FIPS 140-2 Non-Proprietary Security Policy for the Cisco PIX 525/535 Security Appliance

Introduction

This is a non-proprietary Cryptographic Module Security Policy for the Cisco PIX 525 and PIX 535 security appliances, referred to in this document as PIX security appliances, devices, modules, or appliances. This security policy describes how the PIX security appliances meet the security requirements of FIPS 140-2 and how to run the devices in a FIPS 140-2 mode of operation.

This policy was prepared as part of the Level 1 FIPS 140-2 validation of the Cisco PIX 525 and PIX 535 security appliances.

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 standard and validation program is available on the NIST website at http://csrc.nist.gov/cryptval/.

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This document includes the following sections:

- FIPS 140-2 Submission Package, page 2
- Overview, page 2
- PIX Security Appliance Validation Level, page 3
- Physical Characteristics and Module Interfaces, page 3
- Roles and Services, page 6
- Authentication Mechanisms, page 7
- Cryptographic Key Management, page 8
- Self-Tests, page 11
- Mitigation of Other Attacks, page 12
- Secure Operation, page 12

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- Approved Cryptographic Algorithms, page 15
- Non-FIPS Approved Algorithms, page 16
- Tamper-Evidence, page 16
- Related Documentation, page 18
- Obtaining Documentation, page 19
- Documentation Feedback, page 20
- Cisco Product Security Overview, page 20
- Obtaining Technical Assistance, page 21
- Obtaining Additional Publications and Information, page 23
- Definitions, page 24

FIPS 140-2 Submission Package

This security policy document is part of a complete FIPS 140-2 Submission Package. In addition to this document, the complete FIPS 140-2 Submission Package contains:

- 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 on page 21 for more information.

Overview

The Cisco PIX security appliances deliver robust user and application policy enforcement, multi-vector attack protection, and secure connectivity services in cost-effective, easy-to-deploy solutions. Cisco PIX security appliances provide comprehensive security, performance, and reliability for network environments of all sizes.

These PIX security appliances provide multiple integrated security and networking services, including:

- Application-aware firewall services
- Voice over IP (VoIP) and multimedia security
- Robust site-to-site and remote-access IPSec VPN connectivity
- Resiliency
- Intelligent networking services
- Flexible management solutions

The Cisco PIX 525 and PIX 535 security appliances are validated with the VPN Acceleration Card+ (VAC+), to provide hardware-accelerated IP Security (IPSec) VPN support for international cryptographic standards and scalable VPN tunnel aggregation in a solution that comes integrated with, or as an upgrade for, most Cisco PIX security appliances. Ranging from solutions for small to midsize businesses (SMBs) to large enterprises and service providers, the Cisco PIX security appliances offer

integrated network security services and investment protection. The Cisco PIX VAC+ offloads VPN cryptographic functionality from the PIX device, enabling the Cisco PIX security appliances to deliver stateful inspection firewall services, advanced application and protocol inspection, inline intrusion protection, and robust multimedia and voice security services.

Among their capabilities, Cisco PIX 525 and PIX 535 security appliances offer the use of Online Certificate Status Protocol (OCSP). This provides an alternative to a Certificate Revocation List for obtaining the revocation status of X.509 digital certificates. Rather than requiring a client to download a complete and often large certificate revocation list, OCSP localizes the certificate status on a Validation Authority, which it queries for the status of a specific certificate. Use of OCSP for VPN tunnel establishment has been reviewed and approved for FIPS mode operation.

PIX Security Appliance Validation Level

Table 1 lists the level of validation for each area in the FIPS PUB 140-2.

Table 1 Validation Level by Section

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

Physical Characteristics and Module Interfaces

The design of the Cisco PIX 525 and PIX 535 security appliances supports a combination of 10/100 Fast Ethernet interfaces and Gigabit Ethernet interfaces, with a redundant power supply on PIX 535.

Each PIX security appliance is a multi-chip standalone device. The cryptographic boundary is defined as encompassing the “top,” “front,” “left,” “right,” and “bottom” surfaces of the case, as well as the “backplane” of the case not supporting a removable interface or service card, and the inverse of the three-dimensional space within the case that would otherwise be occupied by an installed service card. The cryptographic boundary includes the connection apparatus between the service card and the motherboard/daughterboard that hosts the service card, but the boundary does not include the service card itself (except when a VAC+ is inserted into an available PIX Circuit Board Interface). In other words, the cryptographic boundary encompasses all hardware components within the case of the device except any installed modular service card (except when a VAC+ is inserted into an available PIX Circuit Board Interface).

