Cisco Wide Area Application Engine 512 and 612 Hardware Installation Guide

C O N T E N T S

Preface

This preface describes the purpose of the *Cisco Wide Area Application Engine 512 and 612 Hardware Installation Guide*, who should read it, how it is organized, and its document conventions.

This preface contains the following sections:

Purpose

This installation guide explains how to prepare your site for installation, how to install a WAE-512 and WAE-612 (WAE) in an equipment rack, and how to maintain and troubleshoot the system hardware. After completing the hardware

installation procedures covered in this guide, you will then use the appropriate companion publications to configure your system. (See the "Related Documentation" section on page xi.)

Audience

To use this installation guide, you should be familiar with internetworking equipment and cabling, and have a basic knowledge of electronic circuitry and wiring practices.

To complete the installation, including the software configuration for your WAE appliance and for the router with which it works in conjunction, you should be familiar with basic networking principles and router configuration, especially web page protocols.

⚠️
Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Organization

This guide includes the following chapters:

Chapter	Title	Description
Chapter 1	Introducing the Cisco Wide Area Application Engine	Describes the physical properties of the WAE appliance and provides a functional overview of the different software-based device modes.
Chapter 2	Preparing to Install the Cisco Wide Area Application Engine	Describes safety considerations and gives an overview of the installation and procedures you should perform *before* the actual installation.
Chapter 3	Installing the Cisco Wide Area Application Engine	Describes installing the hardware and connecting the external network interface cables.

Chapter	Title	Description
Chapter 4	Installing Hardware Options	Describes how to remove and replace the hard disk drives, memory options, and adapters.
Appendix A	Technical Specifications	Describes the functional specifications for the hardware models.
Appendix B	Troubleshooting the System Hardware	Describes troubleshooting procedures for the hardware installation.
Appendix C	Maintaining the Cisco Wide Area Application Engine	Contains the procedures for keeping your system in good condition.

Conventions

Command descriptions use the following conventions:

Convention	Description
boldface font	Commands and keywords are in **boldface**.
italic font	Variables for which you supply values are in *italics*.
[ ]	Elements in square brackets are optional.
{**x**	**y**	**z**}	Alternative keywords are grouped in braces and separated by vertical bars.
[**x**	**y**	**z**]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string, or the string will include the quotation marks.

Screen examples use the following conventions:

Convention	Description
screen font	Terminal sessions and information the system displays are in screen font.
boldface screen font	Information you must enter is in **boldface screen** font.
italic screen font	Variables for which you supply values are in *italic screen* font.
^	The symbol ^ represents the key labeled Control—for example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Notes, cautionary statements, and safety warnings use these conventions:

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Related Documentation

The WAE appliance supports three different software installations: Cisco Wide Area Application Services software (WAAS), Cisco Wide Area File System (WAFS) software and Cisco Application and Content Networking System (ACNS) software.

When WAAS software is installed, the WAE appliance can function as either a Central Manager or as an Application Acceleration Engine. When ACNS software is installed, the WAE appliance functions as a Content Engine or one of the other ACNS device modes (Content Router or Content Distribution Manager). When WAFS software is installed, the WAE appliance functions as a File Engine.

The Cisco WAAS software document set includes the following documents:

- *Cisco WAAS Release Notes*
- *Cisco WAAS Quick Installation Guide*
- *Cisco WAAS User Guide*
- *Cisco WAAS Command Reference*
- *Cisco WAAS System Messages Guide*
- *Cisco WAAS Logging Messages Guide*
- *Cisco WAAS MIB Support Guide*

The WAFS software document set includes the following documents:

- *Release Notes for Cisco WAFS*
- *Cisco WAFS 3.0 Quick Installation Guide*
- *Cisco WAFS 3.0 Configuration Guide*
- *Cisco WAFS 3.0 Command Reference*
- *Cisco WAFS 3.0 User Guide*
- *Cisco WAFS 3.0 Online Help*
- *Cisco WAFS MIB Quick Reference*
- *Cisco WAFS System Messages Reference*
- *NIST Net Installation and Configuration Note*
- *Cisco WAFS Benchmark Tool for Microsoft Office Applications Installation and Configuration Note*

The ACNS software document set includes the following documents:

- *Release Notes for Cisco ACNS Software*
- *Cisco ACNS Software Upgrade and Maintenance Guide, Release 5.x*
- *Cisco ACNS Software Configuration Guide for Locally Managed Deployments*
- *Cisco ACNS Software Configuration Guide for Centrally Managed Deployments*
- *Cisco ACNS Software Command Reference*
- *Cisco ACNS Software API Guide*

The documentation for this product also includes the following hardware-related documents:

- *Regulatory Compliance and Safety Information for the Cisco Content Networking Product Series*
- *Installing the Cisco WAE Inline Network Adapter*

Obtaining Documentation

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

Cisco.com

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

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

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

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

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

Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/

Cisco Marketplace:

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

Ordering Documentation

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

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

Cisco will continue to support documentation orders using the Ordering tool:

- Registered Cisco.com users (Cisco direct customers) can order documentation from the Ordering tool:

  http://www.cisco.com/en/US/partner/ordering/

- Instructions for ordering documentation using the Ordering tool are at this URL:

  http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

Documentation Feedback

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

You can send comments about Cisco documentation to bug-doc@cisco.com.

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

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

We appreciate your comments.

Cisco Product Security Overview

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

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you can perform these tasks:

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

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

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

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

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

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

- Emergencies — security-alert@cisco.com

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

- Nonemergencies — psirt@cisco.com

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

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

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.*x* through 8.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

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

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco

service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

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

http://www.cisco.com/techsupport

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

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

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

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended

solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

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

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

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

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

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

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

Definitions of Service Request Severity

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

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

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

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

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

Obtaining Additional Publications and Information

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

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

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

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

  http://www.ciscopress.com

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

  http://www.cisco.com/packet

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

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

  or view the digital edition at this URL:

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

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

  http://www.cisco.com/ipj

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

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

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

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

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

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

C H A P T E R 1

Introducing the Cisco Wide Area Application Engine

This chapter provides a basic functional overview of the Cisco Wide Area Application Engine 512 and 612 (WAE-512 and WAE-612), and describes the hardware, major components, and front and back panel indicators and controls.

This chapter contains the following sections:

Introduction

The Wide Area Application Engines (WAE-512 and WAE-612) support three different software installations that provide a comprehensive set of services for the remote office: Cisco Wide Area Application Services (WAAS) software, Cisco Wide Area File System (WAFS) software and Cisco Application and Content Networking System (ACNS) software.

The following software releases support the WAE-512 and WAE-612 appliances:

- WAAS 4.0.1 and later
- WAFS 3.0.7 and later
- ACNS 5.4.3 and later
- ACNS 5.5.1 and later

When WAAS software is installed, the WAE appliance can function as either a Central Manager or as an Application Acceleration Engine. When ACNS software is installed, the WAE appliance functions as a Content Engine or one of the other ACNS device modes (Content Router or Content Distribution Manager). When WAFS software is installed, the WAE appliance functions as a File Engine.

Figure 1-1 shows the WAE-512 and Figure 1-2 shows the WAE-612.

Figure 1-1   WAE-512—Front View
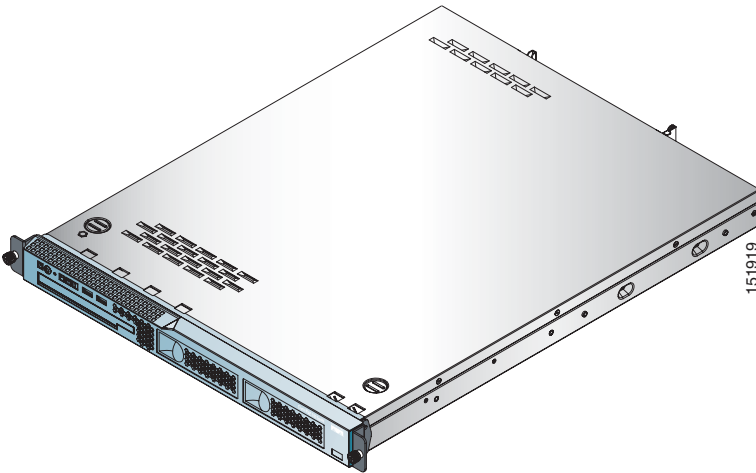
Figure 1-2   WAE-612—Front View
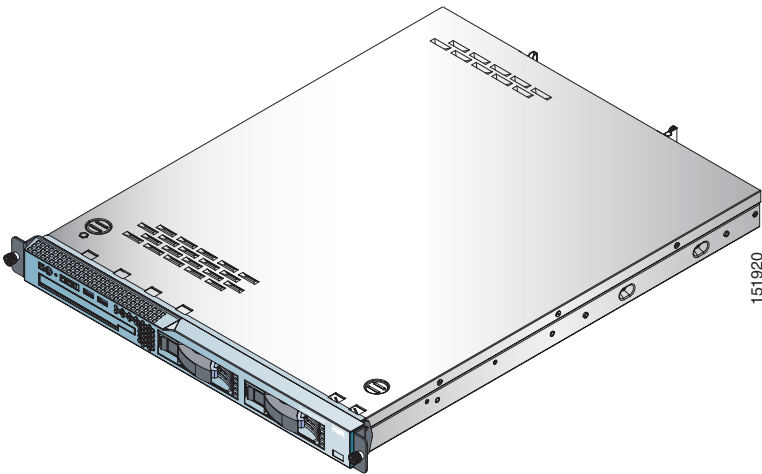
The WAE-512 and WAE-612 are configured for AC-input power and have a single AC-input power supply.

The WAE appliance has an integrated dual-port Ethernet controller, which supports 10BASE-T/100BASE-TX/1000BASE-TX Ethernet using RJ-45 receptacles. Both Ethernet ports support autodetect speed mode and full-duplex operation, which enable simultaneous transmission and reception of data on the Ethernet LAN.

WAE-512 and 612 models that are operating with ACNS software support an MPEG A/V decoder adapter. This adapter is user-replaceable and is installed in PCI-X slot 1 on the back panel.

Figure 1-3 shows the WAE rear view.

Figure 1-3   *WAE-512 and WAE-612 Back Panel*
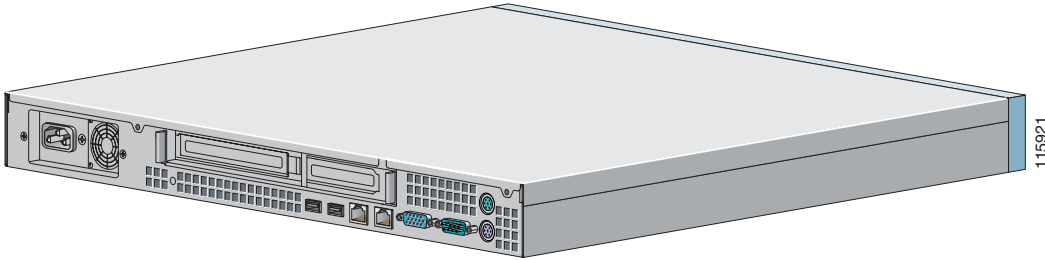
Software Functional Description

The operation of the WAE is dependent on the software application that is installed on it. This section describes WAAS, ACNS and WAFS software:

WAAS Software Description

With WAAS software installed, the WAE appliance functions as either a WAAS Central Manager or a WAAS Application Acceleration Engine. The WAAS Central Manager provides a graphical user interface to monitor and configure all Acceleration Engines. The WAAS Acceleration Engine is deployed in remote branch offices and in the data center to accelerate TCP applications that access data across the network.

The Application Acceleration Engine functionality operates at different levels based on the software licenses purchased. WAAS 4.x, software offers the WAAS Transport License or the WAAS Enterprise License options.

Cisco WAAS software helps enterprises meet the following objectives:

- Provide branch office employees with LAN-like access to information and applications across a geographically distributed network.

- Migrate application and file servers from branch offices into centrally managed data centers.

- Minimize unnecessary WAN bandwidth consumption through the use of advanced compression algorithms.

- Provide print services to branch office users. Cisco WAAS allows you to configure a WAE as a print server so you do not need to deploy a dedicated system to fulfill print requests.

- Improve application performance over the WAN by addressing the following common issues:

  - Low data rates (constrained bandwidth)

  - Slow delivery of frames (high network latency)

  - Higher rates of packet loss (low reliability)

ACNS Software Description

With ACNS software installed, the WAE appliance functions as a Content Distribution Manager, Content Engine, or Content Router. The Content Distribution Manager provides a graphical user interface to manage registered Content Engines and Content Routers. The ACNS solution addresses the need to distribute and receive high-bandwidth, media-rich content across the Internet or an intranet without performance losses or content-delivery delays.

ACNS software offers the following content-based services:

- Content caching and hosting

- Proxy services

- Content replication

- Video streaming

In Content Engine mode, the WAE operates either as a component of an ACNS network or as a standalone content-caching device and is generally positioned on the WAN edge between your enterprise network and the Internet.

Note   The WAE-612 supports device-mode configuration and can be configured with ACNS 5.x software to operate as a Content Engine, a Content Router, a Content Distribution Manager, or an IP/TV Program Manager. The WAE-512 operates as a Content Engine only.

