Avaya VPN Router Configuration – FIPS 140-2

Avaya VPN Router

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Preface

This guide provides information about how to configure the Avaya VPN Router to operate in FIPS-compliant mode. This guide includes the following information:

- Roles and services available when using the Avaya VPN Router in FIPS mode
- 140-2 tamper evidence requirements and instructions for applying the tamper evident labels
- Instructions for enabling and disabling FIPS mode

This guide describes Avaya VPN Router only in the context of configuring them for FIPS 140-2 level 2. For more information about Avaya VPN Router hardware and software documentation, see "Related publications" on page 14.

Throughout this guide, the Avaya VPN Router is referred to as *the gateway.*

Before you begin

This guide is for network managers who are responsible for setting up and configuring the Avaya VPN Router for FIPS 140-2 level 2. This guide assumes that you have the following background:

- Experience with system administration
- Familiarity with network management
- Knowledge of FIPS 140-2 concepts and procedures

Text conventions

This guide uses the following text conventions:

angle brackets (< >)
Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command.

Example: If the command syntax is **`ping`** *`<ip_address>`*, you enter **`ping 192.32.10.12`**

`bold Courier text`
Indicates command names and options and text that you need to enter.

Example: Use the **`show health`** command.

brackets ([ ])
Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command.

Example: If the command syntax is **`show ntp`** `[`**`associations`**`]`, you can enter either **`show ntp`** or **`show ntp associations`**.

italic text
Indicates new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore.

Example: If the command syntax is **`ping`** *`<ip_address>`*, *`ip_address`* is one variable and you substitute one value for it.

`plain Courier text`
Indicates command syntax and system output, for example, prompts and system messages.

Example: `File not found.`

separator (>)
Shows menu paths.

Example: Choose Status > Health Check.

Acronyms

This guide uses the following acronyms:

3DES	Triple DES
AES	Advanced Encryption Standard
AH	Authentication Header
CA	certificate authority
CHAP	Challenge Handshake Authentication Protocol
CSP	critical security parameter
DES	Data Encryption Standard
DTR	Derived Test Requirements
ECMP	equal cost multipath
ESP	Encapsulating Security Payload
FIPS	Federal Information Processing Standards
FTP	File Transfer Protocol
HMAC	Hashing Message Authentication Code
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol, Secure
IKE	Internet Key Exchange
IP	Internet Protocol
IPsec	Internet Protocol Security
ISAKMP	Internet Security Association and Key Management Protocol
KAT	known answer test
L2F	Layer 2 Forwarding
L2TP	Layer 2 Tunneling Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LED	light emitting diode

MAC	Message Authentication Code
MD5	Message Digest 5
MS-CHAP	Microsoft Challenge Handshake Authentication Protocol
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSPF	Open Shortest Path First
PAP	Password Authentication Protocol
PCI	peripheral component interconnect
PPTP	Point-to-Point Tunneling Protocol
RADIUS	Remote Authentication Dial-In User Services
RIP	Routing Information Protocol
SA	security association
SHA-1	Secure Hash Algorithm 1
SNMP	Simple Network Management Protocol
SSL	Secure Socket Layer
TLS	Transport Layer Security
WAN	wide area network

Related publications

For complete information about installing and configuring the Avaya VPN Router , refer to the following publications (included on the FIPS 140-2 software CD):

- Release notes

  Provide late-breaking information about your hardware and software.

- Hardware installation guide:
  - *Avaya VPN Router Installation— VPN Router 600*
  - *Avaya VPN Router Installation— VPN Router 1700*
  - *Avaya VPN Router Installation— VPN Router 1750*

  - *Avaya VPN Router Installation— VPN Router 2700*
  - *Avaya VPN Router Installation— VPN Router 2750*
  - *Avaya VPN Router Installation— VPN Router 5000*
- Software configuration guides

New in this release

The following sections details what is new in *Avaya VPN Router Configuration — FIPS 140-2*.

Features

See the following sections for information about feature changes:

Avaya VPN Router 1010, 1050, and 1100 tamper-evident labels

FIPS 140-2 requires that the Avaya VPN Router 1010, 1050, and 1100 receive a level 1 physical compliant label placed over their respective reset configuration holes. For more information see "Applying the tamper-evident label (Avaya VPN Router 1010, 1050, and 1100)" on page 40

Tamper-evident shields

FIPS 140-2 requires the restriction of visual access to the inside of a module. To comply with this standard, you can now seal the Avaya VPN Router by using tamper- evident shields. For more information see "Tamper-evident shields" on page 41.

Chapter 1
Overview of FIPS 140-2 compliance

This chapter introduces Federal Information Processing Standards (FIPS) 140-2 requirements for the Avaya VPN Router.

Note: FIPS 140-2 information applies to these Avaya VPN Router hardware platforms: Avaya VPN Router 600, 1700, 1750, 2700, 2750, and 5000.

This chapter contains the following topics:

FIPS 140-2 validation

FIPS 140-2 is a U.S. Government federal standard that enhance the security of information when applied to software and hardware. The FIPS 140-2 publication ("Security Requirements for Cryptographic Modules") specify requirements for the design and implementation of products that perform cryptography.

You can find FIPS 140-2 publications and related information at the http://csrc.nist.gov/cryptval/ URL

The FIPS 140-2 standard provide four levels of compliance for a cryptographic module. Level 1 is the lowest level, and Level 4 is the highest. The Avaya VPN Router meets Level 2 standards for FIPS 140-2.

Level 2 provides role-based authentication in which a module must authenticate that an operator is authorized to assume a specific role and perform a corresponding set of services. For more information about role-based authentication, see "Role-based authentication" on page 23.

For a device to be certified as FIPS-compliant, the following actions must take place:

1. The applying company submits relevant design documentation, source code, and product executable to a National Voluntary Laboratory Accreditation Program (NVLAP).
2. The laboratory executes the tests described in the Derived Test Requirements (DTR).
3. The laboratory issues a test report to the National Institute of Standards and Technology (NIST) indicating compliance (PASS or N/A) on all applicable FIPS 140-2 requirements.
4. NIST issues an official certificate to the company certifying its compliance with those requirements.

Avaya VPN Router software version 7.05.100 has been certified under FIPS 140-2 level 2, when the provided tamper evident labels are applied on the following platforms:

- Avaya VPN Router 600, 1700, 1750, 2700, 2750 and 5000

.

Note: For the FIPS 140-2-certified software version that runs on each Avaya VPN Router platform, go to the http://csrc.nist.gov/cryptval/ URL. In the left column of the page, click on Validation Lists, then click on the Vendor List link on the resulting page.

Hardware overview

The hardware for the Avaya VPN Router can include the following interfaces:

- One (private) 10/100 Ethernet LAN port provided on the base system
- One serial port for network management
- Depending on the system, expansion slots that can accommodate a combination of optional LAN, WAN, and serial interface cards and hardware encryption accelerator cards

Note: The Avaya hardware encryption accelerator card is an encryption, compression, and authentication processor card with a PCI interface. This option card is certified for operation in FIPS mode.