Each PIX security appliance provides a number of physical and logical interfaces to the device, and the physical interfaces provided by the device are mapped to four FIPS 140-2 defined logical interfaces: data input, data output, control input, and status output.

The logical interfaces and their mapping are described in Table 2 and in Table 3:

Table 2 Cisco 525 Physical Interface/Logical Interface Mapping

Physical Interface	FIPS 140-2 Logical Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-2	Data Input Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-2	Data Output Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-2 Power Switch Com 1 (Console Port)	Control Input Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 0 100Mbps LED 10/100BaseTX Ethernet 0 ACT LED 10/100BaseTX Ethernet 0 LINK LED 10/100BaseTX Ethernet 1 10/100BaseTX Ethernet 1 100Mbps LED 10/100BaseTX Ethernet 1 ACT LED 10/100BaseTX Ethernet 1 LINK LED Circuit Board Interfaces 0-2 Power LED System Activity LED Com 1 (Console Port)	Status Output Interface
Main Power Plug	Power Interface
USB Port Serial Failover Interface	Unused Interface

Table 3 Cisco 535 Physical Interface/Logical Interface Mapping

Physical Interface	FIPS 140-2 Logical Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-8 Console Port	Data Input Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-8 Console Port	Data Output Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 1 Circuit Board Interfaces 0-8 Power Switch Console Port	Control Input Interface
10/100BaseTX Ethernet 0 10/100BaseTX Ethernet 0 100Mbps LED 10/100BaseTX Ethernet 0 ACT LED 10/100BaseTX Ethernet 0 LINK LED 10/100BaseTX Ethernet 1 10/100BaseTX Ethernet 1 100Mbps LED 10/100BaseTX Ethernet 1 ACT LED 10/100BaseTX Ethernet 1 LINK LED Circuit Board Interfaces 0-8 Console Port	Status Output Interface
Power Plug(s)	Power Interface
USB Port Serial Failover Interface	Unused Interface

Roles and Services

The device can be accessed in one of the following ways.

- Console Port
- Telnet over IPSec
- SSH
- ASDM via HTTPS/TLS

As required by FIPS 140-2, there are two main roles in the PIX security appliance that operators may assume: a crypto officer role and a user role. The PIX security appliance supports role-based authentication, and the respective services for each role are described in the "Crypto Officer Services" section on page 6, and the "User Services" section on page 6.

Crypto Officer Services

The crypto officer role is responsible for the configuration and maintenance of the PIX security appliance and authenticates from the **enable** command (for local authentication) or the **login** command (for AAA authentication) from the user services. The crypto officer services consist of the following:

- **Configure the Device**—Define network interfaces and settings; set the protocols the PIX security appliance will support; enable interfaces and network services; set system date and time; load authentication information; and configure authentication servers, filters and access lists for interfaces and users, and privileges
- **Define Rules and Filters**—Create packet filters that are applied to user data streams on each interface. Each filter consists of a set of rules, which define a set of packets to permit or deny based on characteristics such as protocol ID, addresses, ports, TCP connection establishment, or packet direction.
- **View Status**—View the configuration, routing tables, active sessions, use SNMP queries to view SNMP MIB statistics, health, temperature, memory status, packet statistics, review accounting logs, and view physical interface status.
- **Manage the Device**—Log off users, shutdown or reload the PIX security appliance, view complete configurations, view full status, manage user rights, and restore configurations.
- **Set Encryption/Bypass**—Set up the configuration tables for IP tunneling, set keys and algorithms to be used for each IP range or allow plaintext packets to be sent from specified IP address.
- **Install Service Card**— Remove tamper-evident seals to install or replace service cards.

User Services

Basic encryption and decryption services are performed by the User role. A user enters the system by accessing the console port with a terminal program or via IPSec protected telnet or SSH session to a LAN port. The PIX security appliance will prompt the user for their password. If the password is correct, the user is allowed entry to the executive program. The services available to the user role consist of:

- **Status Functions**—Image version currently running, installed hardware components, and version of hardware installed
- **Network Functions**—Initiate diagnostic network services, such as ping
- **Directory Services**—Display directory of files kept in Flash memory

Critical Security Parameters

The services accessing the Critical Security Parameters (CSPs), the type of access and which role accesses the CSPs are listed in the Table 4.