To deploy Cisco Content Engines with Cisco ACNS software within your existing network, your network must support Cisco IOS software and the Web Cache Communication Protocol (WCCP). WCCP transparently redirects HTTP requests to a Content Engine, and the Content Engine responds to those requests.

WAFS Software Description

With WAFS software installed, the WAE appliance functions as a File Engine. The File Engine is an Internet file delivery device that provides the following file-based services:

- Segment-level file and metadata caching
- Protocol-specific latency reduction
- WAN transport-level optimization
- Policy-based prepositioning
- Global locking and coherency
- Native end-to-end CIFS/NFS support
- Web-based centralized control and management
- Branch file server replacement

Hardware Features

This section illustrates and describes the front and back panel controls, ports, and LED indicators on the WAE-512 and WAE-612. It contains the following topics:

Front Panel Control Buttons

Figure 1-4 shows the WAE front panel, and Table 1-1 describes the front panel control buttons.

Figure 1-4   Front Panel Control Buttons
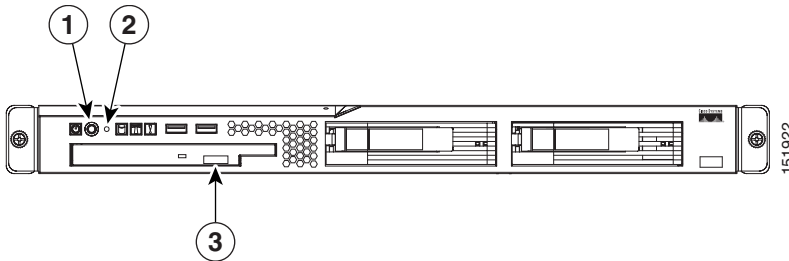
1	Power control button	**2**	Reset button
3	CD eject button		

Table 1-1   Front Panel Control Buttons

Item	Description
Power control button	Powers up the device. You might need to use a pen or the end of a straightened paper clip to press the button.
Reset button	Resets the device and runs the power-on self-test (POST). You might need to use a pen or the end of a straightened paper clip to press the button. **Note** This is a hardware reset button and does not restore the device to the factory default software settings.
CD eject button	Opens the CD drive tray.

LED Indicators

Figure 1-5 shows the location of front panel LEDs, and Table 1-2 describes their function.

Figure 1-5   Front Panel LEDs
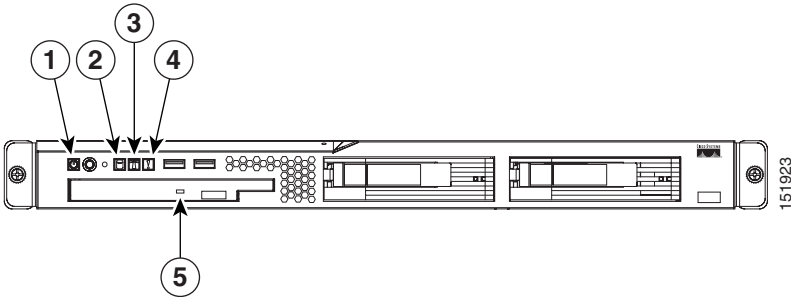
1	Power on	2	Hard disk drive activity
3	System locator (not supported on Content Engine models)	4	System error
5	CD-ROM drive activity		

Table 1-2   Front Panel LEDs

LED	Color	State	Description
Power	Green	On	Power is flowing to the device.
		Flashing	The device is in standby mode.
Hard disk drive activity	Green	Flashing	The associated hard disk drive is in use.
System error	Amber	On	A system error has occurred.
CD-ROM drive activity	Green	On	The CD-ROM drive is in use.

Figure 1-6 shows the location of back panel LEDs, and Table 1-3 describes their function.

Figure 1-6   *Back Panel LEDs*
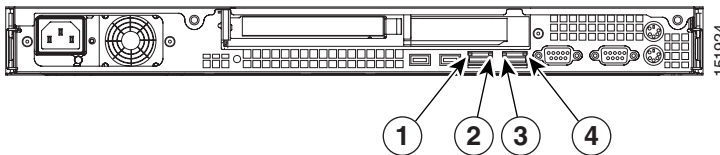
| 1 | Ethernet 1 transmit receive activity | 2 | Ethernet 1 speed |
| 3 | Ethernet 2 transmit receive activity | 4 | Ethernet 2 speed |

Table 1-3   *Back Panel LEDs*

Indicator	Color	State	Description
Ethernet 1 transmit receive activity	Green	On	There is an active link connection on the 10/100/1000BASE-T interface for Ethernet port 1.
Ethernet 1 speed	Green	On	The speed of the Ethernet LAN is 1000BASE-TX.
		Off	The speed of the Ethernet LAN is 10BASE-T/100BASE-TX.
Ethernet 2 transmit receive activity	Green	On	There is an active link connection on the 10/100/1000BASE-T interface for Ethernet port 2.
Ethernet 2 speed	Green	On	The speed of the Ethernet LAN is 1000BASE-TX.
		Off	The speed of the Ethernet LAN is 10BASE-T/100BASE-TX.

Note   The MPEG A/V decoder adapter does not have any LEDs.

Cisco Wide Area Application Engine 512 and 612 Hardware Installation Guide

Input/Output Ports and Connectors

Your WAE appliance supports the following I/O connectors on the back of the device:

- Ethernet connectors
- Serial connector
- Video and audio connectors (on optional adapter)

Warning   **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.** Statement 1021

Figure 1-7 shows the location of the WAE back panel connectors and receptacles.

Figure 1-7   WAE-512 and WAE-612 Back Panel Connectors and Receptacles

1	AC power receptacle	2	Mouse connector[1]
3	Keyboard connector[1]	4	Serial port
5	Monitor connector[1]	6	Ethernet 2 port connector
7	Ethernet 1 port connector	8	USB 1 port (not supported)
9	USB 2 port (not supported)		

1. Not required for normal operation. Can be used for troubleshooting purposes.

Note The system software does not support the use of a keyboard or mouse (Personal System 2 [PS/2] or Universal Serial Bus [USB]). However, keyboard and mouse are supported by the BIOS for power-on self-test (POST), and the configuration/setup utility.

Table 1-4 describes the back panel ports and receptacles.

Table 1-4   Back Panel Ports and Connectors

Item	Description
AC power receptacle	The AC power cord connects to this plug.
Ethernet 1 port	This 10/100/1000BASE-T port is autosensing with full-duplex capability; it connects your device to the Ethernet LAN.
Ethernet 2 port	This 10/100/1000BASE-T port is autosensing with full-duplex capability; it connects your device to the Ethernet LAN.
Serial port	This is a standard serial port for connecting to a console or terminal.
Audio/video port (on optional MPEG A/V decoder adapter)	• 3 BNC[1] connectors for YUV, RGB[2], and composite video output • Mini-XLR 8-pin connector for S/PDIF[3] and analog stereo audio output • Mini-XLR 8-pin connector for VGA[4] output

1. BNC = Bayonet Neill-Concelman
2. RGB = red green blue
3. S/PDIF = Sony/Philips Digital Interface
4. VGA = video graphics array

Ethernet Port Connector

The WAE appliance comes with one integrated dual-port Ethernet controller. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet LAN.

To access the Ethernet port, connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to the RJ-45 connector on the back of the device.

Note   The 100BASE-TX/1000BASE-TX Ethernet standard requires that the cabling in the network be Category 5 or higher.

Figure 1-8 shows the pin number assignments for the Ethernet RJ-45 port.

Figure 1-8   Ethernet Port Connector

Activity LED (green)   Link LED (green)

8   1
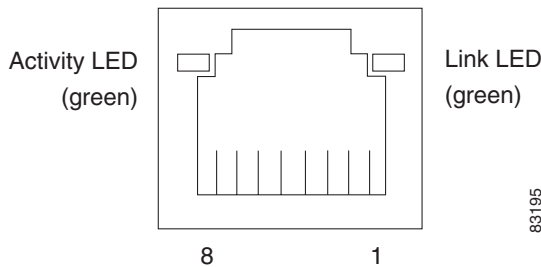
Serial Port Connector

The WAE appliance has one standard serial port connector located on the back of the device.

Figure 1-9 shows the pin number assignments for the 9-pin, male D-shell serial port connector on the back of the device. These pin number assignments conform to the industry standard for RS-232 communications.

Figure 1-9   Serial Port Connector

1   5

6   9
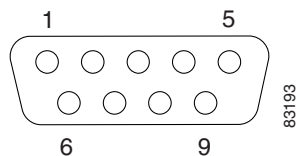
Video Port Connectors

The WAE-512 and WAE-612 support one optional MPEG A/V decoder adapter that has one audio and video input/output port.

Figure 1-10 shows the following five connectors for the audio and video input/output port:

- 3 BNC connectors for YUV, RGB, and composite video output
- Mini-XLR 8-pin connector for Sony/Philips Digital Interface (S/PDIF) and analog stereo audio output
- Mini-XLR 8-pin connector for video graphics array (VGA) output

Figure 1-10   *Video Input/Output Connectors*
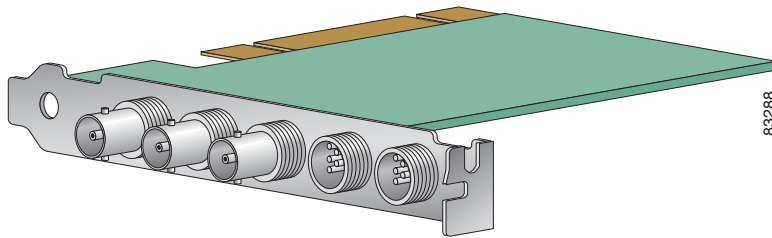
Table 1-5 provides the pinout for the audio output mini-XLR 8-pin connector, and Table 1-6 provides the pinout for the VGA output mini-XLR 8-pin connector.

Table 1-5   *Audio Output Connector Pinout*

Pin Number	Destination
1	Audio left (–)
2	Ground
3	Audio left (+)
4	Audio right (+)
5	Ground
6	Audio left (–)
7	Ground
8	S/PDIF

Table 1-6   VGA Output Connector Pinout

Pin Number	Destination
1	Vsync
2	Ground
3	Hsync
4	Blue
5	Ground
6	Red
7	Green
8	Ground

Inline Network Adapter Description

This section describes the following features of the WAE inline network adapter:

- Form and Function
- Ports and LED Indicators
- Inline Network Adapter Cabling Requirements
- Installation Scenarios and Cabling Examples for Fast Ethernet Connections

For adapter specifications, see Table A-4 in Appendix A.

Form and Function

Your appliance supports one optional 4-port Ethernet inline network adapter. The inline network adapter is a full-height, three-quarter-length PCI-X network interface card that contains four independent Gigabit Ethernet ports. (See Figure 1-11.)

Figure 1-11   Inline Network Adapter
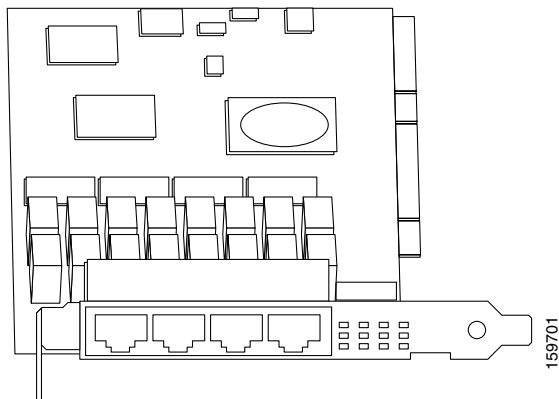
The Cisco WAE inline network adapter provides inline traffic interception capability for your appliance. When your appliance is configured for inline interception mode, you can set attributes to control which interfaces are to be used over which VLANs. By default, the adapter operates on all inline-capable interfaces and VLANs. You can configure the inline redirection feature using the WAAS 4.0.7 CLI or the WAAS 4.0.7 Central Manager GUI.

The WAAS software defines two new interface types: A group interface that represents an inline pair grouping and a port interface that represents the individual port. These interfaces are referred to as inlineGroup and inlinePort, respectively.

InlineGroup interfaces are numbered using the format slot/group. The slot number is the slot in which the adapter is inserted. (In the WAE 500 series and 600 series appliances, the adapter must be installed in slot 1 only.) The group number is either 0 or 1 (each adapter has 2 group pairs). The group number is displayed on the adapter label.

InlinePort interfaces are numbered slot/group/lan or slot/group/wan. The last attribute is the LAN or WAN designator.

The inline network adapter also includes an onboard programmable Watch Dog Timer (WDT) controller. You can set the time to wait after a failure event, such as a power outage or a kernel crash, before the unit begins to operate in mechanical bypass mode. In mechanical bypass mode, traffic is bridged between the LAN and WAN ports of each group. Mechanical bypass mode prevents the WAE from

becoming a single point of failure and allows traffic to continue to flow between the router and the client while it passes through an unresponsive WAE without being processed.

For more information about configuring the inline network adapter, see the *Cisco Wide Area Application Services Configuration Guide.*

Ports and LED Indicators

Figure 1-12 shows the inline network adapter port numbers, interface designations, and LEDs. Table 1-7 describes the LED functions.