Table 1 maps the physical interfaces on an Avaya VPN Router to the logical interfaces described by the FIPS 140-2

Table 1 FIPS logical interfaces mapped to Avaya VPN Router physical interfaces

FIPS 140-2 logical interface	Physical interface on the Avaya VPN Router
Data input interface	LAN port WAN port
Data output interface	LAN port WAN port
Control input interface	LAN port WAN port Serial port Power switch Reset switch
Status output interface	Front panel LEDs LAN port LEDs WAN port LEDs Serial port
Power interface	Power plugs

Roles and services

The Avaya VPN Router can support multiple simultaneous users (or “operators”). For FIPS 140-2 Level 2 compliance, the Avaya VPN Router must be able to maintain internally the separation of operator roles and the services performed by each operator. The Avaya VPN Router must also employ access control mechanisms to:

- Authenticate an operator accessing the gateway—either directly or indirectly, via a computer process acting on his or her behalf.
- Verify that the operator is authorized to perform the desired roles and services within that role.

Role-based authentication

To comply with FIPS 140-2 Level 2, the Avaya VPN Router employs *role-based authentication* of users and stores user identity information in an internal Lightweight Directory Access Protocol (LDAP) database. You can optionally configure the Avaya VPN Router as an LDAP proxy server; in this way authentication can be performed against a variety of external servers using LDAP or RADIUS, including Novell* NDS*, Microsoft Windows NT* Domains, RSA* Security and ACE Server*.

FIPS 140-2 Level 2 specifies two main roles that users can assume in the Avaya VPN Router: the *Crypto Officer* role and the *User* role. The Avaya VPN Router administrator assumes the Crypto Officer role to configure and maintain the gateway using Crypto Officer services; other users exercise only User services.

Crypto Officer role

The Crypto Officer role assumes the following rights:

- **Manage Switch** rights (None, View, or Manage): *View* rights allow an administrator to view all configuration and status information on the Avaya VPN Router. *Manage* rights allow an administrator to configure the Avaya VPN Router and change settings.
- **Manage Users** rights (None, View, or Manage): *View* rights allow an administrator to view all user accounts and settings on the gateway. *Manage* rights allow an administrator to create, modify, and delete users.

User role

A user is authenticated and assumes the User role to access the following services:

- Initiate IPsec tunnels.
- Initiate PPTP tunnels.
- Initiate L2TP tunnels.
- Initiate L2F tunnels.
- Change his or her own password.

Crypto Officer services

The Avaya VPN Router has a factory default login ID and password that allow access to the Crypto Officer role. This initial account is the primary administrator's account for the Avaya VPN Router and guarantees that at least one account is able to assume the Crypto Officer role and completely manage the gateway and users. (This initial account always has *manage gateway* and *manage users* rights.) An administrator of the Avaya VPN Router can assign permission to access the Crypto Officer role to additional accounts, thereby creating additional administrators.

Administrators can always access the Avaya VPN Router and authenticate themselves via the serial port. An administrator can also authenticate as a User over a secure tunnel and then authenticate to the gateway as a Crypto Officer in order to manage the gateway. The default configuration allows HTTP management on the private LAN interface of the gateway without requiring a secure tunnel. For FIPS 140-2 level 2 compliance, however, disable HTTP over private non-tunneled interfaces.

Note: You can manage the Avaya VPN Router using an HTTPS connection over a private non-tunneled interfaces and still be in compliance with FIPS 140-2 level 2.

At the highest level, Crypto Officer services include the following:

- **Configure the Avaya VPN Router**: Define network interfaces and settings, set the protocols the Avaya VPN Router will support, define routing tables, set system date and time, load authentication information, etc.
- **Create user groups**: Define common sets of user permissions such as access hours, user priority, password restrictions, protocols allowed, filters applied, and types of encryption allowed. Administrators can define the permission sets for a number of users by creating, editing, and deleting user groups.
- **Create users**: Define user accounts and assign them permissions using user groups. Additionally, an account can be assigned an administrator ID, allowing access to the Crypto Officer role. Each administrator ID is assigned rights to manage the Avaya VPN Router (one of *none*, *view gateway*, or *manage gateway*) and rights to manage users (one of *none*, *view users*, or *manage users*).

- **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 that defines a set of packets to permit or deny. Rules consist of such basic characteristics as protocol ID, addresses, ports, TCP connection establishment, and packet direction. The administrator can use any of the predefined rules or create custom rules to be included in each filter.
- **Monitor status**: View the Avaya VPN Router configuration, routing tables, and active sessions; use Gets to view SNMP MIB II statistics, usage graphs, health, temperature, memory status, voltage, and packet statistics; and review accounting logs.
- **Manage the Avaya VPN Router**: Log off users, shut down or reset the gateway, disable or enable audible alarms, manually back up Avaya VPN Router configurations, restore gateway configurations, or create a recovery diskette.

User services

An administrator (Crypto Officer) who has *manage users* rights assigns each user a name and a user group. The user group defines access permissions and services that the user can exercise, including access hours, call admission priority, forwarding priority, number of simultaneous logins, maximum password age, minimum password length, whether passwords contain only alphabetic characters, whether static IP addresses are assigned, idle timeout, forced logoff for timeout, and filters.

The administrator also assigns each user separate user IDs and passwords for the following services: IPsec, PPTP, L2TP, and L2F tunnels. The user can then authenticate as necessary to initiate secure tunnels using any of these services.

IPsec

IPsec requires authentication through user name and password. IPsec authenticates the user to the gateway and is protected using Internet Key Exchange/Internet Security Association Key Management Protocol (IKE/ISAKMP). Security options for IPsec include using an Encapsulated Security Payload (ESP) with Advanced Encryption Standard (AES), Data Encryption Standard (DES), Triple DES, or “40-bit DES” for encryption of data.

Security options also include using an Authentication Header (AH) with Hashing Message Authentication Code Secure Hash Algorithm (HMAC SHA-1) or HMAC Message Digest 5 (MD5) for operator authentication to the module. These security options provide secure communication for a user and prevent sensitive data from traveling over the Internet in the clear.

When operating in FIPS mode, only the IPsec protocol with AES, DES, or Triple DES encryption and HMAC SHA-1 is used to create a secure tunnel.

PPTP

PPTP requires authentication using Challenge Handshake Authentication Protocol (CHAP), Microsoft CHAP (MS-CHAP), or Password Authentication Protocol (PAP). Security options for PPTP include using 40-bit RC4 and 128-bit RC4 for encryption of data. Security options also include using SHA-1 or MD5 for operator authentication to the module. These security options provide secure communication for a user and prevent sensitive data from traveling over the Internet in the clear.

When operating in FIPS mode, only SHA-1 is enabled and encryption is disabled. This mode of operation is considered bypass mode, that is, data is forwarded through the gateway in plain-text form and is not encrypted.

L2TP

L2TP requires authentication using MS-CHAP, CHAP, or PAP. Security options for L2TP include using 40-bit RC4 and 128-bit RC4 for encryption of data. Security options also include using SHA-1 or MD5 for operator authentication to the module. These security options provide secure communication for a user.

When operating in FIPS mode, only SHA-1 is enabled and encryption is disabled. This mode of operation is considered bypass mode, that is, data is forwarded through the Avaya VPN Router in plain-text form and is not encrypted.

L2F

L2F requires authentication using CHAP or PAP. Security options for L2F include using SHA-1 or MD5 for operator authentication. When operating in FIPS mode, only SHA-1 is enabled. This mode of operation is considered bypass mode, that is, data is forwarded through the Avaya VPN Router in plain-text form and is not encrypted.