Table 4 Role and Service Access to Security Relevant Data Items

CSP/Role/Service Access Policy	Critical Security Parameter	CSP 1	CSP 2	CSP 3	CSP 4	CSP 5	CSP 6	CSP 7	CSP 8	CSP 9	CSP 10	CSP 11	CSP 12	CSP 13	CSP 14	CSP 15	CSP 16
Role/Service																	
User Role																	
Status Functions		r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
Network Functions		r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
Directory Services		r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
Crypto-Officer Role																	
Configure the Module		rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd
Define Roles and Filters		rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd
Status Functions																	
Manage the Module		rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd
Set Encryption/Bypass		rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd
Install Service Card																	

r = read w = write d = delete

Authentication Mechanisms

The PIX security appliance supports either a password or digital certificates for authenticating IPSec users. To log on to the PIX security appliance for management purposes, an operator must connect to it through one of the management interfaces (Console Port, SSH, Telnet, ASDM, or WebVPN) and provide a password.

Table 5 describes the estimated strength of the authentication mechanism.

Table 5 Estimated Strength of Authentication Mechanism

Authentication Type	Strength
Username Password mechanism	Passwords must be a minimum of 6 characters (see the "Secure Operation" section on page 12). The password can consist of alphanumeric values (a-z, A-Z, 0-9), yielding 62 choices per character. The probability of a successful random attempt is 1/62^6, which is less than 1/1,000,000. This is also valid for RADIUS or TACACS+ shared secret keys.
Certificate based authentication	The PIX security appliance supports a public key based authentication with 1024 and 2048 (for RSA) bit keys. A 1024-bit RSA key has at least 80-bits of equivalent strength. The probability of a successful random attempt is 1/2^80, which is less than 1/1,000,000. A 2048-bit RSA key has at least 112-bits of equivalent strength. The probability of a successful random attempt is 1/2^112, which is less than 1/1,000,000.
HMAC-SHA-1	With at least 80-bits of equivalent strength, the probability of a successful random attempt is 1/2^80, which is less than 1/1,000,000.

The PIX security appliance provides protection against password guessing within a one-minute period. Specifically:

- Using passwords: It is possible for an unauthorized user to enter one password per second. This would result in 60 attempts per one minute period. This would leave a probability of one in 500 million. thus, the probability of an authentication within a one-minute period is much less than one in 100,000.
- Using HMAC-SHA-1 for IPSec packets: The PIX modules process 156,000 packets per second. The HMAC SHA-1 algorithm provides 80 bits of security, so the probability of a successful random attempt is one in (2^80)/156,000. Thus, the probability of a successful random authentication within a one-minute period is much less than one in 100,000.
- Using RSA digital signatures for IKE: Similar to HMAC-SHA-1, the probability of a successful random authentication within a one-minute period is (2^80)/156,000, which is much smaller than one in 100,000.

Cryptographic Key Management

The PIX security appliances use a variety of critical security parameters during operation.

Table 6 lists the critical security parameters used by the PIX security appliance.

Table 6 Critical Security Parameters Used by the PIX Security Appliance

#	Key/CSP Name	Generation/ Algorithm	Description	Storage	Zeroization
1	RSA public/private keys	ANSI X9.31/RSA	Identity certificates for the PIX security appliance itself and also used in IPSec, TLS, and SSH negotiations. The PIX security appliance supports 512, 768, 1024 and 2048 bit RSA key sizes (512 and 768 bit RSA keys shall not be used in FIPS mode); 1536 bit keys are not supported.	Private Key — NVRAM (plain text) and RAM (plain text) Public Key — NVRAM (plain text) and RAM (plain text)	Private Key—crypto key zeroize, write to startup config, then reboot. Public Key—delete trustpoint from configuration, write to startup config, then reboot.
2	Failover Key	Pre-shared secret	Used to encrypt and authenticate LAN-based failover.	NVRAM (plain text) and RAM (plain text)	Deleting keys from the configuration via **erase flash:** command (or replacing), write to startup config, then reboot
3	Diffie-Hellman Key Pairs	ANSI X9.31 / DH	Key agreement for IKE, TLS, and SSH sessions. DH groups 1 (768 bits of keying strength), 2 (1024 bits), and 5 (1536 bits) are supported. Group 1 must not be used in FIPS mode of operation.	RAM (plain text)	Resetting or rebooting the PIX security appliance.
4	Public keys	RSA	Public keys of peers	RAM (plain text)	Resetting or rebooting the PIX security appliance.
5	TLS Traffic Keys	Generated using the TLS protocol (X9.31PRNG + HMAC-SHA1 + HMAC-MD5 + either DH or RSA) Algorithm; Also TDES, AES, & ECDH	Used in HTTPS connections	RAM (plain text)	Resetting or rebooting the PIX security appliance.
6	SSH Session Keys	ANSI X9.31 / TDES-AES	SSH keys	RAM (plain text)	Resetting or rebooting the PIX security appliance.
7	IPSec authentication keys	ANSI X9.31 / TDES-AES / DH / ECDH	Exchanged using the IKE protocol and the public/private key pairs. These are TDES or AES keys.	RAM (plain text)	Resetting or rebooting the PIX security appliance.