Figure 1-12   Inline Network Adapter Port Numbering and LEDs
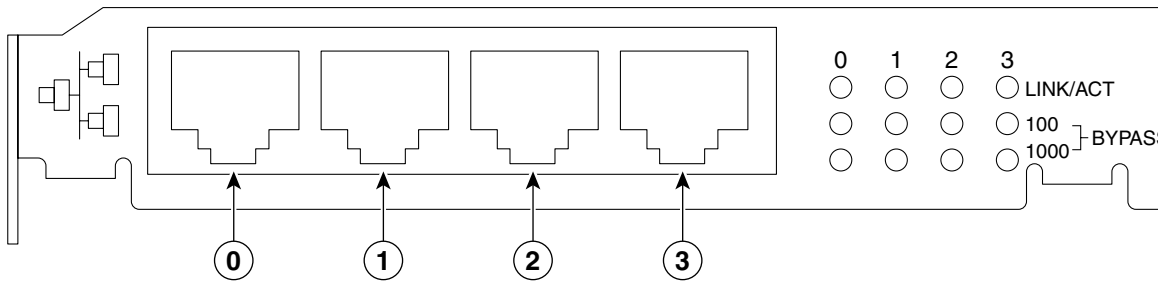
0	Port 0; Group 1 WAN interface	1	Port 1; Group 1 LAN interface
2	Port 2; Group 0 WAN interface	3	Port 3: Group 0 LAN interface

The inline network adapter has three LEDs that correspond to each port (the 0 LEDs correspond to Port 0, and so forth). Table 1-7 describes the LEDs.

Table 1-7   Inline Network Adapter LEDs

LEDs	State	Description
Link / Activity	On	The 10/100/1000BASE-T interface is receiving power.
	Blinking	The Ethernet link is transmitting data.
100	On	The speed of the Ethernet connection is 100BASE-TX.

Table 1-7   Inline Network Adapter LEDs (continued)

LEDs	State	Description
1000	On	The speed of the Ethernet connection is 1000BASE-TX.
Bypass	Both the 100 and 1000 LEDs are on	The corresponding ports are in mechanical bypass mode.

Inline Network Adapter Cabling Requirements

Your inline network adapter ships with two types of cables: crossover and straight-through. When you connect the WAE inline network adapter, proper cabling depends on the link speed (Gigabit Ethernet or Fast Ethernet) and the types of devices (DCE or DTE) being connected.

Note   You must retain the same link speed from one end of the connection to the other end. Inline adapter interfaces are able to autonegotiate link speeds. If any of your connecting interfaces are configured for Fast Ethernet (whether on a switch or a router), your WAE inline adapter uses Fast Ethernet. If any of your connecting interfaces are configured for Gigabit Ethernet, your WAE inline adapter uses Gigabit Ethernet. Speed and duplex settings are port-specific, so two inline ports can negotiate different speeds independently.

If you are connecting a WAE inline appliance between two devices using Gigabit Ethernet, you can use either straight-through cables, crossover cables, or any combination of the two cable types, regardless of the type of device. However, for consistency, we recommend that you use straight-through cables for all Gigabit Ethernet connections.

Table 1-8 shows the cable requirements for WAE and non-WAE connections when you are using Gigabit Ethernet end to end.

Table 1-8   Cable Requirements for WAE Connections Using Gigabit Ethernet

Connection	Required Cable
Switch to switch (no WAE)	Crossover or Straight-through
Switch to router (no WAE)	Crossover or Straight-through

Table 1-8   *Cable Requirements for WAE Connections Using Gigabit Ethernet (continued)*

Connection	Required Cable
Router to router (no WAE)	Crossover or Straight-through
Switch to WAE and	Crossover or Straight-through
WAE to Router	Crossover or Straight-through
Switch to WAE and	Crossover or Straight-through
WAE to Switch	Crossover or Straight-through
Router to WAE and	Crossover or Straight-through
WAE to Router	Crossover or Straight-through
WAE to WAE	Crossover or Straight-through

Some switches support automatic medium-dependent interface crossover (MDIX). You can configure MDIX by using the **mdix auto** global configuration switch command. If your switch supports MDIX, you do not need to follow these cabling rules because MDIX automatically adjusts transmit and receive pairs when an incorrect cable type (crossover or straight-through) is installed on a 10/100 Fast Ethernet port. However, when you configure MDIX, you must also configure the port to use autosense (not manual selection of speed/duplex).

⚠

Caution   If you are connecting to Fast Ethernet ports on both the LAN and the WAN sides of the WAE inline appliance, you must consider the types of devices that are being connected, and you must use the correct cables. You must follow these cabling instructions for the inline network adapter to work properly. (See Table 1-9. For illustrations and examples, see the "Installation Scenarios and Cabling Examples for Fast Ethernet Connections" section on page 1-20.)

To connect the inline network adapter using the correct cables for Fast Ethernet connections, follow these steps:

Step 1   Determine which type of cable you would use for a direct connection between your two end devices (without a WAE inline network appliance connected between them) by using the following standard cabling rules:

- When you are directly connecting two network devices that are similar, such as two switches, use a crossover cable.

- When you are directly connecting two network devices that are different, such as a switch and router, use a straight-through cable.

> **Note**   Because the inline network adapter has an internal crossover connection that becomes active when the InlineGroup interface is placed in mechanical bypass mode, you must figure out which cable you would use to connect the two network devices directly, and then you must install the other cable type (on one side, usually the WAN side of the inline appliance) instead.

Table 1-9 shows the cable requirements for WAE and non-WAE connections when you are using Fast Ethernet end to end.

Table 1-9   Cable Requirements for WAE Connections Using Fast Ethernet

Connection	Required Cable
Switch to switch (no WAE)	Crossover
Switch to router (no WAE)	Straight-through
Router to router (no WAE)	Crossover
Switch to WAE and	Straight-through
WAE to Router	Crossover
Switch to WAE and	Straight-through
WAE to Switch	Straight-through
Router to WAE and	Straight-through
WAE to Router	Straight-through
WAE to WAE	Crossover

Step 2 Connect Fast Ethernet ports on both the LAN and the WAN sides of the WAE inline appliance by using the following cable types:

- On the LAN side of the connection, use a straight-through cable between the WAE inline appliance and the network device.

- On the WAN side of the connection, use the cable that is different from the cable that you would use to connect the two network devices directly (as determined in Step 1).

  For example, if you are connecting a router and a switch (two different devices) through the WAE inline appliance, use a straight-through cable on the LAN side of the connection and use a crossover cable on the WAN side of the connection. (If you were connecting the two different devices directly, you would use a straight-through cable, so use the crossover cable instead.)

  If you are connecting two switches (or two similar devices), use straight-through cables on both the LAN and the WAN sides of the WAE inline appliance.

  Figure 1-13 through Figure 1-15 show the cables to use for the WAE LAN and WAN connections between Fast Ethernet ports.

Installation Scenarios and Cabling Examples for Fast Ethernet Connections

WAE appliances can be installed physically between two network devices (such as the branch office router and branch office LAN switch) by connecting the WAE inline network adapter ports to the network devices using the proper cables.

If you are connecting a WAE inline appliance between two devices using Gigabit Ethernet, you can use either straight-through cables, crossover cables, or any combination of the two cable types, regardless of the type of device. This section shows cabling examples for Fast Ethernet connections only, because Fast Ethernet has specific cabling requirements.

The inline network adapter has four ports that are divided into two inline groups (see the "Ports and LED Indicators" section on page 1-16). The WAE can be physically placed inline between two distinct network paths, creating redundant WAN links. (See Figure 1-13.)
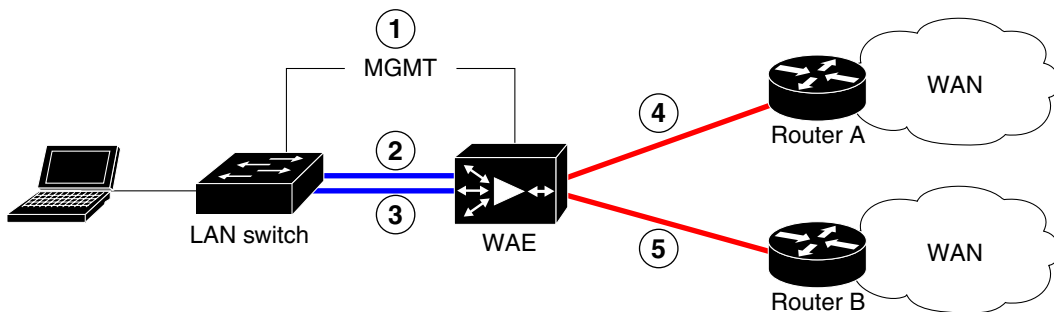
Two WAEs with inline network adapters can also be installed back-to-back in a serial fashion between two network devices for failover purposes. In this type of serial cluster configuration, if one WAE fails or becomes overloaded, the other WAE can provide optimization. (See Figure 1-14.)

Note When you connect two WAE inline appliances to each other in serial fashion, always use a crossover cable between the two WAEs. (See Figure 1-15.)

Figure 1-13   Cabling for a Single Inline WAE with Redundant WAN Connections

1	Connection: Management Gigabit Ethernet: 1/0 Cable type: Straight-through (recommended)	**2**	Connection: WAE to LAN switch (using InlineGroup 1/0) Fast Ethernet: LAN0 (InlinePort 1/0/lan) Cable type: Straight-through
3	Connection: WAE to LAN switch (using InlineGroup 1/1) Fast Ethernet: LAN1 (InlinePort 1/1/lan) Cable type: Straight-through	**4**	Connection: WAE to WAN router A (using InlineGroup 1/0) Fast Ethernet: WAN0 (InlinePort 1/0/wan) Cable type: Crossover
5	Connection: WAE to WAN router B (using InlineGroup 1/1) Fast Ethernet: WAN1 (InlinePort 1/1/wan) Cable type: Crossover		

Figure 1-14   Cabling for Serial Cluster Inline WAEs with a Single WAN Connection

1	Connection: WAE 1 to LAN switch	2	Connection: WAE 1 to WAE 2
	Fast Ethernet: LAN0 (InlinePort 1/0/lan)		Fast Ethernet: WAE1 WAN0 (InlinePort 1/0/wan) to WAE 2 LAN0 (InlinePort 1/0/lan)
	Cable type: Straight-through		Cable type: Crossover
3	Connection: WAE 2 to WAN router		
	Fast Ethernet: WAE 2 WAN0 (InlinePort 1/0/wan)		
	Cable type: Crossover		

Figure 1-15   Cabling Between Two Inline WAEs
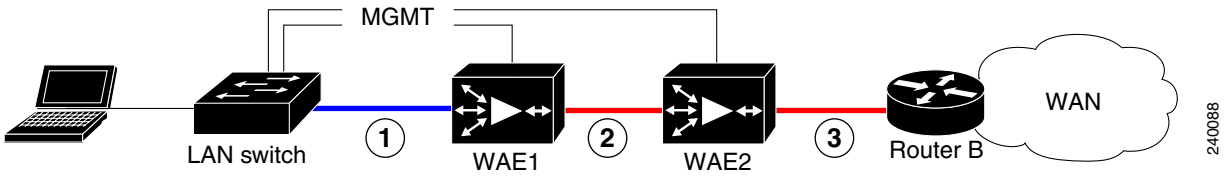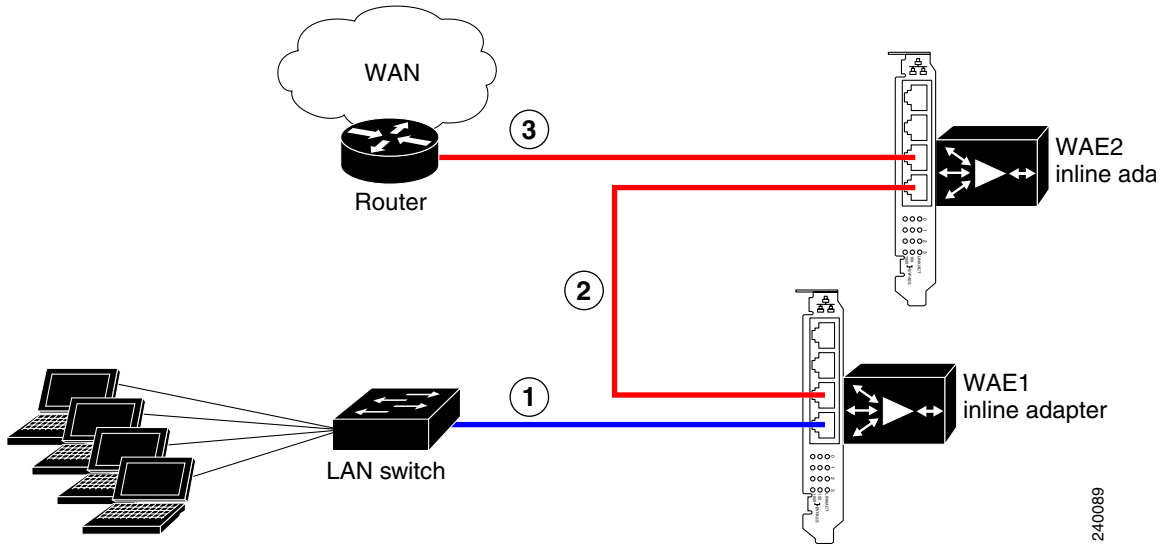
1	Connection: WAE 1 to LAN switch Fast Ethernet: WAE 1 LAN0 (InlinePort 1/0/lan) Cable type: Straight-through	**2**	Connection: WAE 1 to WAE 2 Fast Ethernet: WAE 1 WAN0 (InlinePort 1/0/wan) to WAE 2 LAN0 (InlinePort 1/0/lan) Cable type: Crossover
3	Connection: WAE 2 to WAN router Fast Ethernet: WAE 2 WAN0 (InlinePort 1/0/wan) Cable type: Crossover		

Hardware Features

Preparing to Install the Cisco Wide Area Application Engine

This chapter contains important safety information you should know before working with the Wide Area Application Engine (WAE). Use the guidelines in this chapter to ensure your own personal safety and to help protect your device from potential damage.

