_psirt_rss_feed.html)

## ***Reporting Security Problems in Cisco Products***

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies — [security-alert@cisco.com](mailto:security-alert@cisco.com)

An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- Nonemergencies — [psirt@cisco.com](mailto:psirt@cisco.com)

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

### **Tip**

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x. Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

The link on this page has the current PGP key ID in use.

## **Obtaining Technical Assistance**

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

### ***Cisco Technical Support & Documentation Website***

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

### **Note**

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Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

## ***Submitting a Service Request***

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227) EMEA: +32 2 704 55 55 USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

## ***Definitions of Service Request Severity***

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1) – Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2) – Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3) – Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4) – You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

## Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

<http://www.cisco.com/go/marketplace/>

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

<http://www.ciscopress.com>

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

<http://www.cisco.com/packet>

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- or view the digital edition at this URL:

<http://ciscoiq.texterity.com/ciscoiq/sample/>

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

<http://www.cisco.com/ipj>

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

<http://www.cisco.com/en/US/products/index.html>

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

<http://www.cisco.com/discuss/networking>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.html>

## Definition List

AES – Advanced Encryption Standard

CMVP – Cryptographic Module Validation Program

CSEC – Communications Security Establishment Canada

CSP – Critical Security Parameter

FIPS – Federal Information Processing Standard

HMAC – Hash Message Authentication Code

HTTP – Hyper Text Transfer Protocol

KAT – Known Answer Test

LED – Light Emitting Diode

MAC – Message Authentication Code

MACsec – IEEE MAC Security protocol 802.1AE

NIST – National Institute of Standards and Technology

NVRAM – Non-Volatile Random Access Memory

PoE+ – Power over Ethernet Plus

RAM – Random Access Memory

RNG – Random Number Generator

SHA – Secure Hash Algorithm

Triple-DES – Triple Data Encryption Standard