Table 6 Critical Security Parameters Used by the PIX Security Appliance (continued)

#	Key/CSP Name	Generation/ Algorithm	Description	Storage	Zeroization
8	IPSec traffic keys	ANSI X9.31 / TDES-AES / DH / ECDH	Exchanged using the IKE protocol and the public/private key pairs. These are TDES or AES keys.	RAM (plain text)	Resetting or rebooting the PIX security appliance.
9	IKE preshared keys	Shared Secret	Entered by the crypto officer in plain text form and used for authentication during IKE	NVRAM (plain text) and RAM (plain text)	Deleting keys from the configuration via the **erase flash:** command (or replacing). write to startup configuration, then reboot.
10	IKE Authentication key	Generated using IKE (X9.31 + HMAC-SHA1 + DH + ECDH). Algorithms: TDES, AES, SHA-1	Used to encrypt and authenticate IKE negotiations	RAM (plain text)	Resetting or rebooting the PIX security appliance.
11	IKE Encryption Key	Generated using IKE (X9.31 + HMAC-SHA1 + DH + ECDH). Algorithms: TDES, AES, SHA-1	Used to encrypt IKE negotiations	RAM (plain text)	Resetting or rebooting the PIX security appliance.
12	RADIUS and TACACS+ shared secret keys	Shared Secret	Used for authenticating the RADIUS or TACACS+ server to the PIX security appliance and vice versa. Entered by the crypto officer in plain text form and stored in plain text form.	NVRAM (plain text) and RAM (plain text)	Deleting keys from the configuration via the **erase flash:** command (or replacing). Write to startup configuration, then reboot.
13	Usernames/ Passwords	Secret	Critical security parameters used to authenticate the user/crypto officer login.	NVRAM (plain text) and RAM (plain text)	Overwriting the passwords with new ones, write to startup config, then reboot.
14	Certificates of Certificate Authorities (CAs)	ANSI X9.31	This is a public key certificate, using signatures from a certificate authority (CA), to verify certificates issued by the CA. Install the CA certificate prior to installing subordinate certificates.	NVRAM (plain text) and RAM (plain text)	Delete trustpoint from configuration via **erase flash:** command, write to startup config, then reboot.

Table 6 Critical Security Parameters Used by the PIX Security Appliance (continued)

#	Key/CSP Name	Generation/ Algorithm	Description	Storage	Zeroization
15	PRNG Seed Key	Entropy	Seed key for X9.31 PRNG. Entropy is 192 bits (TDES key length).	RAM (plain text)	Zeroized with generation of new seed.
16	ECDH Key Pairs	ANSI X9.31 DH	Key agreement for IKE; ECDH group 7 (K-163)	RAM (plain text)	Resetting or rebooting the PIX security appliance

Self-Tests

The PIX security appliances 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.

Table 7 lists the PIX security appliance power-on self-tests.

Table 7 Security Appliance Power-On Self-Tests

Implementation	Tests Performed
PIX security appliance software	• Software/firmware test • Bypass test • RSA KAT (signature/verification) • RSA KAT (encrypt/decrypt) • AES KAT • TDES KAT • SHA-1 KAT • HMAC SHA-1 KAT • PRNG KAT
VAC+ (Broadcom 5823)	• RSA KAT (signature/verification) • RSA KAT (encrypt/decrypt) • AES KAT • TDES KAT • SHA-1 KAT • HMAC SHA-1 KAT

The PIX security appliances perform all power-on self-tests automatically at boot-up when FIPS mode is enabled. All power-on self-tests must be passed before a user/crypto officer can perform services. The power-on self-tests are performed after the cryptographic systems are initialized but prior to the initialization of the LAN's interfaces; this prevents the device from passing any data during a power-on self-test failure. In the unlikely event that a power-on self-test fails, an error message is displayed on the console followed by a system reboot.

Table 8 lists the conditional self-tests that the PIX security appliance performs.