This chapter contains the following sections:

Note Read the *Regulatory Compliance and Safety Information for the Cisco Content Networking Product Series* document that came with your device before you begin the installation.

Safety Warnings

Before you install the device, observe the safety warnings in this section.

Warning **This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.** Statement 88

Warning   **Before working on a chassis or working near power supplies, unplug the power cord on AC units.** Statement 246

Warning   **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning   **Read the installation instructions before connecting the system to the power source.** Statement 1004

Warning   **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

- **This unit should be mounted at the bottom of the rack if it is the only unit in the rack.**

- **When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.**

- **If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.** Statement 1006

Warning   **There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.** Statement 1015

Warning   **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning   **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.** Statement 1019

Warning   **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.** Statement 1021

Warning   **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024

Warning   **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Warning   **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Warning   **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Warning   **This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.** Statement 1045

Warning   **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Warning   **Hazardous voltage or energy may be present on DC power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place.** Statement 1075

Safety Guidelines

To reduce the risk of bodily injury, electrical shock, fire, and damage to the equipment, observe the precautions in this section.

General Precautions

Observe the following general precautions for using and working with your system:

- Observe and follow service markings. Do not service any Cisco product except as explained in your system documentation. Opening or removing covers that are marked with the triangular symbol with a lightning bolt may expose you to electrical shock. Components inside these compartments should be serviced only by an authorized service technician.

- If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your authorized service provider:

  - The power cable or plug is damaged.

  - An object has fallen into the product.

  - The product has been exposed to water.

- – The product has been dropped or damaged.

  – The product does not operate correctly when you follow the operating instructions.

- Keep your system components away from radiators and heat sources. Also, do not block cooling vents.

- Do not spill food or liquids on your system components, and never operate the product in a wet environment.

- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.

- Use the product only with other Cisco-approved equipment.

- Allow the product to cool before removing covers or touching internal components.

- Use the correct external power source. Operate the product only from the type of power source indicated on the electrical ratings label. If you are not sure of the type of power source required, consult your service representative or local power company.

- Use only approved power cables. If you have not been provided with a power cable for your system or for any AC-powered option intended for your system, purchase a power cable that is approved for use in your country. The power cable must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cable should be greater than the ratings marked on the product.

- To help prevent electric shock, plug the system components and peripheral power cables into properly grounded electrical outlets. These cables are equipped with three-prong plugs to help ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable.

- Observe power strip ratings. Make sure that the total ampere rating of all products plugged into the power strip does not exceed 80 percent of the power strip ampere ratings limit.

- Do not use appliance or voltage converters or kits sold for appliances with your product.

- To help protect your system components from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).

- Position cables and power cords carefully; route cables and the power cord and plug so that they cannot be stepped on or tripped over. Be sure that nothing rests on your system components' cables or power cord.

- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local or national wiring rules.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside the device. To prevent static damage, discharge static electricity from your body before you touch any of your system's electronic components. You can do so by touching an unpainted metal surface on the chassis.

You can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component in your system. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.

- When transporting a sensitive component, first place it in an antistatic container or packaging.

- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

Rack Installation Safety Guidelines

Before installing your device in a rack, review the following guidelines:

- Two or more people are required to install the device in a rack.

- Ensure that the room air temperature is below 95°F (35°C).

- Do not block any air vents; usually 6 inches (15 cm) of space provides proper airflow.

- Plan the device installation starting from the bottom of the rack.

- Install the heaviest device in the bottom of the rack.

- Do not extend more than one device out of the rack at the same time.
- Remove the rack doors and side panels to provide easier access during installation.
- Connect the device to a properly grounded outlet.
- Do not overload the power outlet when installing multiple devices in the rack.
- Do not place any object weighing more than 110 lb (50 kg) on top of rack-mounted devices.

C H A P T E R 3

Installing the Cisco Wide Area Application Engine

This chapter explains how to install the Cisco Wide Area Application Engine (WAE) 512 and WAE 612 into an equipment rack. It also provides general instructions for installing the device on a table or workbench. This chapter contains the following sections:

Before you begin the installation, read the *Regulatory Compliance and Safety Information for the Cisco Content Networking Product Series* document that shipped with your device.

⚠️ **Warning** **Read the installation instructions before connecting the system to the power source.** Statement 1004

Tools and Parts Required

A sliding rail rack-mount kit and cable management assembly is included in your shipping container accessory box. The rack-mount kit is suitable for mounting the device in a 19-inch (48.26-cm) four-post equipment rack.

Angle brackets for mounting the device in a two-post rack are also included in your shipping container.

You need the following parts and tools to install the device in a rack:

- Flat-blade screwdriver
- Phillips screwdriver
- One rack-mount kit
- Documentation

Installing the Cisco Wide Area Application Engine

Place the device in the desired location. You can mount it in a rack for your convenience, or place it on a solid, stable surface. If you do not plan to install the unit in an equipment rack, proceed to the "Installing the Chassis on a Tabletop" section on page 3-12.

Racks are marked in vertical increments of 1.75 inches (4.44 cm). Each increment is referred to as a rack unit (RU). A 1-RU device is 1.75 inches (4.44 cm) tall.

Warning   **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

- **This unit should be mounted at the bottom of the rack if it is the only unit in the rack.**

- **When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.**

- **If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.** Statement 1006

Installing the Chassis in a Two-Post Rack

The chassis mounts to two rack posts with brackets that attach to the sides of the chassis. These brackets are for a 19-inch (48.26-cm) equipment rack and require four screws in each bracket. (See Figure 3-1.)

Figure 3-1   Rack-Mount Brackets
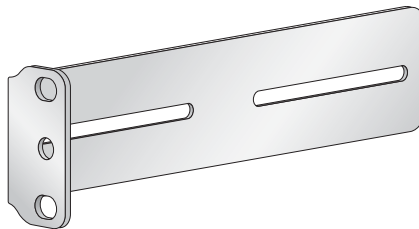
Orientation for 19-inch rack

124554

To install the chassis in a two-post rack, follow these steps:

Step 1   Attach a bracket to one side of the chassis, aligning the front flange of the bracket with the hash mark on the side of the chassis. (See Figure 3-2.)

*Figure 3-2   Installing the Chassis in the Rack*
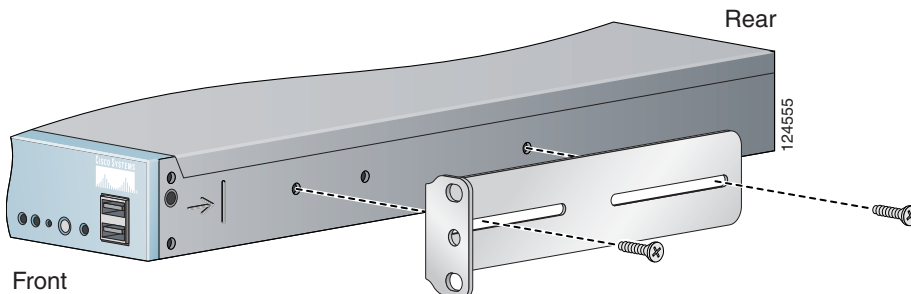
Step 2   Attach a second bracket to the opposite side of the chassis in the same manner.

Step 3   After you secure the brackets to the chassis, rack-mount the chassis by threading at least two screws through the bracket flanges on each side of the chassis into the corresponding holes in each side of the rack. You need two people to install the chassis in the rack—one person to hold the chassis and one person to secure it to the rack.

The inlet and exhaust ports for cooling air are located in the front and rear of the chassis, respectively; therefore, multiple chassis can be stacked with little or no vertical clearance.

Installing the Chassis in a Four-Post Rack

The four-post rack-mounting system does not require any tools for installation, unless you are shipping a device mounted in a rack. When you are shipping a device in a rack, you need a Phillips screwdriver. Figure 3-3 shows the items that you need to install the chassis in a four-post rack. If any items are missing or damaged, contact your place of purchase.

Figure 3-3   Rack-Mount Installation Kit
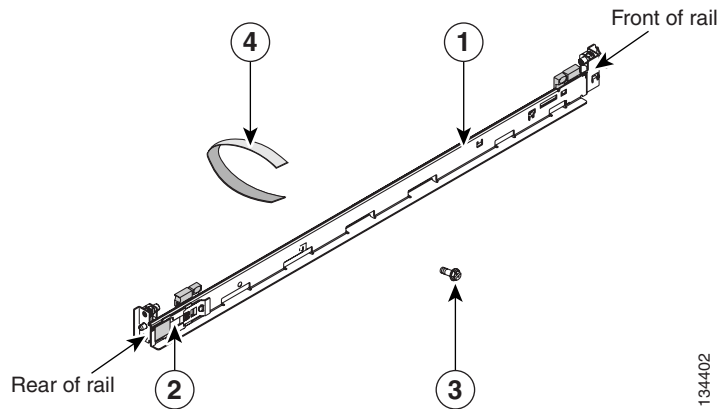
1	Slide rails (2)	2	Shipping bracket
3	M6 screws (6)	4	Cable straps (6)

These slide rails come with spring-loaded locking pins at both ends of each rail. To attach the slide rails to an equipment rack, you need to pull back the pin carriage, align the pins with holes in the equipment rack-mounting flange, and release the pin carriage to lock the pins into the rack posts. A rail-adjustment bracket allows you to adjust the length of the slide rails to fit the rack. (See Figure 3-4.)

The chassis rests on the lower ledges provided by the two rails and slides in and out of the rack along the rail ledges.

To install the chassis in a four-post rack, follow these steps:

Step 1   To begin, open the pin carriages at the front and rear of the left slide rail:

- On the front of the rail, press on tabs labeled (2) and (3) in Figure 3-4, and slide the pin carriage toward the rear of the rail, releasing the latch tab (2) as it catches in place.

• On the rear of the rail, press on the two rear tabs, and slide the pin carriage toward the front of the rail, releasing the latch tab as it catches in place. To prevent the rail-adjustment bracket (labeled 1 in Figure 3-4) from moving during this step, hold it in place with your thumb.

> **Note** Slide rails are marked (RIGHT/FRONT and LEFT/FRONT) for proper placement.

*Figure 3-4   Opening the Spring-Loaded Pin Carriages—Left Slide Rail Shown*
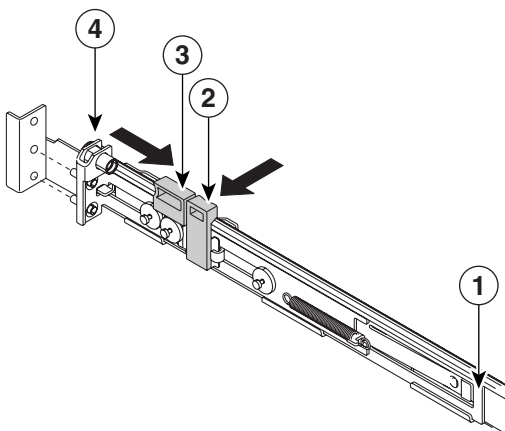
1	Rail-adjustment bracket	**2**	Latch tab
3	Slider tab	**4**	Pin carriage

Step 2   To adjust the length of the slide rail, lift the release tab (labeled 1 in Figure 3-5) and fully extend the rail-adjustment bracket from the rear of the slide rail until it snaps into place.

Step 3   To secure the slide rail to the equipment rack, align the pins on the rear of the slide rail with the holes on the rear mounting flange. Press the latch tab (labeled 2 in Figure 3-5) to release the pin carriage.

Note   Ensure that the pins are fully extended through the mounting flange and slide rail pin bracket. (See Figure 3-5.)