Key management

The Avaya VPN Router uses and securely administers these FIPS 140-2 level 2 critical security parameters (CSPs):

- User passwords
- Keys (secret, private, and public)
- Certificates

User passwords

User passwords are created by the Crypto Officer and are stored in the LDAP database in an encrypted format and never released. They are used only for authentication in key exchange protocols. User passwords can be destroyed by Crypto Officers or by users when they overwrite their own passwords. New and changed passwords should have at least five characters.

Note: The Password Authentication Protocol (PAP) transmits password information in the clear; do not enable PAP before you set local policy.

Keys

The Avaya VPN Router uses and manages the following types of keys.

- Session keys: These ephemeral secret keys are created using the gateway’s pseudo-random number generator for protocols such as MS-CHAP and ISAKMP, which securely negotiate key exchange and then allow encryption services for PPTP, L2TP, and IPsec. These keys are created during the negotiation of secure tunnels on behalf of operators who have successfully authenticated themselves to the gateway with their user ID and password. The keys are temporarily stored in memory during a tunnel session and are destroyed when the appropriate tunnel, security association (SA), or session is terminated. They are never archived or released from the device.

  In FIPS mode, only the IPsec protocol with AES, DES, or Triple DES encryption is used to create a secure tunnel.

- Pre-shared keys: These ephemeral secret keys are internally derived for protocols such as MS-CHAP and ISAKMP. The keys are used for authentication purposes with the hashing and encryption services to set up SAs between the gateway and an operator. The keys are temporarily stored in memory during a tunnel session and are destroyed when the appropriate tunnel, SA, or session is terminated. They are never archived or released from the device.

  In FIPS mode, only the IPsec protocol with AES, DES, or Triple DES encryption and HMAC SHA-1 is used to create a secure tunnel.

- Diffie-Hellman keys: These ephemeral public/private key pairs are used with protocols such as ISAKMP to derive pre-shared secret keys during tunneling sessions. These keys are internally generated using the gateway's pseudo-random number generator during session setup. They are temporarily stored in memory during a tunnel session and destroyed when the appropriate tunnel, SA, or session is terminated. The private key is never output. The public key is output to the respective party during a key agreement procedure.
- DES password key: This key is used to encrypt all passwords to be stored in the switch's internal LDAP database. This key is compiled into the Avaya VPN Router device code. For instructions on how to zeroize DES password keys, see the security policy for the Avaya VPN Router model. (Go to this URL for the list of Avaya security policies: (http://csrc.nist.gov/cryptval/140-1/1401vend.htm.)
- 3DES password encryption: When enabled in a one time configuration session, all current DES encrypted passwords are converted to 3DES encryption. This process enables a conversion of DES passwords used in older LDAP versions to the upgraded 3DES encryption type. Once converted to the 3DES type, however, you can no longer use DES encryption. As well, the process does not require a configuration rebuild when upgrading from older releases of code.
- RSA keys: These public/private key pairs are used to generate and verify digital signatures for authentication of users during tunneling sessions. The gateway's keys are generated internally according to the PKCS#1 standard using a pseudo-random number generator. The keys are stored in uniquely named directories in PKCS#5 and PKCS#8 formats. The administrator can zeroize all RSA keys by entering commands to delete and zeroize the key directories. The private key is never output. The public key is output to obtain a certificate from a third-party certificate authority (CA).

- Configureable hash key: This configurable key enables the entry of a user defined 8 byte character string or hexadecimal value encryption key on the Avaya VPN Router. A SHA1 hash is stored in the LDAP to ensure that the Avaya VPN Routers using a single or external LDAP are using the same password. A hash is created locally to validate with the LDAP version before the new key is accepted and the new password is then stored in the LDAP. When an encryption key is entered from the GUI or the CLI, the passwords currently encrypted are decrypted and re-encrypted with the new encryption key. The SHA1 stored on the LDAP validates the encryption key to ensure there is no corruption of the key before updating the LDAP.

Certificates

RSA certificates are public key-based certificates that are used to authenticate users for tunnel sessions. In addition, the Avaya VPN Router has its own certificate that it uses to authenticate itself to operators. These X.509 certificates are issued by a third-party certificate authority (CA) and are stored in the internal LDAP database. Certificates can be zeroized by the administrator using commands that actively delete the certificates.

Firewall and advanced routing

You can further restrict access to the Avaya VPN Router by enabling the Avaya VPN Router Stateful Firewall. For the Avaya VPN Router Stateful Firewall to function, you must install the Firewall License Key.

Additionally, you can use the advanced routing features of the Avaya VPN Router in FIPS mode. The Advanced Routing License Key is required to enable features such as OSPF and ECMP.

Self-tests

To prevent any secure data from being released, it is important to test the cryptographic components of a security module to ensure that all components are functioning correctly. The Avaya VPN Router includes an array of self-tests that are run when power is applied to the Avaya VPN Router and periodically during operation.

The self-tests that run at power-up include the following:

- Cryptographic known answer tests (KATs) on the FIPS-approved cryptographic algorithms (AES, DES, 3DES), on the message digest (SHA-1), and on signatures (RSA with SHA-1)
- Software/firmware integrity tests using a DES MAC per FIPS PUB 113, “Computer Data Authentication”
- Continuous random number generator and pseudo-random number generator tests
- IPSEC and SSL tests that include generated messages indicating pass, failure, or trusted state.

Other tests are run periodically or conditionally, including the following:

- Software/firmware load test for FIPS-approved upgrades using a DES MAC
- Continuous random number generator and pseudo-random number generator tests
- Checksum tests on flash memory that has been updated with flash changes

If any of these self-tests fail, the gateway transitions into an error state. Within the error state, all secure data transmission is halted and the gateway outputs status information indicating the failure.

Chapter 2
Physically securing the Avaya VPN Router

To make your Avaya VPN Router compliant with FIPS 140-2, you must apply the tamper-evident labels and the tamper-evident shields included in the FIPS kit.

Caution: You are responsible for using the FIPS labeling kit and the instructions in this guide to apply the labels and to configure your system for FIPS 140-2 compliance. Avaya Customer Services does *not* apply the labels for you.

This chapter contains the following topics:

After you configure the Avaya VPN Router in FIPS conformant mode (with tamper-evident labels in place), the system cannot be accessed without signs of tampering.

FIPS 140-2 security kit components

Table 2 lists the items in the Avaya VPN Router FIPS 140-2 security kit.

Table 2 Contents of the Avaya VPN Router FIPS security kit

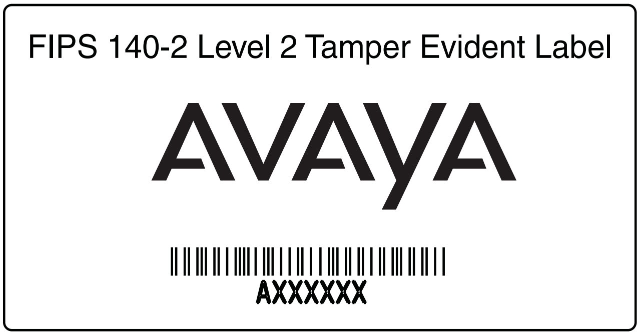
Quantity	Description
2	Sheets of labels (24 labels total). Each sheet has the following labels: • 8 general FIPS security labels • 3 AC filter input security labels • 1 I/O panel air holes security label
1*	Tamper-evident windowed label- Avaya VPN Router 600 only*
5	Alcohol wipes for cleaning the equipment prior to securing labels
1	Avaya VPN Router software CD (contains software and documentation)
1	Recovery diskette, used to restore the software image and file system (The FIPS kit for the Avaya VPN Router 600 does not contain a recovery diskette.)
1*	Tamper-evident shield - Avaya VPN Router 600 only*
2*	Tamper-evident shields - Avaya VPN Router 2700/2750 only*
3*	Tamper-evident shields - Avaya VPN Router 1700/1750 only*

Caution: If you have not received all the items listed in Table 2, contact Avaya Customer Service (see "Customer service" on page 9).