Table 8 PIX Security Appliance Conditional Self-Tests

Implementation	Tests Performed
PIX security appliance software	• Pairwise key consistency test for RSA • Continuous Random Number Generator Test for all RNGs • Conditional Bypass test
VAC+ (Broadcom 5823)	• Pairwise key consistency test for RSA

Mitigation of Other Attacks

The PIX security appliances do not claim to mitigate any attacks in a FIPS-approved mode of operation above and beyond the protection inherently provided by the PIX security appliance.

Secure Operation

The Cisco PIX 525 and PIX 535 security appliances meet FIPS 140-2 Level 1 requirements.

This section describes how to place and keep the PIX security appliance in a FIPS-approved mode of operation. Operating the PIX security appliance without maintaining the settings described in the "Crypto Officer Guidance – System Initialization" section on page 12 and "Crypto Officer Guidance – System Configuration" section on page 14 will remove the PIX security appliance from the FIPS-approved mode of operation.

The Crypto Officer must ensure that the PC that is used for the console connection is a stand-alone or a non-networked PC.

Crypto Officer Guidance – System Initialization

The PIX security appliances were validated with adaptive security appliance software version 7.2.2.18 (file name: pix722-18.bin) and the previous version 7.0.4 (file name: pix704.bin). These are the only allowable images for FIPS-approved mode of operation.

Initialize the system using the procedure below:

Step 1 Ensure the security context mode is set to single mode.

```
(config)#mode single
```

Step 2 Ensure the firewall mode is set to routed.

```
(config)#no firewall transparent
```

Step 3 Disable the console output of system crash information.

```
(config)#crashinfo console disable
```

Step 4 Install TDES/AES licenses to require the device to use TDES and AES (for data traffic and SSH). (See http://www.cisco.com/en/US/products/hw/vpndevc/ps2030/products_data_sheet09186a00800b0d85.html for additional information on PIX licenses.)

Step 5 Enable "FIPS Mode" to allow the device to internally enforce FIPS-compliant behavior, such as running power-on self tests and bypass test.

```
(config)#fips enable
```

Step 6 Disable password recovery.

```
(config)#no service password-recovery
```

Step 7 Set the configuration register to bypass ROMMON prompt at boot.

```
(config)#config-register 0x10011
```

Step 8 Define the failover key to ensure encryption of the link to redundant devices prior to enabling failover.

```
(config)#failover key hex <key>
```

Note Failover is not required for FIPS mode of operation. If failover is enabled, then the above configuration should be followed. Only LAN-based failover is allowed for FIPS mode of operation; serial link failover is not allowed in FIPS mode of operation.

Step 9 Enable AAA authorization for the console.

```
(config-terminal)#aaa authentication serial console LOCAL
(config-terminal)#username <name> password <password>
```

Step 10 Enable AAA authorization for SSH and Telnet.

```
(config-terminal)#aaa authentication ssh console LOCAL
(config-terminal)#aaa authentication telnet console LOCAL
```

Step 11 Enable AAA authorization for Enable mode.

```
(config-terminal)#aaa authentication enable console LOCAL
```

Step 12 Specify Privilege Level 15 for crypto officer and Privilege Level 1 for user and set up username/password for each role.

```
(config-terminal)#username <name> password <password> privilege 15
(config-terminal)#username <name> password <password> privilege 1
```

Step 13 Ensure passwords are at least 6 characters long.

Step 14 Replace all default passwords, such as enable and telnet, with new passwords.

Step 15 Install a VAC+ card if one is not already installed.

Note Before applying Tamper Evidence Labels, the Crypto Officer may install any physical interface module (such as the PIX-1FE, PIX-1GE-66, or the PIX-4FE-66 cards) along with the required VPN Acceleration Card PLUS (VAC+) for cryptographic acceleration. The original VAC is not supported in the FIPS-approved mode of operation.

Step 16 Apply tamper-evident labels as described in the "Tamper-Evidence" section on page 16.

Step 17 Reboot the PIX security appliance.

Crypto Officer Guidance – System Configuration

Configure the system using the following procedure:

Step 1 Assign users a Privilege Level of 1.

Step 2 Define RADIUS and TACACS+ shared secret keys that are at least 6 characters long and secure all traffic between the PIX security appliance and the RADIUS/TACACS+ server via IPSec tunnel.

Note Use only if RADIUS/TACACS+ is configured.

Step 3 Configure the TLS protocol for key derivation using HTTPS to protect administrative functions. Due to known issues relating to the use of TLS with certain versions of the Java plugin, we recommend that the customer upgrade to JRE 1.5.0_05 or later. Use the following settings when launching ASDM in a TLS-only environment with JRE 1.5.0_05:

- Configure the device to allow only TLSv1 packets.

```
(config)# ssl server-version tlsv1-only
(config)# ssl client-version tlsv1-only
```

- Uncheck SSL Version 2.0 in both the web browser and JRE security settings.
- Check TLS V1.0 in both the web browser and JRE security settings.