*Figure 3-5*   ***Attaching the Slide Rail to the Rear Mounting Flange—Left Front Rail Shown***

Pins extended through the mounting flange and slide rail pin bracket

Pins not extended through the mounting flange and slide rail pin bracket
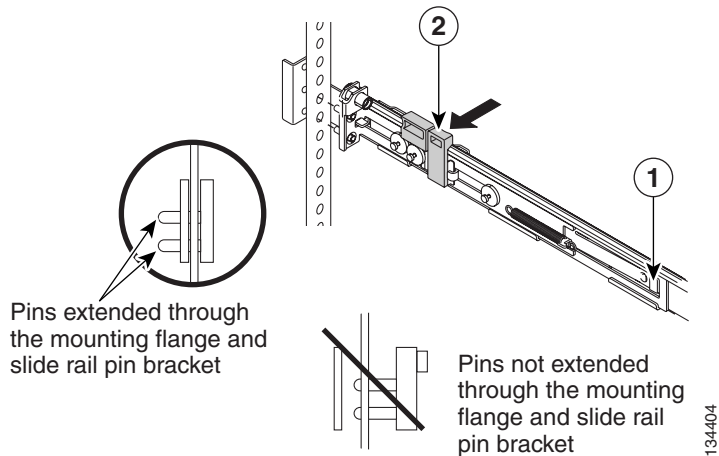
1	Release tab for the rail-adjustment bracket	**2**	Latch tab

Step 4   To secure the front of the slide rail to the equipment rack, align the pins (labeled 1 in Figure 3-6) on the front pin carriage to the front mounting flange. If you adjusted the rail length, push the pin carriage back toward the rear of the slide rail. Press the latch tab (labeled 2 in Figure 3-6) to release the front pin carriage.

Note   Ensure that the pins are fully extended through the mounting flange and the slide rail pin bracket (labeled 3 in Figure 3-6).

Figure 3-6   *Attaching the Slide Rail to the Front Mounting Flange—Left Front Rail Shown*

Pins extended through the mounting flange and slide rail pin bracket

Pins not extended through the mounting flange and slide rail pin bracket
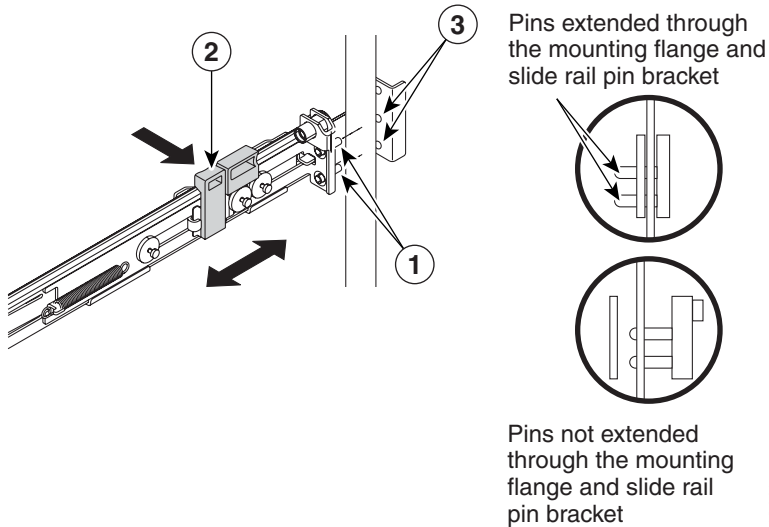
134405

1	Pins	2	Latch tab
3	Slide rail pin bracket		

Step 5   Repeat these steps for the right slide rail. Make sure that you attach the second slide rail at the same rack height as the first one so that the chassis will be level in the rack.

Step 6   To install the chassis in the rack, align the chassis on the slide rails and push the chassis fully into the rack. Secure the chassis to the front mounting flanges with the captive thumbscrews (labeled 1 in Figure 3-7).

> **Note**   You must leave the shipping brackets (labeled 2 in Figure 3-7) attached to the slide rails unless the shipping brackets impede the chassis from sliding fully into the rack. If you need to remove the shipping brackets, continue with Step 7.

Figure 3-7   Inserting the Chassis onto the Slide Rails
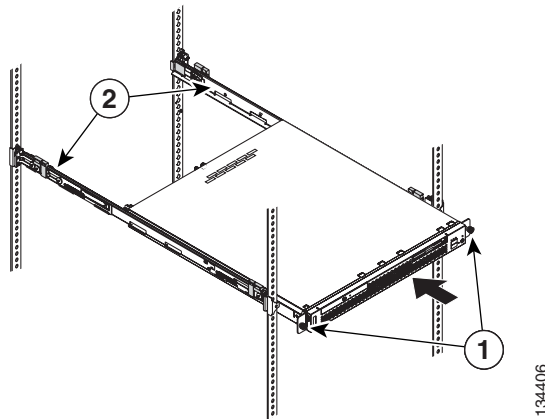
| **1** | Captive thumbscrews | **2** | Shipping brackets |

Step 7   To remove the shipping bracket, press on the release tab (labeled 1 in Figure 3-8) as indicated on the shipping bracket, and remove the shipping bracket from the slide rail. Repeat this step for the other shipping bracket. Store the shipping brackets for future use.

Note   You must reinstall the shipping brackets on the slide rails before you transport the rack with the chassis installed. To reinstall the shipping brackets, reverse this step.

Figure 3-8   Removing the Shipping Bracket
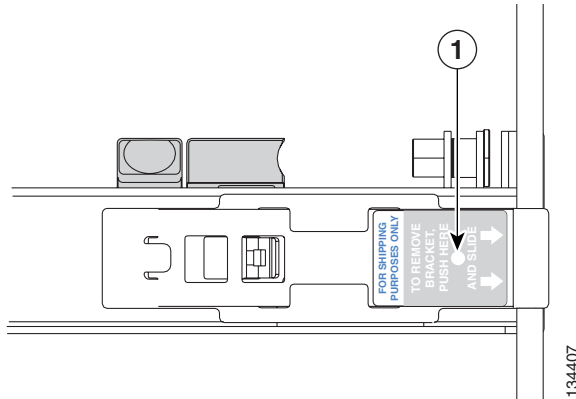
1	Release tab

Step 8   Attach the power cords and the Ethernet cables to the rear of the device. Route the cables to the left corner of the chassis (as viewed from the rear) and use the cable straps to secure the cables to the slide rails. (See Figure 3-9.)

Figure 3-9   Securing the Cables
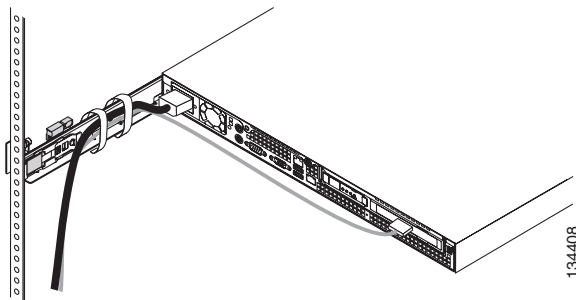
> **Note**   Leave enough slack in the cables to allow for sliding the device in or out of the rack.

Step 9   To transport the rack to another location with the chassis installed, you must secure the chassis to the rack.

  a. Remove one mounting screw and loosen the other mounting screws as indicated in Figure 3-10.

Figure 3-10   Securing the Chassis for Transporting in the Rack
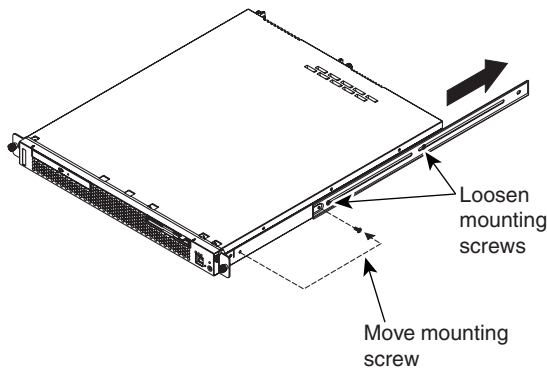
  b. If necessary, disconnect the cables from the rear of the chassis, then slide the chassis out of the rack six inches (150 mm).

  c. Fully extend the rail, and reinsert the M6 screws in each slide rail. To secure the rail, tighten all screws. The rails should be fully extended to the rear of the rack, and the shipping brackets should be installed.

  d. Secure the chassis to the rack with the M6 screws.

To remove the chassis from the rack, reverse these instructions. Store these installation instructions with your product documentation for future use.

> **Note**   The four-post rack-mounting system is designed for racks that do not have pre-threaded holes. If you are using an equipment rack with pre-threaded holes, the pins will not protrude through the rack. Instead, secure the slide rails to the rack by attaching screws through the slide rail pin brackets at both ends of each rail. (See Figure 3-11.)

Figure 3-11   Attaching the Slide Rails and Chassis Using M6 Screws
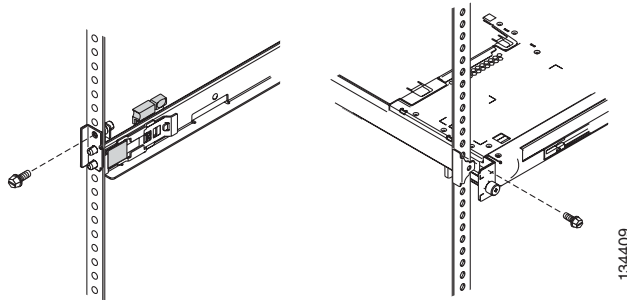
Installing the Chassis on a Tabletop

When you install a chassis on a workbench or tabletop, ensure that the surface is clean and in a safe location and that you have considered the following:

- The chassis should be installed off the floor. (Dust that accumulates on the floor is drawn into the interior of the chassis by the cooling fans. Excessive dust inside the device can cause overtemperature conditions and component failures.)

- There must be approximately 19 inches (48.26 cm) of clearance at the front and rear of the chassis for accessing network cables or equipment.

- The device must receive adequate ventilation (it cannot be installed in an enclosed cabinet where ventilation is inadequate).

To install the chassis on a workbench or tabletop, follow these steps:

Step 1   Remove any debris and dust from the tabletop or workbench, as well as from the surrounding area. Also make sure that your path between the device and its new location is unobstructed.

Step 2   Place the chassis on the tabletop or workbench.

Step 3   Ensure that no exhaust air from other equipment will be drawn into the chassis. Also, make sure that there is adequate clearance at the front and rear of the chassis.

Connecting Cables

To connect network and console cables to the device, follow these steps:

Step 1   For network connections, insert a Category 5 UTP cable into the Ethernet 1 or Ethernet 2 receptacle on the device back panel. (See Figure 3-12.)

Step 2   Connect the other end of the network cable to a hub or switch in your network.

> **Note**   We strongly recommend that you do not use half-duplex connections on the WAE or on routers, switches, or other devices.

Step 3   For console connections, plug the serial cable into the serial port on the device back panel.

Step 4   Connect the other end of the console cable to a console or a communications server.

Figure 3-12   WAE-512 and WAE-612 Back Panel Connectors and Receptacles

1	AC power receptacle	**2**	Mouse connector[1]
3	Keyboard connector[1]	**4**	Serial port
5	Monitor connector[1]	**6**	Ethernet 2 port connector
7	Ethernet 1 port connector	**8**	USB 1 port (not supported)
9	USB 2 port (not supported)		

1. Not required for normal operation. Can be used for troubleshooting purposes.

Note The system software does not support the use of a keyboard or mouse (PS/2 or USB). However, a keyboard and mouse are supported by the BIOS for power-on self-test (POST) and troubleshooting purposes.

Connecting Power and Booting the System

To connect power to the device, follow these steps:

Step 1   Review the information in the "Safety Warnings" section on page 2-1.

Step 2   Plug the AC power cord into the power cord receptacle at the rear of the device. (See Figure 3-12.)

Step 3   Connect the other end of the power cord to a power source at your installation site.

Step 4   Power up all externally connected devices.

Step 5   Press the power control button on the front of the device.

The system should begin booting. Once the operating system boots, you are ready to initialize the basic software configuration. (See the "Related Documentation" section on page xi for a list of software configuration documents.)

✎
Note   While the device is powering up, the power LED on the front of the chassis is green.

Checking the LEDs

When the device is up and running, observe the front panel LEDs. To verify that your system is operating properly, see the "LED Indicators" section on page 1-7.

Removing or Replacing a Cisco Wide Area Application Engine

⚠
Warning   **Before working on a chassis or working near power supplies, unplug the power cord on AC units.** Statement 246

⚠

Warning **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

To remove a device from your network, power it down, disconnect the power cords and network cables, and physically remove the chassis from the rack.

The device is in constant communication with the router on your network. When the router notices that the device is no longer responding to it, the router stops sending requests to the device. This is transparent to users. If other devices are attached to the router, the router continues sending requests to the other devices.

When you remove a device, the pages that were cached on that device are no longer available to the router or other devices, and you might see an increase in outgoing web traffic that might have otherwise been fulfilled by the device that you are removing. However, after a time, the router and other devices redistribute the load of web traffic.

If you remove the last device from your network, you can also disable device support on the router. However, this is not necessary; having device support enabled when there are no devices attached has no effect on the router's performance.

To replace a device, remove it from the network, and then install a new device. Configure it using the same configuration parameters (IP address, and so forth) that you used for the removed device.

Installing Hardware Options

This chapter provides basic instructions for installing hardware options in the Wide Area Application Engine (WAE). These instructions are intended for experienced technicians.