Tamper-evident labels

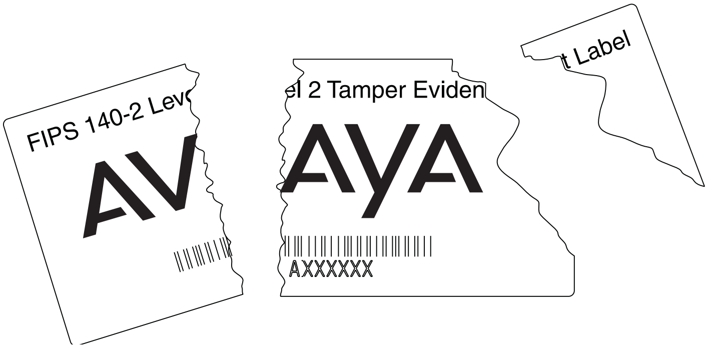
The FIPS 140-2 labeling kit contains multiple Type C, tamper-evident identification and information labels for resealing your system after maintenance, upgrade of option cards and memory, or required access to the floppy disk drive. Each label has a unique serial number to be recorded by the network manager for control purposes Figure 1.

Figure 1 Tamper-evident label



The tamper-evident labels are made of a special thin-gauge white vinyl with a self-adhesive backing. Any attempt to access the VPR will damage or destroy these labels. An attempt to remove a label breaks it or continually tears off small fragments, as shown in Figure 2.

Figure 2 Damaged tamper-evident label



Other signs of tampering include warped or bent metal cover, scratches in the paint of the module, and possibly, a smell of organic solvents.

Because each tamper-evident label has a unique serial number, the labels can be inspected for damage and verified against the network manager’s log files (see “Monitoring and controlling FIPS labels” on page 46).

Caution: To ensure the security of the system, surplus maintenance labels *must* be controlled and locked.

Before you label the Avaya VPN Router

Before you apply the tamper-evident labels to your system, note the following:

- The FIPS 140-2 security labels are very fragile and require careful handling.
- You must press the label firmly onto the chassis to ensure proper adhesion. Do not rub.
- You must allow *72 hours* for the adhesive on the tamper-evident seals to cure completely.

Note: Your system is not fully FIPS 140-2 compliant until the adhesive has completely cured (72 hours).

Applying the tamper-evident label (Avaya VPN Router 600)

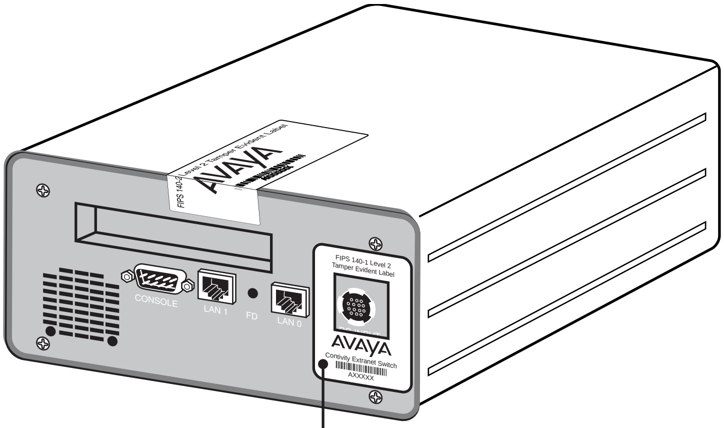
The Avaya VPN Router 600 has one removable portion. Removing the system from the chassis allows access to the system board, memory, and expansion slots.

To seal the cover of the Avaya VPN Router 600, you must apply the tamper-evident labels as follows:

1. Ensure that the temperature of the VPR is above 10°C (50°F).
2. Clean the chassis of any grease, dirt, or oil. Use the alcohol-based cleaning pads that are shipped in the FIPS 140-2 security kit.
3. Affix the solid label to the top of the chassis, making sure that the label overlaps the rear panel Figure 3 on page 37.

4 Affix the windowed label to the rear panel by centering the window over the chassis‘s power connector while ensuring that the left side of the label covers the RC pinhole Figure 3.

Figure 3 Tamper-evident labels applied to the Avaya VPN Router 600



Windowed label covering RC pinhole
and power connector centered in window

5 Record the serial number of the label applied to the Avaya VPN Router 600 in a security log (for an example of a security log, see Figure 11 on page 46).

Note: Allow *72 hours* for the adhesive in the tamper-evident seals to cure completely.

6 For instructions on configuring the Avaya VPN Router 600 for FIPS mode, see Chapter 3, “Enabling and disabling FIPS mode,” on page 49.

Applying the tamper-evident labels (Avaya VPN Router 1700, 1750, 2700, and 2750)

The Avaya VPN Router 1700, 1750, 2700, and 2750 have two removable portions: the front bezel and the top cover. Removing the front bezel allows access to the floppy disk drive. Removing the top cover allows access to the system board, memory, and expansion slots.

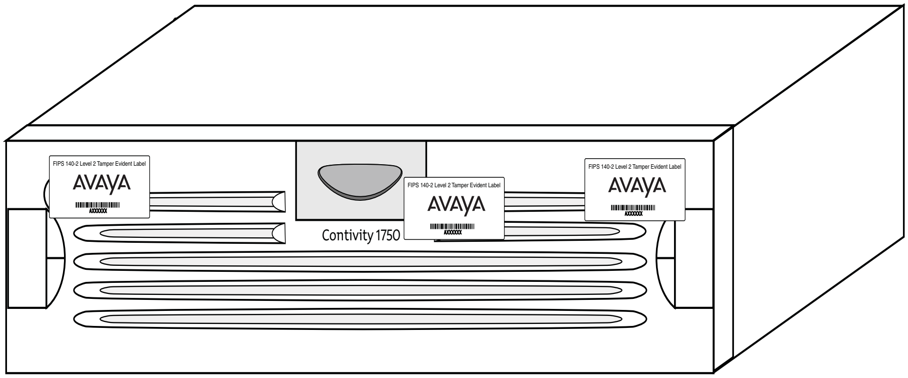
To seal the Avaya VPN Router 1700, 1750, 2700 or 2750, you must apply the serialized, tamper-evident labels as follows.

1 Ensure that the temperature of the Avaya VPN Router is above 10°C (50°F).

2 Clean the front bezel of any grease, dirt, or oil. Use the alcohol-based cleaning pads that are shipped in the FIPS 140-2 security kit.

3 Affix two labels over the bezel screw holes completely covering the holes and affix one label overlapping the center piece and the bezel (Figure 4).