Step 4 Configure the PIX security appliance to use SSHv2.

```
(config)# ssh version 2
```

Note All operators must still authenticate after remote access is granted.

Step 5 Configure the PIX security appliance to assure that any remote connections via Telnet are secured through IPSec.

Step 6 Configure the PIX security appliance to assure that only FIPS-approved algorithms are used for IPSec tunnels. This is accomplished by configuring the ISAKMP policy to use Diffie-Hellman Group 2, 5, or 7.

```
(config)# isakmp policy <priority>
sw8-5520(config-isakmp-policy)# group <num>
```

Note <priority> is an integer between 1 and 65535. <num> is the Diffie-Hellman group number 2, 5, or 7. Group 1 should not be used in FIPS mode of operation.

Step 7 Configure the PIX security appliance to assure that error messages can only be viewed by an authenticated crypto officer.

Step 8 Configure SNMP to always use a secure IPSec tunnel.

Step 9 Disable the TFTP server.

Step 10 Disable the HTTP server from performing system management. HTTPS with TLS should always be used for Web-based management.

Step 11 Ensure that installed digital certificates are signed using FIPS approved algorithms (SHA-1).

Step 12 Ensure that 512-bit and 768-bit RSA keys are not used.

Approved Cryptographic Algorithms

The PIX security appliances support many different cryptographic algorithms. However, only the following FIPS-approved algorithms may be used:

- AES encryption/decryption
- TDES encryption/decryption
- SHA-1 hashing
- HMAC-SHA-1 for hashed message authentication
- RSA signing and verifying
- X9.31 for RNG

In addition, the following algorithms are FIPS-allowed:

- Diffie-Hellman (allowed for use in FIPS mode) (key agreement; key establishment methodology provides 80 or 96 bits of encryption strength; non-compliant less than 80-bits of equivalent strength). Diffie-Hellman Group 1 (768-bit) is not approved for the FIPS mode of operation.
- ECDH (allowed for use in FIPS mode)(key agreement; key establishment methodology provides 80 bits of encryption strength).
- RSA encryption/decryption (allowed in FIPS mode for key transport) (key wrapping; key establishment methodology provides 80 or 112 bits of encryption strength, non-compliant less than 80 bits of encryption strength).
- TLS for Layer 7 security

Note Pursuant to the DES Transition Plan and the approval of the Withdrawal of Federal Information Processing Standard (FIPS) 46-3, Data Encryption Standard (DES); FIPS 74, Guidelines for Implementing and Using the NBS Data Encryption Standard; and FIPS 81, DES Modes of Operation, the DES algorithm should not be used in FIPS-approved mode of operation. The DES Algorithm must not be used when the TDES/AES licenses are installed.

Each cryptographic implementation in the PIX security appliance software release with on-board acceleration has achieved the certifications listed in Table 9.

Table 9 Algorithm Certificates

Algorithm	PIX Security Appliance Software	VPN Acceleration Card +
AES	536	209
TDES	538	298
SHA-1	606	285
HMAC SHA-1	283	15
RNG	309	Not supported
RSA	242	107

Non-FIPS Approved Algorithms

The PIX security appliances implement the following non-FIPS-approved cryptographic algorithms:

- DES
- SSL
- RC4
- MD5
- MD5 HMAC
- Diffie-Hellman (allowed for use in FIPS mode) (key agreement; key establishment methodology provides 80 or 96 bits of encryption strength; non-compliant less than 80-bits of equivalent strength). Diffie-Hellman Group 1 (768-bit) is not approved for the FIPS mode of operation.
- ECDH (allowed for use in FIPS mode)(key agreement; key establishment methodology provides 80 bits of encryption strength).
- RSA (allowed in FIPS mode for key transport) (key wrapping; key establishment methodology provides 80 or 112 bits of encryption strength, non-compliant less than 80 bits of encryption strength).

Tamper-Evidence

All Critical Security Parameters (CSPs) are stored and protected within the PIX security appliance tamper-evident enclosure. The administrator is responsible for properly placing all tamper-evident labels to comply with the FIPS 140-2 security policy. The security labels mandatory for FIPS 140-2 compliance are provided in FIPS Kit (Cisco-FIPS-KIT=). These security labels are very fragile and cannot be removed without clear signs of damage to the labels.