This chapter contains the following topics:

Removing the Cover and Bezel

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units.** Statement 246
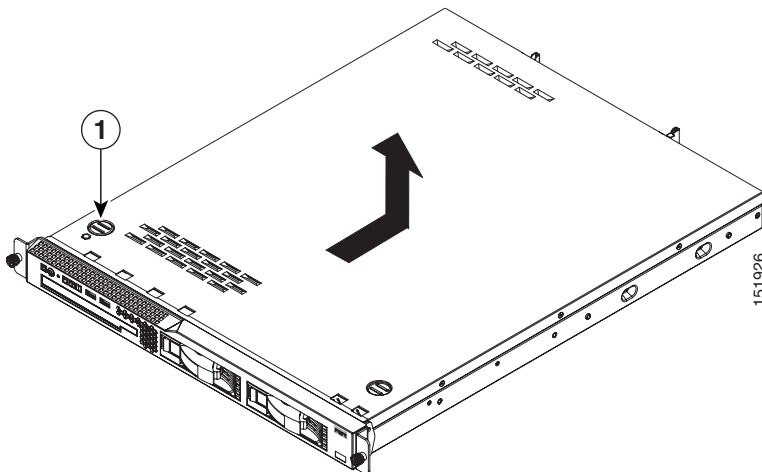
To remove the cover, follow these steps:

Step 1 Review the information in the "Safety Warnings" section on page 2-1, and the "Safety Guidelines" section on page 2-4.

Step 2 Power down the device and all attached devices. Disconnect the power cord and all external cables.

Step 3   Press the cover release button. (See Figure 4-1.)

Figure 4-1   Removing the Cover

1	Cover release button

Step 4   While holding the cover release button down with your thumb, lift the opposite front corner of chassis slightly with your other hand, and using your free thumb, slide the cover back approximately 0.5 inches (1.27 cm); then lift it up and off the device.

⚠

Caution   For proper cooling and airflow, replace the cover before turning on the device. Operating the device for extended periods (over 30 minutes) with the cover removed might damage device components.

Installing Adapters

This section provides general information about the system board, riser card, adapters, and PCI-X slot configuration specifications. Use these instructions to install any full-height three-quarter-length PCI-X adapter card.

Note The MPEG decoder adapter is supported in ACNS software only. The inline network adapter is supported in WAAS 4.0.7 and later software only.

Before you install adapters, review the following information:

- The adapter slots are on the riser card assembly. You must first remove the riser card assembly to access the adapter slots. (See Figure 4-2.)

- The device has two Peripheral Component Interconnect-Extended (PCI-X) adapter slots:

    - PCI-X slot 1 is for one full-height three-quarter-length adapter.

    - PCI-X slot 2 is for one low-profile half-length adapter; however, it is not used in this device.

- You must install supported adapters in PCI-X slot 1. (This slot is labeled "Slot 1" on the back of the device.)

- Documentation is included with the adapter. Follow the instructions in the adapter documentation in addition to the instructions in this chapter.

Caution When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see the "Protecting Against Electrostatic Discharge" section on page 2-6.

Note The illustrations in this document might differ slightly from your hardware.

To install an adapter, follow these steps:

Step 1 Review the safety information in the "Safety Guidelines" section on page 2-4.

Step 2 Power down the device and peripheral devices.

Step 3   Disconnect the power cord and then all external cables from the device.

Step 4   Remove the device cover.

Step 5   Grasp the riser card at the rear edge and lift to remove the riser card assembly. (See Figure 4-2.)

Figure 4-2   Removing the Riser Card Assembly
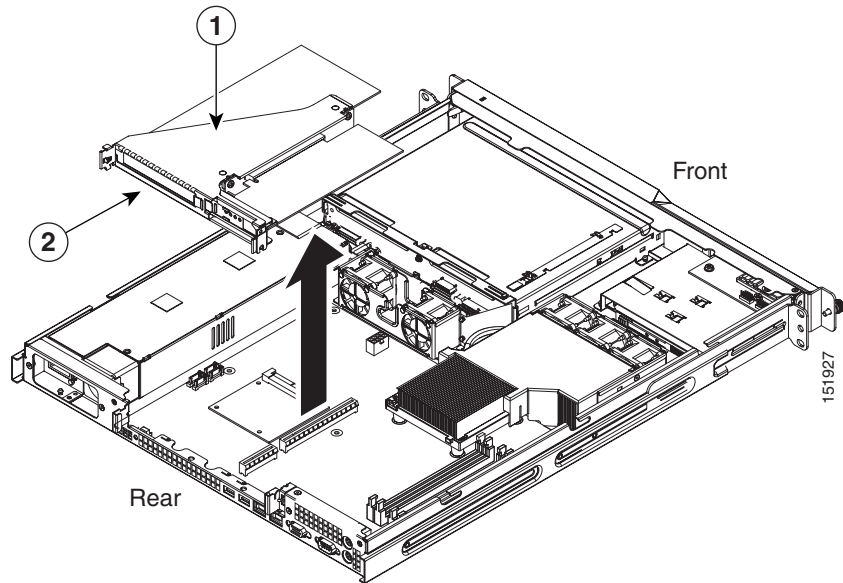
1	Riser card assembly	**2**	Rear edge of riser card

Step 6   Place the riser card assembly on a flat, static-protective surface.

Step 7   Remove the expansion slot cover for Slot 1. (See Figure 4-3.)

Note   PCI expansion slot covers must be installed on all vacant slots. This maintains the electronic emissions characteristics of the device and ensures proper cooling of device components.

Figure 4-3   Installing the Adapter in the Riser Card Assembly
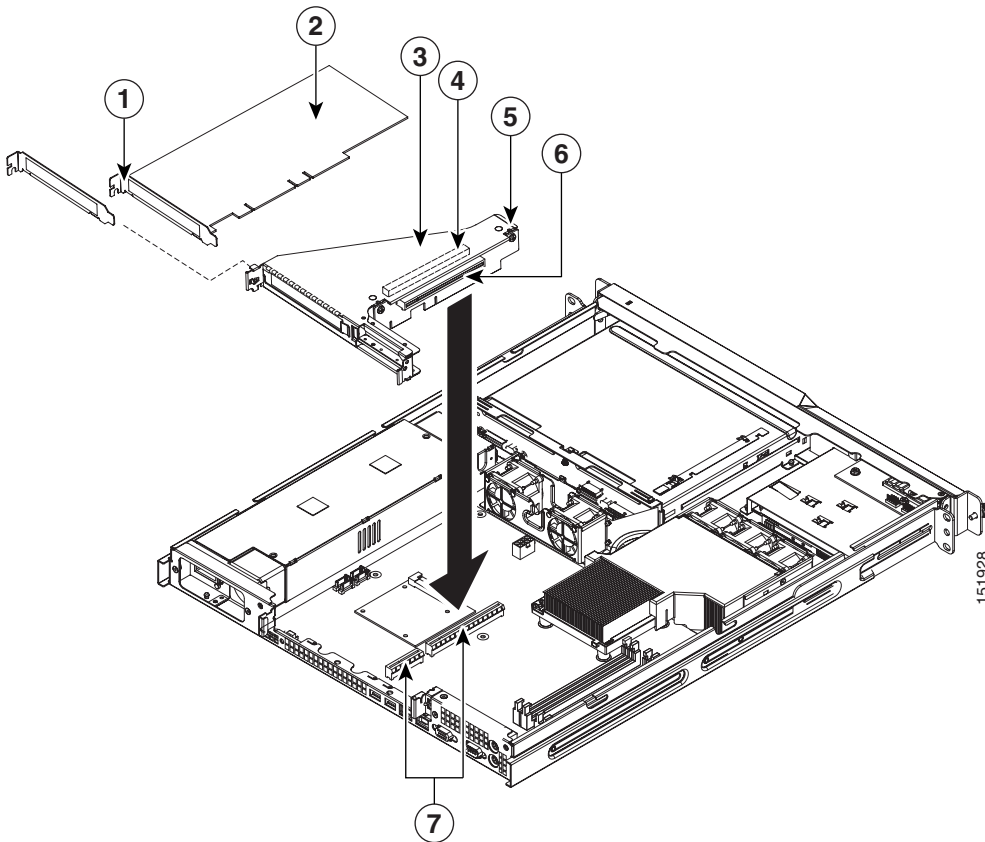
1	Expansion slot bracket	**2**	Adapter
3	Adapter support bracket	**4**	PCI-X expansion slot 1
5	Riser card assembly	**6**	PCI-X expanison slot 2 (not supported)
7	Riser card connectors		

Step 8   Touch the static-protective package that contains the adapter to any unpainted metal surface on the device, and then remove the adapter from the static-protective package. Avoid touching the components and gold-plated edge connectors on the adapter.

Step 9   Place the adapter, component-side up, on a flat, static-protective surface.

⚠

Caution   When you install an adapter in the device, be sure that it is completely and correctly seated in the PCI expansion slot before you power up the device. Incomplete insertion might cause damage to the system board or the adapter.

Step 10   To install the adapter, carefully grasp the adapter by its top edge or upper corners, align it with the expansion slot in the riser card assembly, and then press the adapter *firmly* into the expansion slot.

Step 11   Reinstall the riser card. Make sure that the riser card is fully seated in the riser card connectors on the system board.

Step 12   If you have other hardware options to install, do so now; otherwise, go to the "Completing the Installation" section on page 4-15.

Installing DIMMs

Adding memory to your device is an easy way to make your system software run faster. You can increase the amount of memory in your device by installing additional dual-inline memory modules (DIMMs).

When you install additional memory, note the following information:

- Review the memory specifications for your WAE model in the "Appliance Specifications" section on page A-1.

- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS displays the total amount of installed memory and the amount of configured memory.

- You must use DIMMs (MEM-WAE-1GB=) purchased from Cisco only.

- Memory modules are installed on the system board in the DIMM connectors shown in Figure 4-4. Devices with a single DIMM should have the module installed in DIMM connector 1. Install the next module in DIMM connector 3. The third and fourth DIMMs must be installed as a pair in DIMM connectors 2 and 4.

- When you install or remove DIMMs, the WAE appliance automatically detects the new DIMM configuration and no save in the BIOS is required.

Figure 4-4 shows the location of the system-board connectors for installing DIMMs.

Figure 4-4   *System Board DIMM Connectors*
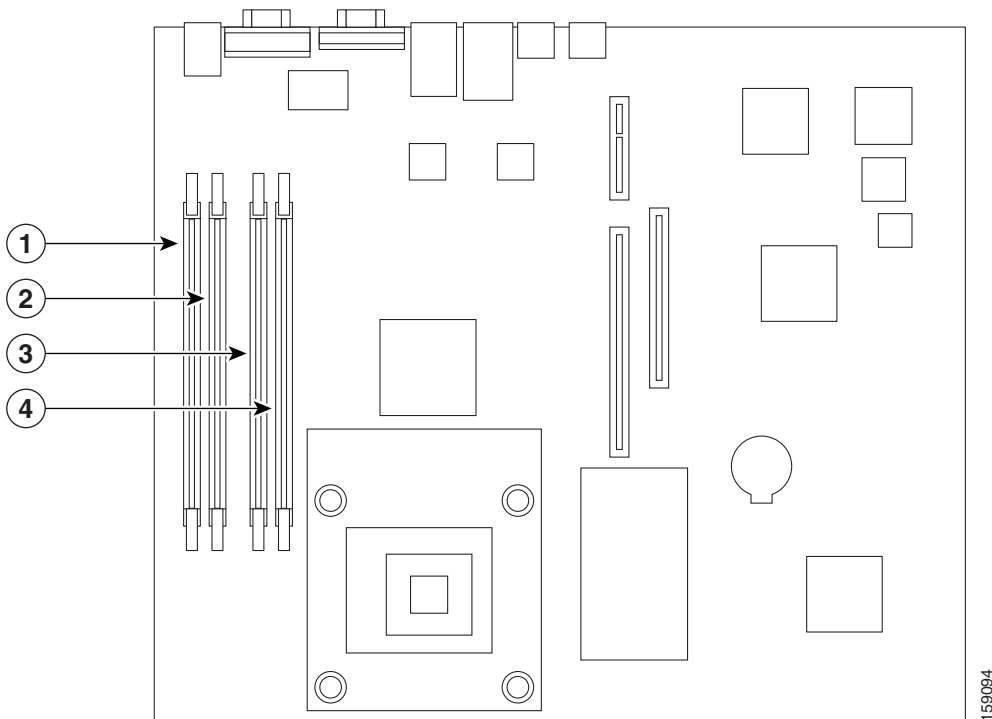
1	DIMM 1	**2**	DIMM 2
3	DIMM 3	**4**	DIMM 4

⚠️

Caution   When you handle static-sensitive devices, take precautions to avoid damage from static electricity.

To install a DIMM, follow these steps:

Step 1   Review the safety information in the "Safety Guidelines" section on page 2-4.

Step 2   Power off the device and peripheral devices. Disconnect the power cord, and then disconnect all external cables. Remove the cover. (See the "Removing the Cover and Bezel" section on page 4-1 for details.

Step 3   Touch the static-protective package that contains the DIMM to any unpainted metal surface on the device, and then remove the DIMM from the package.

Step 4   Install the DIMM:

    a.   Open the retaining clip on each end of the DIMM connector. Turn the DIMM so that the pins align correctly with the connector. (See Figure 4-5.)