Figure 4 Tamper-evident labels applied to the front bezel of the Avaya VPN Router 1700, 1750, 2700, and 2750


FIPS 140-2 Level 2 Tamper Evident Label
AVAYA
AXXXXXX
FIPS 140-2 Level 2 Tamper Evident Label
AVAYA
AXXXXXX
Contivity 1750
FIPS 140-2 Level 2 Tamper Evident Label
AVAYA
AXXXXXX

4 Record the serial numbers of the labels applied to the Avaya VPN Router in a security log (for an example of a security log, see Figure 11 on page 46).

➡ **Note:** Allow *72 hours* for the adhesive in the tamper-evident seals to cure completely.

5 For instructions on configuring the Avaya VPN Router for FIPS mode, see Chapter 3, “Enabling and disabling FIPS mode,” on page 49.

Applying the tamper-evident labels (Avaya VPN Router 5000)

The Avaya VPN Router 5000 has two removable portions: the front bezel and the top cover. Removing the front bezel allows access to the hard disk drives and the floppy disk drive. Removing the top cover allows access to the system board, memory, and expansion slots.

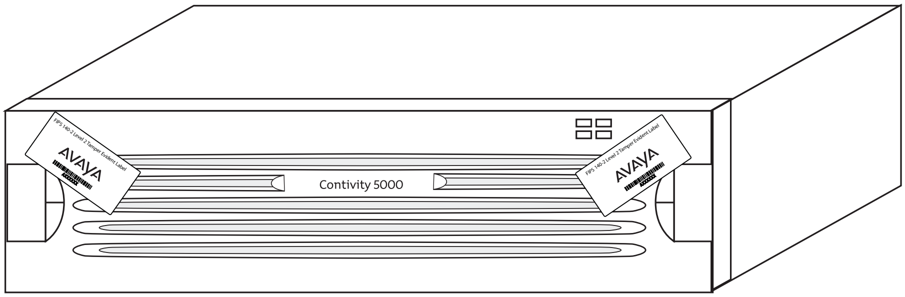
To seal the Avaya VPN Router 5000, you must apply the serialized, tamper-evident labels as follows.

1 Ensure that the temperature of the Avaya VPN Router is above 10°C (50°F).

2 Clean the bezel of any grease, dirt, or oil. Use the alcohol-based cleaning pads that are shipped in the FIPS 140-2 security kit.

3 Affix two labels over the bezel screw holes, making sure that the labels completely cover the holes Figure 4 on page 38.

Figure 5 Tamper-evident label applied to the bezel of the Avaya VPN Router 5000


FIPS 140-2 Level 2 Tamper Evident Label
AVAYA
Contivity 5000
FIPS 140-2 Level 2 Tamper Evident Label
AVAYA

4 Record the serial numbers of the labels applied to the Avaya VPN Router 5000 in a security log (for an example of a security log, see Figure 11 on page 46)..

Note: Allow *72 hours* for the adhesive in the tamper-evident seals to cure completely.

5 For instructions on configuring the gateway for FIPS mode, see Chapter 3, "Enabling and disabling FIPS mode," on page 49

Applying the tamper-evident label (Avaya VPN Router 1010, 1050, and 1100)

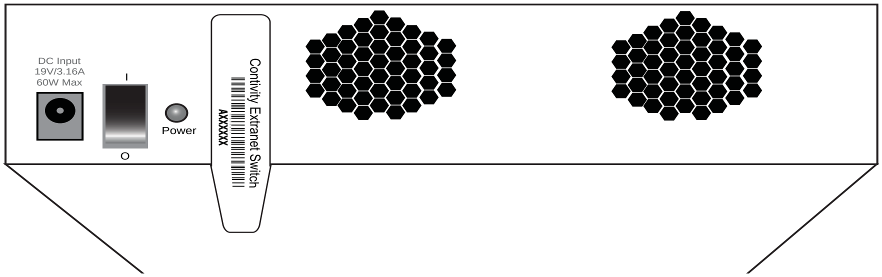
Avaya VPN Router 1010, 1050, and 1100 chassis require a FIPS 140-2 label for level 1 physical compliancy. In this procedure you place the tamper-evident label over the reset configuration pinholes at the back of the chassis.

1 Ensure that the temperature of the Avaya VPN Router is above 10°C (50°F).

2 Clean the chassis of any grease, dirt, or oil. Use the alcohol-based cleaning pads that are shipped in the FIPS 140-2 security kit.

3 Affix the label over the reset configuration holes at the back of the Avaya VPN Router 1010, 1050, or 1100 chassis Figure 6 on page 41.

Figure 6 Tamper-evident label applied to the chassis of the Avaya VPN Router 1010, 1050, and 1100



4 Record the serial numbers of the labels applied to the Avaya VPN Router 1010, 1050, and 1100 in a security log (for an example of a security log, see Figure 11 on page 46).

Note: Allow *72 hours* for the adhesive in the tamper-evident seals to cure completely.

5 For instructions on configuring the gateway for FIPS mode, see Chapter 3, “Enabling and disabling FIPS mode,” on page 49.

Tamper-evident shields

FIPS 140-2 requires the restriction of visual access to the inside of a module. To comply with this standard, the Avaya VPN Router is sealed by using tamper-evident shields supplied with the FIPS 140-2 security kit onto the Avaya VPN Router chassis.

The tamper-evident shield is a solid opaque metal bracket that has legs, or stand-offs,which when inserted, prevent any visual access into the chassis. Tamper-evident shields are inserted into the front air vents of the Avaya VPN Router 600 and the rear air vents of the Avaya VPN Router 1700, 1750, 2700, and 2750 chassis.

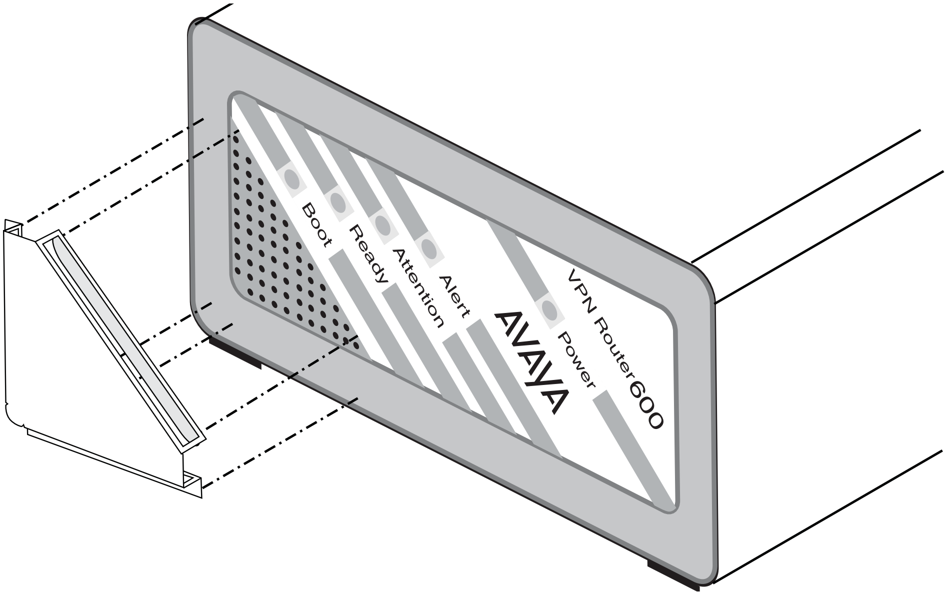
Any attempt to remove the shield results in one or more of the stand-offs breaking and thereby revealing evidence of tampering.