The crypto officer should inspect the tamper-evident labels periodically to verify they are intact and the serial numbers on the applied tamper-evident labels match the records in the security log.

Note The tamper-evident seals are produced from a special thin gauge vinyl with self-adhesive backing. Any attempt to open the PIX security appliance will damage the tamper-evident seals or the material of the PIX security appliance cover. Because the tamper-evident seals have non-repeated serial numbers, they may be inspected for damage and compared against the applied serial numbers to verify that the device has not been tampered with. Tamper-evident seals can also be inspected for signs of tampering, which include the following: curled corners, rips, and slices. The word Open may appear if the label was peeled back. Extra tamper-evident seals have been included in your FIPS kit to accommodate maintenance of your chassis.

Apply the serialized tamper-evident labels by performing the steps in either the "PIX 525" section on page 17 or the "PIX 535" section on page 18.

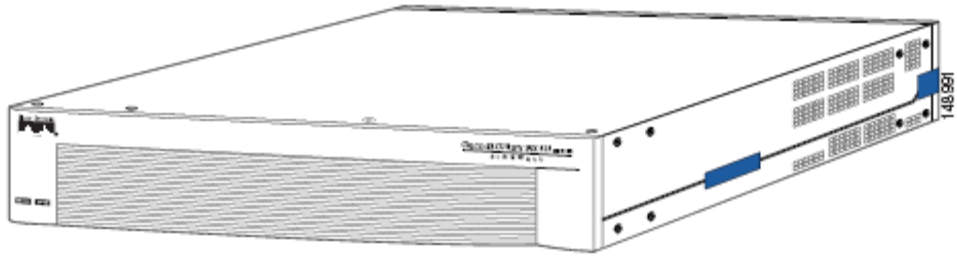
PIX 525

Step 1 Turn off and unplug the system before cleaning the chassis and applying labels.

Step 2 Clean the chassis of any grease, dirt, or oil before applying the labels. Alcohol-based cleaning pads are recommended for this purpose.

Step 3 Apply one label on the side of the PIX security appliance as shown in Figure 1. Apply a second label towards the back of the device and wrap it toward the back plate as shown in Figure 1. See the same label from a different angle in Figure 2.

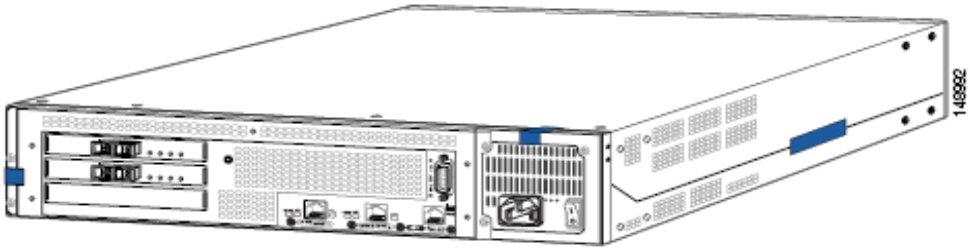
Figure 1 Cisco PIX 525 Front Tamper-Evident Label Placement



Step 4 On the back of the device, apply a label to cover the power supply, as shown in Figure 2.

Step 5 Apply one label on the other side of the device as shown in Figure 2.

Figure 2 Cisco PIX 525 Back Tamper-Evident Label Placement



Step 6 Record the serial numbers of the labels applied to the system in a security log.

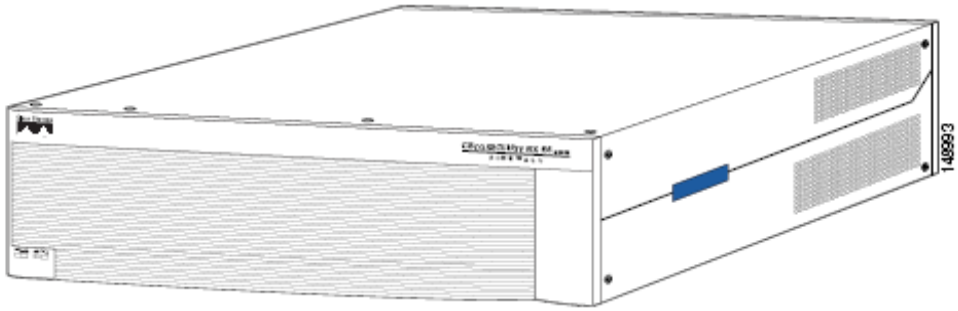
PIX 535

Step 1 Turn off and unplug the system before cleaning the chassis and applying labels.