Figure 4-5   Installing a DIMM
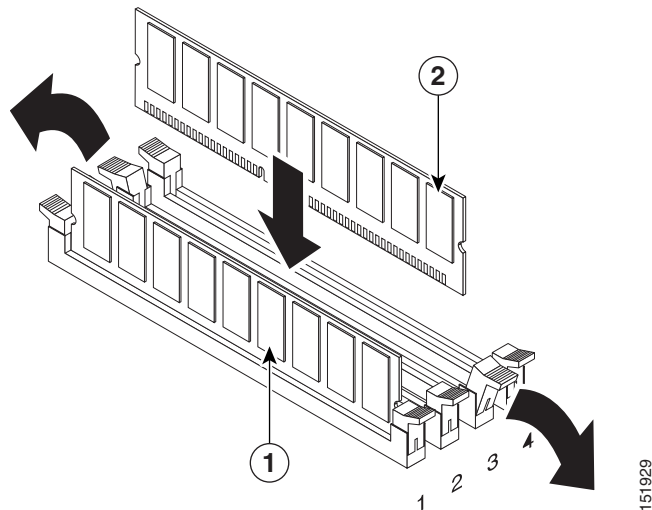
| **1** | DIMM 1 | **2** | DIMM 3 |

⚠

Caution   To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

  b. Insert the DIMM into the connector by aligning the DIMM edges with the slots at each end of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. Be sure that the retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

  c. If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM, and then reinsert the DIMM.

Step 5 If you have other options to install, do so now; otherwise, go to the "Completing the Installation" section on page 4-15.

Working with Hard Disk Drives

This section describes how to install a hard disk drive in the Wide Area Application Engine (WAE). The WAE-512 requires simple-swap Serial Advanced Technology Attachment II (SATA) hard disk drives, and the WAE-612 accepts Serial Attached SCSI (SAS) hard disk drives or hot-swap SATA hard disk drives.

Consider the following information when installing a hard disk drive:

- Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

- In the WAE-512 and WAE-612, disk00 belongs in the left drive bay and disk01 belongs in the right drive bay as seen when facing the drive bays.

- If you are installing a SAS hard disk drive, see the documentation that comes with the drive before installing it.

✎

Note To avoid damage to the hard disk drive connectors, make sure that the cover is in place and fully closed whenever you install or remove a hard disk drive.

- All hard disk drives being used in the WAE should have the same throughput speed rating. Mixing hard disk drives with different speed ratings will cause all hard disk drives to operate at the lower throughput speed.

⚠

Caution   To maintain proper system cooling, do not operate the device for more than 10 minutes without either a hard disk drive or a filler panel installed in each bay.

Installing SATA Hard Disk Drives

✎

Note   The WAE-512 supports simple-swap SATA hard disk drives. Simple-swap hard disk drives are not hot-swappable. Disconnect all power from the server before removing or installing a simple-swap hard disk drive.

✎

Note   The WAE-612 hardware supports hot-swappable SATA hard disk drives; however, you must be running WAAS 4.0.13 or a later version to obtain the software support for hot-swapping. If you are running a WAAS version prior to 4.0.13, we recommend that you power down your WAE-612 when swapping or installing new hard disk drives.

To install an SATA hard disk drive in a bay, follow these steps:

Step 1   Inspect the new drive for any signs of damage.

Step 2   Review the information in the "Safety Warnings" section on page 2-1, and the "Safety Guidelines" section on page 2-4.

Step 3   Make sure that the chassis cover is in place and fully closed.

Step 4   Power down the device and peripheral devices, and disconnect the power cord and all external cables.

Step 5   If the drive bay contains a filler panel, remove it.

Step 6   To install the hard disk drive, pull the loops of the drive tray toward each other and slide the drive into the bay until the drive connects to the backplane.

Step 7   Insert the filler panel into the bay to cover the drive. (See Figure 4-6.)

Note   Figure 4-6 shows that disk00 is being inserted into the left drive bay in the WAE-512.

Step 8   If you have other options to install, do so now; otherwise, go to the "Completing the Installation" section on page 4-15.

Figure 4-6   Installing an SATA Hard Disk in the WAE-512—Disk00 is Shown
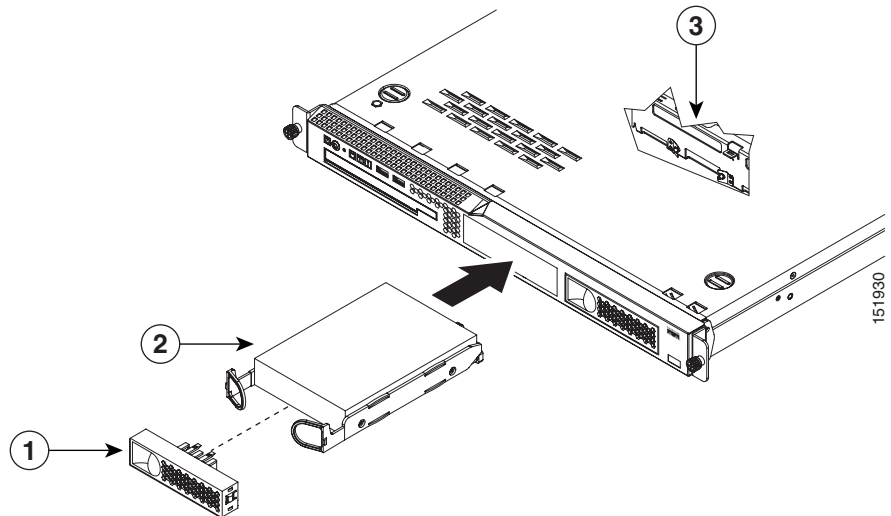
1	Filler panel	**2**	SATA hard disk drive
3	SATA hard disk drive backplane		

Installing an SAS Hard Disk Drive

> **Note** The WAE-612 hardware supports hot-swappable SAS hard disk drives; however, you must be running WAAS 4.0.13 or a later version to obtain the software support for hot-swapping. If you are running a WAAS version prior to 4.0.13, we recommend that you power down your WAE-612 when swapping or installing new hard disk drives.

To install an SAS hard disk drive in the WAE-612, follow these steps:

Step 1 Inspect the new drive for any signs of damage.

Step 2 Review the information in the "Safety Warnings" section on page 2-1, and the "Safety Guidelines" section on page 2-4.

Step 3 Make sure that the chassis cover is in place and fully closed.

Step 4 Open the drive tray handle.

Step 5 Gently push the drive assembly into the bay until the drive stops. (See Figure 4-7.)

> **Note** If you are replacing disk00 in a WAE-612, you must install it in the left drive bay.

Figure 4-7   Installing a SAS Hard Disk in the WAE-612—Disk01 is Shown
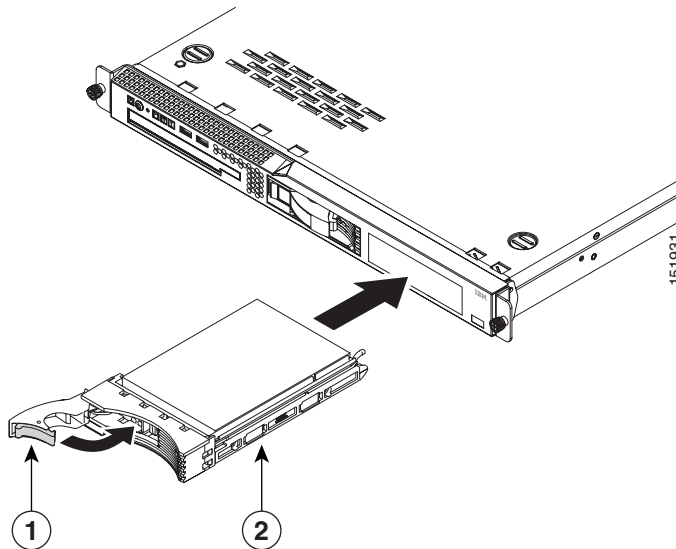
1	Drive handle (in open position)	**2**	SAS drive and tray assembly

Step 6   Close the drive tray handle.

Step 7   Reload the appliance.

Step 8   Check the hard disk drive status LED to make sure that the hard disk drive is operating correctly. If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and needs to be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

Completing the Installation

⚠️

Caution   To maintain proper cooling and airflow, install the cover before turning on the device. Operating the device for extended periods (over 30 minutes) with the cover removed might damage device components.

To complete the installation, follow these steps:

Step 1   Install the cover by placing it into position and sliding it forward. (See Figure 4-8.)

Figure 4-8   Installing the Cover

⚠️
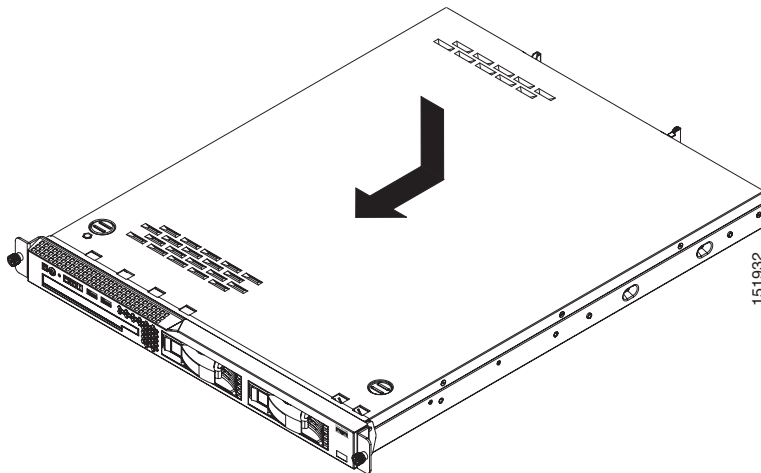
Caution   Before sliding the cover forward, make sure that the cover will properly engage the ledge at the front of the device.

Step 2   Install the device in the rack. See the "Installing the Cisco Wide Area Application Engine" section on page 3-2 for instructions.

Step 3   Connect all external cables and the power cord to the device, and then plug the power cord into a properly grounded electrical outlet.

A P P E N D I X **A**

Technical Specifications

This appendix describes the WAE models listed here:

Model	Product Number
Wide Area Application Engine 512	WAE-512-K9
Wide Area Application Engine 612	WAE-612-K9

This appendix contains the following sections:

- Appliance Specifications, page A-1
- Adapter Specifications, page A-4

Appliance Specifications

Note Your system software might not support all of the WAE-supported hardware features.

Table A-1 summarizes the features and specifications for the WAE-512 and WAE-612.

Table A-1   Appliance Features and Specifications

Specification	Description
Microprocessor	• WAE-512—One Intel Pentium 4, 3.0-GHz processor 531, 800-MHz FSB[1], 1-MB level-2 cache • WAE-612—One Intel Pentium D Smithfield 3.0 GHz, Dual Core, 800-MHz FSB, 2-MB level-2 cache
Memory	• WAE-512—One, two, or four 1-GB RoHS compliant SDRAM RDIMMs The system comes with one 1-GB RDIMM. You have the option to add one or three additional 1-GB memory modules. • WAE-612—Two or four 1-GB RoHS compliant SDRAM RDIMMs The system comes with two 1-GB RDIMMs. You have the option to add two additional 1-GB memory modules.
Expansion bays	Two 3.5-in. (8.89-cm) slim-height bays for hard disk drives
Expansion slots	Two 64-bit, 100 MHz PCI-X half-length slots (1 low profile, 1 full profile)
Hard disk controllers	• WAE-512—Serial ATA (SATA) controller with integrated RAID (simple swap) • WAE-612—Serial-attached SCSI (SAS) controller with integrated RAID (hot swap)
Hard disk drives	• WAE-512—One or two 80-GB or 250-GB simple-swap serial advanced technology attachment (SATA) hard disk drives. Drive-type mixing is not allowed. • WAE-612—Two 146-GB or 300-GB serial attached SCSI (SAS). Drive-type mixing is not allowed.
Adapters	• 1-port Fibre Channel adapter • 1-port MPEG A/V decoder adapter • 4-port Ethernet inline network adapter **Note** The WAE-512 and WAE-612 support full-height three-quarter-length adapter cards in PCI slot 1.
Power supply	1 AC-input

Table A-1   Appliance Features and Specifications (continued)

Specification	Description
Dimensions	• Height: 1.75 in., 1 RU (43 mm) • Depth: 22 in. (559 mm) • Width: 17.32 in. (440 mm)
Weight	Maximum weight: 28 lb (12.7 kg) depending on your configuration

Electrical input	• Sine-wave input (47–63 Hz) required
	• Input voltage low range:
	  – Minimum: 100 VAC
	  – Maximum: 127 VAC
	• Input voltage high range:
	  – Minimum: 200 VAC
	  – Maximum: 240 VAC
	• Input kilovolt-amperes (kVA), approximately:
	  – Minimum: 0.102 kVA
	  – Maximum: 0.55 kVA

Ports Supported	• Two 1000BASE-TX, 100BASE-TX, 10BASE-T (dual) Ethernet ports
	• Serial port
	• Audio/video ports (on optional adapter):
	  – 3 BNC connectors
	  – 2 mini-XLR connectors

Temperature	• Operating: 50° to 95° F (10° to 35° C) • Nonoperating: –104° to 140° F (–40° to +60° C)
Heat Dissipation	• Minimum configuration: 307 Btu^2/hr (90 Watts) • Maximum configuration: 850 Btu/hr (250 Watts)
Humidity	• Operating: 8 to 80% • Nonoperating: 8 to 80%

Table A-1   Appliance Features and Specifications (continued)

Specification	Description
Altitude	Maximum altitude: 6500 ft (2000 m)
Acoustical noise emissions	• Sound power, idling: 6.5 bel maximum • Sound power, operating: 6.5 bel maximum

1.   FSB = front side bus

2.   Btu = British thermal unit

Adapter Specifications

Table A-2 describes the Fibre Channel adapter specifications.