Attaching the FIPS 140-2 tamper-evident shield to the Avaya VPN Router 600

To attach the tamper-evident shields to the Avaya VPN Router 600 chassis, complete the following:

1. Remove the protective paper from the adhesive strips affixed to the flanges of the tamper-evident shield.
2. Align the flanges to the chassis surface surrounding the air vents found on the front of the chassis as shown in Figure 7. Ensure the flanges do not cover the air vents.
3. Press firmly on the tamper-evident shield to ensure a secure attachment to the chassis.

Figure 7 Attaching the FIPS 140-2 tamper-evident shield to the Avaya VPN Router 600

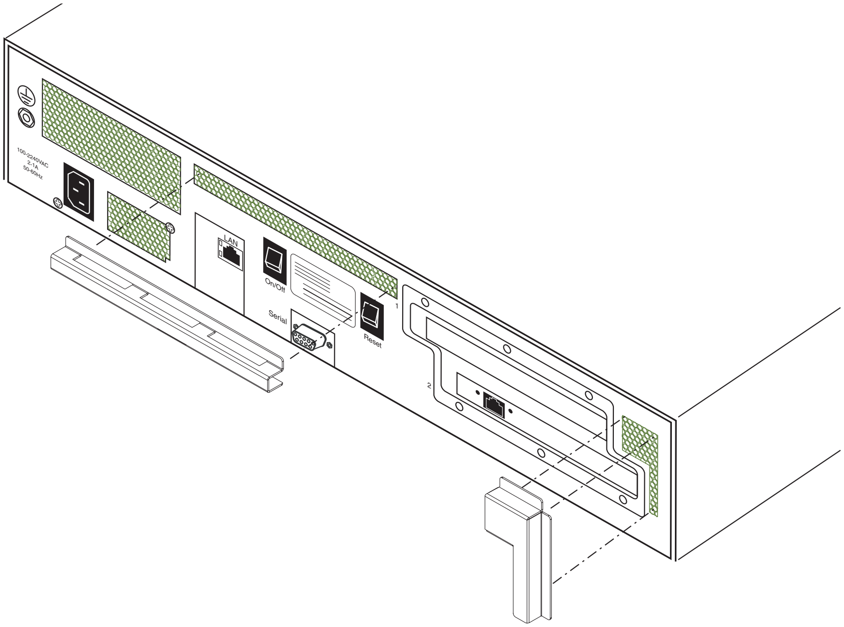


Attaching the FIPS 140-2 tamper-evident shields to the Avaya VPN Router 1700

To attach the tamper-evident shields to the Avaya VPN Router 1700 chassis air vents, complete the following:

1. Remove the protective paper from the adhesive strips affixed to the flanges of the tamper-evident shields.
2. Align the flanges to the chassis surface surrounding the air vents found on the back of the chassis as shown in Figure 8. Ensure the flanges do not cover the air vents.
3. Press firmly on the tamper-evident shield to ensure a secure attachment to the chassis.

Figure 8 Attaching FIPS 140-2 tamper-evident shields to the Avaya VPN Router 1700

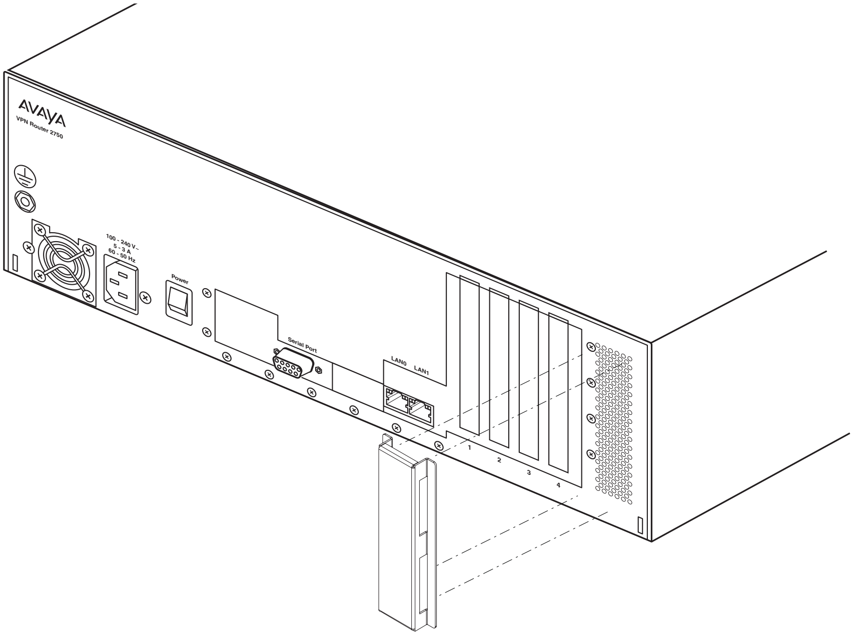


Attaching the FIPS 140-2 tamper-evident shield to the Avaya VPN Router 1750/2750

To attach the tamper-evident shield to the Avaya VPN Router 1750 or 2750 chassis air vents, complete the following:

1. Remove the protective paper from the adhesive strips affixed to the flanges of the tamper-evident shield.
2. Align the flanges to the chassis surface surrounding the air vents found on the back of the chassis as shown in Figure 9. Ensure the flanges do not cover the air vents.
3. Press firmly on the tamper-evident shield to ensure a secure attachment to the chassis.

Figure 9 Attaching FIPS 140-2 tamper-evident shield to the Avaya VPN Router 1750/2750

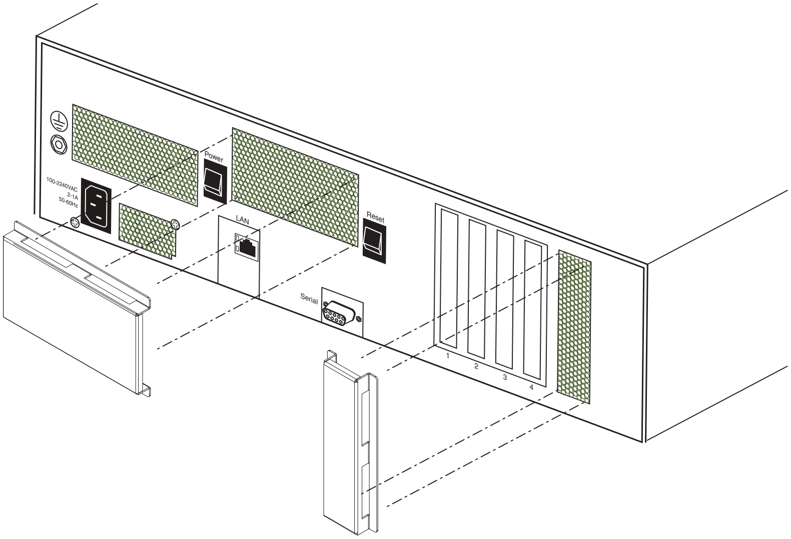


Attaching the FIPS 140-2 tamper-evident shields to the Avaya VPN Router 2700

To attach the tamper-evident shields to the Avaya VPN Router 2700 chassis air vents, complete the following:

1. Remove the protective paper from the adhesive strips affixed to the flanges of the tamper-evident shields.
2. Align the flanges to the chassis surface surrounding the air vents found on the back of the chassis as shown in Figure 10. Ensure the flanges do not cover the air vents.
3. Press firmly on the tamper-evident shield to ensure a secure attachment to the chassis.