Step 2 Clean the chassis of any grease, dirt, or oil before applying the labels. Alcohol-based cleaning pads are recommended for this purpose.

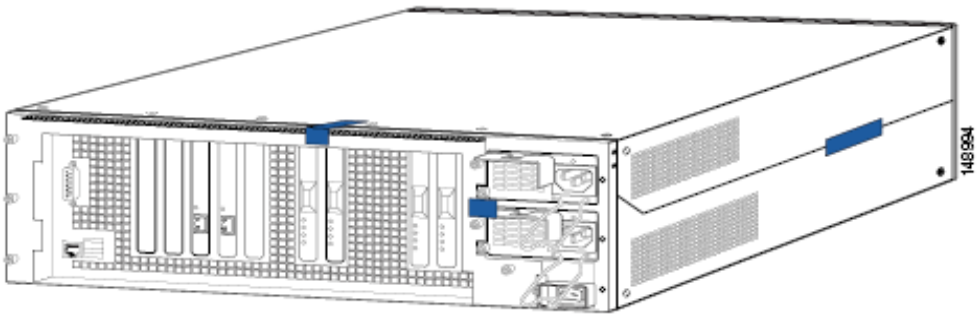
Step 3 Apply one label on the side of the device as shown in Figure 3, and a second label on the other side of the device as shown in Figure 4.

Figure 3 Cisco PIX 535 Front Tamper-Evident Label Placement



Step 4 On the back of the device, apply labels to cover the power supplies and the removable component tray as shown in Figure 4.

Figure 4 Cisco PIX 535 Back Tamper-Evident Label Placement



Step 5 Record the serial numbers of the labels applied to the system in a security log.

Related Documentation

This document deals only with operations and capabilities of the PIX security appliance in the technical terms of a FIPS 140-2 cryptographic device security policy.

More information is available on the PIX security appliance from the following sources:

- PIX security appliance (hardware): http://www.cisco.com/en/US/products/hw/vpndevc/ps2030/tsd_products_support_series_home.html

- PIX security appliance software: http://www.cisco.com/en/US/products/sw/secursw/ps2120/tsd_products_support_series_home.html
- PIX security appliance licenses: http://www.cisco.com/en/US/products/hw/vpndevc/ps2030/products_data_sheet09186a00800b0d85.html
- NIST Cryptographic Module Validation Program website contains contact information for answers to technical or sales-related questions for the PIX security appliance. (See (http://csrc.ncsl.nist.gov/cryptval/.)

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:

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The Product Documentation DVD is a comprehensive library of technical product documentation on a portable medium. The DVD enables you to access multiple versions of installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the same HTML 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= or DOC-DOCDVD=SUB) from Cisco Marketplace at this URL:

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San Jose, CA 95134-9883

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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

From this site, you will find information about how to:

- 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, security notices, and security responses for Cisco products is available at this URL:

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

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

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 have identified a vulnerability in a Cisco product, contact PSIRT:

- For Emergencies only—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.

- For Nonemergencies—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 (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*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

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

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

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 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)—An existing 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 operations 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 the network is impaired, while 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.

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:

  http://www.cisco.com/go/guide

- 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

Definitions

AAA—Authentication, Authorization, and Accounting

AES—Advanced Encryption Standard

CMVP—Cryptographic Module Validation Program

CSP—Critical Security Parameter

DES—Data Encryption Standard

DSA—Digital Signature Algorithm

ECDH—Elliptic Curve Diffie Hellman

FIPS—Federal Information Processing Standard

HMAC—Hashed Message Authentication Code

HTTP—Hyper Text Transfer Protocol

IKE—Internet Key Exchange

KAT—Known Answer Test

LED—Light Emitting Diode

MAC—Message Authentication Code

NIST—National Institute of Standards and Technology

NVRAM—Non-volatile Random Access Memory

OCSP—Online Certificate Status Protocol

PIX—Private Internet eXchange

PRNG—Pseudo-Random Number Generator

RAM—Random Access Memory

RNG—Random Number Generator

RSA—Rivest Shamir and Adleman method for asymmetric encryption

Service Card—A service card may provide additional interfaces, feature acceleration or additional services. Service cards may take a Circuit Board form factor for PIX security appliances

SHA—Secure Hash Algorithm

SSL—Secure Sockets Layer

TLS—Transport Layer Security

Trustpoint—A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA. When certificates are exchanged, the PIX/ASA device follows the trustpoint path upwards until it reaches the root CA to validate the certificate. **VAC**—VPN Acceleration Card

VPN—Virtual Private Network