Figure 10 Attaching FIPS 140-2 tamper-evident shields to the Avaya VPN Router 2700

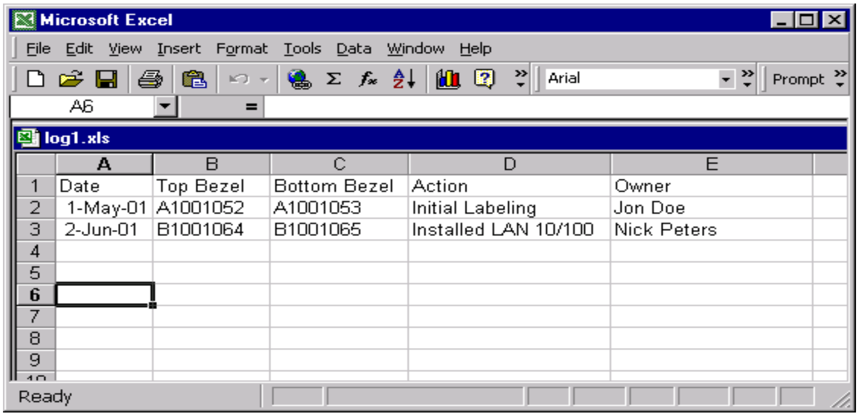


Monitoring and controlling FIPS labels

After you configure the Avaya VPN Router for FIPS mode with the tamper-evident labels and shields in place, the Avaya VPN Router cannot be accessed without signs of tampering or intrusion. For this reason, all access to the FIPS-compliant system must be documented.

A log can identify the date, access area, reason for access, and the person who accessed the system. Figure 11 shows an example of how the FIPS administrator could use Microsoft* Excel to document, monitor, and control use of the FIPS tamper-evident labels to maintain security for an Avaya VPN Router.

Figure 11 Sample log for monitoring and controlling FIPS labels



	A	B	C	D	E
1	Date	Top Bezel	Bottom Bezel	Action	Owner
2	1-May-01	A1001052	A1001053	Initial Labeling	Jon Doe
3	2-Jun-01	B1001064	B1001065	Installed LAN 10/100	Nick Peters
4					
5					
6					
7					
8					
9					

Note: If you have more than one Avaya VPN Router, add a line at the top of the log to identify the gateway by its model and serial number.

Table 3 defines the terms used in the sample log shown in Figure 11 on page 46.

Table 3 Definitions of sample log terms

Term	Definition
Date	Date that the system was accessed
Top bezel	Top bezel labels (2 places)
Bottom bezel	Bottom bezel labels (2 places)

Table 3 Definitions of sample log terms (continued)

Term	Definition
A1001052, A1001053, B1001064, B1001065	Unique numbers assigned to each label
Action	Reason the system was accessed
Owner	Name of the person accessing the system

Chapter 3
Enabling and disabling FIPS mode

The Avaya VPN Router can run in normal operating mode or in FIPS operating mode. In FIPS operating mode, the Avaya VPN Router meets all Level 2 requirements for FIPS 140-2. (You can find FIPS 140-2 publications and related information at the http://csrc.nist.gov/cryptval/ URL. For the list of Avaya security policies, click on Validation Lists in the left column of the page.)

Note: Before you enable FIPS mode, apply the tamper-evident labels and the o the Avaya VPN Router gateway as described in Chapter 2, “Physically securing the Avaya VPN Router,” on page 33.

This chapter contains the following topics:

Changes enforced by FIPS mode

Changing a FIPS mode, from enabled to disabled or disabled to enabled, resets the Avaya VPN Router to the factory default configuration and all connectivity to the NVR is lost. As well, all data that you configured prior to changing a FIPS mode is completely wiped from disk memory. Avaya recommends that you use the Command Line Interface through the console port whenever changing the FIPS mode. After the reset a simple configuration allows you to access the management interface for further configuration..

⛔ **Caution:** Changing FIPS modes causes a loss of all configuration data stored in non-volatile memory (disk) and resets the Avaya VPN Router to factory default configuration. Avaya recommends that you use the Command Line Interface through the console port whenever changing FIPS modes.

The following changes are strongly recommended:

Table 4 Disabling authentication methods by protocol (FIPS mode)

Protocol	**Authentication methods for FIPS mode**
IPsec	MD5 is not an approved FIPS algorithm. (For example, you can select Triple DES with SHA1 integrity, but *not* Triple DES with MD5 integrity.) On the Services, IPsec Settings screen, deselect any encryption option with MD5 as the integrity option.
L2F	You cannot enable CHAP. On the Services, L2F Settings screen, disable (uncheck) the CHAP option and click on OK.
L2TP	You cannot enable MS-CHAP, CHAP, or RC4 encryption. On the Services, L2TP Settings screen, disable (uncheck) MS-CHAP, CHAP, RC4-128, and RC4-40 and click on OK.
OSPF	MD5 is not an approved FIPS algorithm. To change the OSPF authentication type, choose Routing, Interfaces, then click on the Configure button next to OSPF. On the Configure OSPF screen, change the Authentication option from MD5 to None or Simple.
PPTP	You cannot enable MS-CHAP, CHAP, or RC4 encryption. On the Services, PPTP Settings screen, disable (uncheck) MS-CHAP, CHAP, RC4-128, and RC4-40 and click on OK.
RIP	MD5 is not an approved FIPS algorithm. To change the RIP authentication type, choose Routing, Interfaces, then click on the Configure button next to RIP. On the Configure RIP screen, change the Authentication option from MD5 to None or Simple.

- Change the default administrator password on the gateway.
- Disable all management protocols other than HTTPS—for example, HTTP and SNMP—over private non-tunneled interfaces. (NIST permits the use of HTTPS over a private non-tunneled interface.)

  To disable management protocols, choose **Services, Available** and deselect the protocols.

Note: After you disable HTTP, you can manage the gateway using an IPsec tunnel or using an HTTPS connection over a private non-tunneled interface.

Enabling FIPS mode using the command line interface

Enabling FIPS mode resets the Avaya VPN Router to the factory default configuration and all connectivity to the NVR is lost. As well, all data that you configured prior to changing a FIPS mode is completely wiped from disk memory. Avaya recommends that you use the Command Line Interface through the console port whenever changing the FIPS mode. After the reset a simple configuration allows you to access the management interface for further configuration..

Caution: Changing FIPS modes causes a loss of all configuration data stored in non-volatile memory (disk) and resets the Avaya VPN Router to factory default configuration. Avaya recommends that you use the Command Line Interface through the console port whenever changing FIPS modes.

To enable FIPS mode:

1 Access the command line interface in one of two ways:

- Connect a terminal or PC to the serial port on the gateway. From the Serial Port menu, enter `L` to access the command line interface.
- Establish a Telnet session with the gateway’s management IP address.

2 At the Login prompt, log in to the gateway using an account with administrator privileges, for example:

```
Login: admin
Password:<password>
CES>
```

3 At the User mode prompt (`CES>`), go to Privileged EXEC mode and then to Global Configuration mode.

```
CES> enable
Password:<password>
CES# configure terminal
CES(config)#
```

4 Enter the **`fips enable`** command.

```
   CES(config)# fips enable

   To be FIPS compliant, you must be running a FIPS certified
   software version and be protected by FIPS tamper proof
   labels. FIPS kits, which include full instructions on how
   to be FIPS compliant, are available from Avaya sales and
   resellers. A list of switch hardware models and software
   versions that have been FIPS certified is available from
   Avaya and from the US Government NIST Web site.

   Enabling FIPS will initiate a reset to the factory
default configuration.
      Do you want to proceed? [no]:
```

5 Type **`yes`** (or **`y`**) and press Return.

```
Please wait. System will reboot.
CES(config)#

Your connection has been terminated
```

After the Avaya VPN Router gateway reboots, FIPS is enabled and the gateway runs in FIPS mode.

Note: Telnet is automatically disabled on the private interface when you enable FIPS. You can use Telnet to access the command line interface only after you connect to the gateway over a secure tunnel. You can still access the command line interface using the serial port.

Disabling FIPS mode using the command line interface

Disabling FIPS mode resets the Avaya VPN Router to the factory default configuration and all connectivity to the NVR is lost. As well, all data that you configured prior to changing a FIPS mode is completely wiped from disk memory. Avaya recommends that you use the Command Line Interface through the console port whenever changing the FIPS mode. After the reset a simple configuration allows you to access the management interface for further configuration..

Caution: Changing FIPS modes causes a loss of all configuration data stored in non-volatile memory (disk) and resets the Avaya VPN Router to factory default configuration. Avaya recommends that you use the Command Line Interface through the console port whenever changing FIPS modes.

To disable FIPS mode:

1 Access the command line interface in one of two ways:

   - Connect a terminal or PC to the serial port on the gateway. From the Serial Port menu, enter `L` to access the command line interface.
   - Establish a Telnet session with the gateway’s management IP address.

Note: After you enable FIPS mode, you can use Telnet only after you connect to the gateway over a secure tunnel.

2 At the Login prompt, log in to the gateway using an account with administrator privileges, for example:

```
Login: admin
Password:<password>
CES>
```

3 At the User mode prompt (`CES>`), go to Privileged EXEC mode and then to Global Configuration mode.

```
CES> enable
Password:<password>
CES# configure terminal
CES(config)#
```

4 Enter the **`no fips`** command.

```
   CES(config)# no fips
   Disabling FIPS will initiate a reset to the factory
default configuation.
      Do you want to proceed? [no]:
```

5 Type **`yes`** (or **`y`**) and press Return.

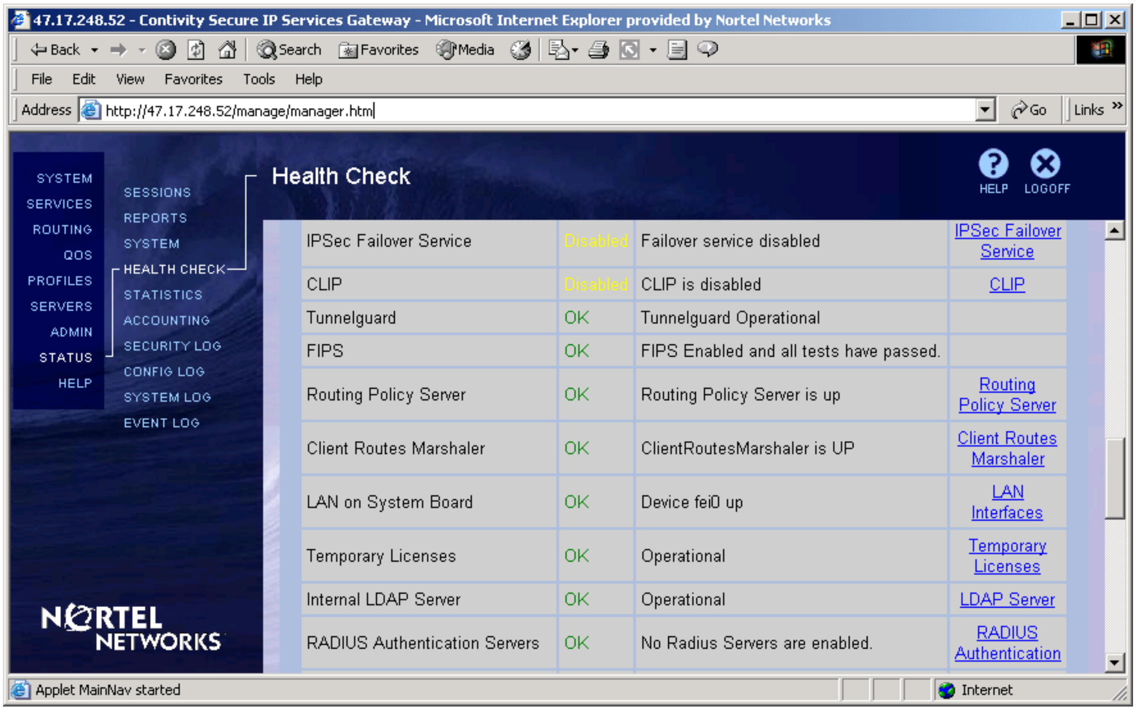
```
Please wait. System will reboot.
CES(config)#

Your connection has been terminated.
```

After the gateway reboots, FIPS is disabled and the gateway runs in normal operating mode. You can reenable FTP, Telnet, and other protocols and services that are not FIPS compliant (see "Changes enforced by FIPS mode" on page 50).

Health Check (FIPS)

A FIPS status entry appears on the Status, Health Check screen (Figure 12).

Figure 12 Health Check screen



IPSec Failover Service	Disabled	Failover service disabled	IPSec Failover Service
CLIP	Disabled	CLIP is disabled	CLIP
Tunnelguard	OK	Tunnelguard Operational	
FIPS	OK	FIPS Enabled and all tests have passed.	
Routing Policy Server	OK	Routing Policy Server is up	Routing Policy Server
Client Routes Marshaler	OK	ClientRoutesMarshaler is UP	Client Routes Marshaler
LAN on System Board	OK	Device fei0 up	LAN Interfaces
Temporary Licenses	OK	Operational	Temporary Licenses
Internal LDAP Server	OK	Operational	LDAP Server
RADIUS Authentication Servers	OK	No Radius Servers are enabled.	RADIUS Authentication

The cause of an unhealthy Health Check status can be determined by consulting the gateway’s event log or system log. Note that the Health Check page has an audible alarm enable feature.

FIPS Health Check status messages

The Health Check screen displays the results of test/self-test functions. SNMP traps are sent based on FIPS warnings or failures. An SNMP trap is sufficient notification according to FIPS requirements for a failed self-test. Table 5 lists the FIPS Health Check status messages.

Table 5 FIPS Health Check status messages

Health Check status (Healthy/Warning/Alert)	Description
Healthy	FIPS: Disabled
Healthy	FIPS: Enabled and all tests passed
Warning	FIPS: Random generator test failed
Warning	FIPS: DES MAC check on executables Failed
Warning	FIPS: DES KAT Test Failed
Warning	FIPS: SHA1 Self Test Failed
Alert	FIPS: Status not known

Security log

The Security log records all activity about system or user security. The Security log lists all security events, both failures and successes. The events can include authentication and authorization events, such as:

- Tunnel or administration requests
- Encryption, authentication, or compression
- Hours of access
- Number of session violations
- Communications with servers
- LDAP
- RADIUS
- FIPS messages

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