Table A-2   Fibre Channel Adapter Specifications

Fibre Channel adapter	• Bus type: Fiber-optic media (shortwave 50-micron) • Bus transfer rate: 2 gigabits per second (Gbps) maximum at half duplex and 4 Gbps at full duplex • Protocols: Supports FCP[1]-SCSI protocol

1.   FCP = Fibre Channel Protocol

Table A-3 describes the MPEG A/V decoder adapter specifications.

Table A-3   MPEG A/V Decoder Adapter Specifications

MPEG A/V decoder adapter	Video specifications
	• S/N:[1] 10 kHz to 4.2 MHz; Y: 65 dB rms[2]; Pb: 70 dB rms; Pr: 70 dB rms
	• Frequency response: 0 to 4.0 MHz ± 2 dB
	• Sync tip: 40 IRE[3] ± 4
	• Luma nonlinearity: 5%
	• Audio specifications
	• S/PDIF[4]
	– PCM[5] or compressed audio coding 3 (AC-3) bitstream out
	– 75-ohm, 0.5-V p-p[6] ± 20%
	– Rise and fall time: > 0.4 microseconds measured from 10 to 90%
	• Analog
	– Jumper-selectable balanced or unbalanced audio (balanced = +4 dBm)
	– Frequency response: 20 Hz to 22 kHz ± 0.5 dB
	– Reference level: 0.5-V p-p ± 10%
	– THD[7]+n:@20 Hz to 22 kHz < 0.5%

1. S/N = signal-to-noise ratio

2. rms = root mean square

3. IRE = Institute of Radio Engineers

4. S/PDIF = Sony/Philips Digital Interface

5. PCM = pulse-coded modulation

6. p-p = peak to peak

7. THD = total harmonic distortion

Table A-4 describes the inline network adapter technical and general specifications.

Note   The minimum software release required for the inline network adapter is WAAS 4.0.7.

Table A-4   *Inline Network Adapter Specifications*

Specification	Description
Copper Gigabit Ethernet Specifications	
IEEE standard	Gigabit Ethernet, 1000BASE-T
	Fast Ethernet, 100BASE-T
	Ethernet, 10BASE-T
Full duplex and half duplex	Supports both half-duplex and full-duplex operation in all operating speeds
Autonegotiation	Autonegotiates between full-duplex and half-duplex operations and between 1000-Mbps, 100-Mbps, and 10-Mbps speeds
Data transfer rate	1000-Mbps, 100-Mbps, and 10-Mbps speeds per port in half-duplex mode
	2000-Mbps, 200-Mbps, and 20-Mbps speeds per port in full-duplex mode
General Technical Specifications	
Interface standard	PCI v2.2 32/64 bit, 33/66 MHz
	PCI-X v1.0 32/64 bit, 66/100/133 MHz
Size	6.6 in. x 4.2 in. (167.64 mm x 106.68 mm)
PCI connector	Universal 64-bit connector
PCI voltage	+12V (minimum 11.4V, maximum 12.6V)
	+3.3V (minimum 3.0V, maximum 3.6V)
Weight	6.18 oz (175 grams)
Operating humidity	0 to 90 percent, noncondensing
Operating temperature	32° to –122° F (0° to 50° C)
Storage temperature	–4° to –149° F (–20° to –65° C)

Troubleshooting the System Hardware

If your system is not working as expected, begin troubleshooting using the procedures in this appendix. This appendix guides you through some initial checks and procedures that can solve basic system problems.

This appendix contains the following sections:

- Checking the Basics, page B-1
- Checking Connections and Switches, page B-2

Checking the Basics

To solve some basic system problems, follow these steps:

Step 1   Was an alert message issued by the system software?

Yes. Check the component named in the alert message.

No. Go to Step 2.

Step 2   Visually inspect the chassis. Is the system wet or damaged?

Yes. Liquid spills, splashes, and excessive humidity can cause damage to the system. If an external device such as an external drive gets wet, contact your service representative for instructions. (See the "Obtaining Technical Assistance" section on page xvi.)

If the chassis was dropped or damaged while being moved, you should check the system to see if it functions properly. If an external device attached to the system is dropped or damaged, contact your service representative for instructions. (See the "Obtaining Technical Assistance" section on page xvi.)

No. Go to Step 3.

Step 3   Perform the steps in the "Checking Connections and Switches" section on page B-2.

Is the problem resolved?

Yes. The power to the system was faulty, or the connections to the system were loose. You have fixed the problem.

No. Go to Step 4.

Step 4   Verify the settings in the system setup program. For details, refer to the software configuration guide or user guide that corresponds to the version of software you are running on your system.(See the "Related Documentation" section on page xi.)

Did the system complete the boot routine?

Yes. The system configuration information was incorrect. You have fixed the problem.

No. Call your service representative. (See the "Obtaining Technical Assistance" section on page xvi.)

Checking Connections and Switches

Improperly set switches and controls and loose or improperly connected cables are the most likely source of problems for the chassis or other external equipment. A quick check of all the switches, controls, and cable connections can easily solve these problems. (See Figure 1-5 for the location of front panel controls and indicators. See Figure 1-6 for the location of back panel connections on the system.)

To check all the connections and switches, follow these steps:

Step 1   Power down the system, including any attached peripherals such as external drives. Disconnect all the power cables from their electrical outlets.

Step 2   If the system is connected to a power strip (or power distribution unit), turn the power strip off and then on again.

Is the power strip receiving power?

Yes. Go to Step 5.

No. Go to Step 3.

Step 3   Plug the power strip into another electrical outlet.

Is the power strip receiving power?

Yes. The original electrical outlet probably does not function. Use a different electrical outlet.

No. Go to Step 4.

Step 4   Plug a system that you know works into the electrical outlet.

Does the system receive power?

Yes. The power strip is probably not functioning properly. Use another power strip.

No. Go to Step 5.

Step 5   Reconnect the system to the electrical outlet or power strip.

Make sure that all connections fit tightly together.

Step 6   Power up the system.

Is the problem resolved?

Yes. The connections were loose. You have fixed the problem.

No. Call your service representative. (See the "Obtaining Technical Assistance" section on page xvi.)

Maintaining the Cisco Wide Area Application Engine

Proper use of preventive maintenance procedures can keep your system in good operating condition and minimize the need for costly, time-consuming service procedures. This appendix contains maintenance procedures that you should perform regularly.

This appendix covers the following maintenance tasks:

Maintaining Your Site Environment

An exhaust fan in the power supply cools the power supply and system by drawing air in through various openings in the system and blowing it out the back. However, the fan also draws dust and other particles into the system, causing contaminant buildup, which results in an increase in the system's internal temperature and interferes with the operation of various system components.

To avoid these conditions, we recommend keeping your work environment clean to reduce the amount of dust and dirt around the system, thereby reducing the amount of contaminants drawn into the system by the power supply fan.

This section discusses various environmental factors that can adversely affect system performance and longevity.

Temperature

Temperature extremes can cause a variety of problems, including premature aging and failure of chips or mechanical failure of devices. Extreme temperature fluctuations can cause chips to become loose in their sockets and can cause expansion and contraction of disk drive platters, resulting in read or write data errors.

To minimize the negative effects of temperature on system performance, follow these guidelines:

- Ensure that the system is operated in an environment no colder than 50°F (10°C) or hotter than 95°F (35°C).

- Ensure that the system has adequate ventilation. Do not place it within a closed-in wall unit or on top of cloth, which can act as insulation. Do not place it where it will receive direct sunlight, particularly in the afternoon. Do not place it next to a heat source of any kind, including heating vents during winter.

Adequate ventilation is particularly important at high altitudes. System performance may not be optimum when the system is operating at high temperatures as well as high altitudes.

- Make sure that all slots and openings on the system remain unobstructed, especially the fan vent on the back of the system.

- Clean the system at regular intervals to avoid any buildup of dust and debris, which can cause a system to overheat.

- If the system has been exposed to abnormally cold temperatures, allow a 2-hour warm-up period to bring it up to normal operating temperature before turning it on. Failure to do so may cause damage to internal components, particularly the hard disk drive.

- If intermittent system failures are noticed, try reseating any socketed chips, which might have become loose because of temperature fluctuations.

Humidity

High-humidity conditions can cause moisture migration and penetration into the system. This moisture can cause corrosion of internal components and degradation of properties such as electrical resistance and thermal conductivity. Extreme moisture buildup inside the system can result in electrical shorts, which can cause serious damage to the system.

Each system is rated to operate at 8 to 80 percent relative humidity, with a humidity gradation of 10 percent per hour. Buildings in which climate is controlled by air conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for system equipment. However, if a system is located in an unusually humid location, a dehumidifier can be used to maintain the humidity within an acceptable range.

Altitude

Operating a system at high altitude (low pressure) reduces the efficiency of forced and convection cooling and can result in electrical problems related to arcing and corona effects. This condition can also cause sealed components with internal pressure, such as electrolytic capacitors, to fail or perform at reduced efficiency.

Each system is rated to operate at a maximum altitude of 6998 feet (2133 meters) and can be stored at a maximum altitude of 15,000 feet (4570 meters).

Dust and Particles

A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the operation of a system's mechanical components. In addition to regular cleaning, you should follow these guidelines to deter contamination of the system equipment:

- Do not permit smoking anywhere near the system.
- Do not permit food or drink near the system.
- Use dust covers when the system is not in use.
- Close windows and outside doors to keep out airborne particles.

Corrosion

The oil from a person's fingers or prolonged exposure to high temperature or humidity can corrode the gold-plated edge connectors and pin connectors on various devices in the system. This corrosion on system connectors is a gradual process that can eventually lead to intermittent failures of electrical circuits.

To prevent corrosion, you should avoid touching contacts on boards and cards. Protecting the system from corrosive elements is especially important in moist and salty environments, which tend to promote corrosion. Also, as a further deterrent to corrosion, the system should not be used in extreme temperatures, as explained in the "Temperature" section on page C-2.

Electrostatic Discharge

Electrostatic discharge (ESD) results from the buildup of static electricity on the human body and certain other objects. This static electricity is often produced by simple movements such as walking across a carpet. ESD is a discharge of a static electrical charge that occurs when a person whose body contains such a charge touches a component in the system. This static discharge can cause components, especially chips, to fail. ESD is a problem particularly in dry environments where the relative humidity is below 50 percent.

To reduce the effects of ESD, you should observe the following guidelines:

- Wear a grounding wrist strap. If a grounding wrist strap is unavailable, touch an unpainted metal surface on the chassis periodically to neutralize any static charge.

- Keep components in their antistatic packaging until they are installed.

- Avoid wearing clothing made of wool or synthetic materials.

Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from a system can adversely affect devices such as radio and television (TV) receivers operating near the system. Radio frequencies emanating from a system can also

interfere with cordless and low-power telephones. Conversely, RFI from high-power telephones can cause spurious characters to appear on the system's monitor screen.

RFI is defined as any EMI with a frequency above 10 kilohertz (kHz). This type of interference can travel from the system to other devices through the power cable and power source or through the air like transmitted radio waves. The Federal Communications Commission (FCC) publishes specific regulations to limit the amount of EMI and RFI emitted by computing equipment. Each system meets these FCC regulations.

To reduce the possibility of EMI and RFI, follow these guidelines:

- Operate the system only with the system cover installed.

- Ensure that the screws on all peripheral cable connectors are securely fastened to their corresponding connectors on the back of the system.

- Always use shielded cables with metal connector shells for attaching peripherals to the system.

Magnetism

Because they store data magnetically, hard disk drives are extremely susceptible to the effects of magnetism. Hard disk drives should never be stored near magnetic sources such as the following:

- Monitors

- TV sets

- Printers

- Telephones with real bells

- Fluorescent lights

Power Source Interruptions

Systems are especially sensitive to variations in voltage supplied by the AC power source. Overvoltage, undervoltage, and transients (or spikes) can erase data from memory or even cause components to fail. To protect against these types of problems, power cables should always be properly grounded and one or both of the following methods should be used:

- Use one of the power protection devices described in the "Using Power Protection Devices" section on page C-7.

- Place the system on a dedicated power circuit (rather than sharing a circuit with other heavy electrical equipment). In general, do not allow the system to share a circuit with any of the following:

  - Copier machines

  - Air conditioners

  - Vacuum cleaners

  - Space heaters

  - Power tools

  - Teletype machines

  - Adding machines

  - Laser printers

  - Facsimile machines

  - Any other motorized equipment

Besides these appliances, the greatest threats to a system's supply of power are surges or blackouts caused by electrical storms. Whenever possible, turn off the system and any peripherals and unplug them from their power sources during thunderstorms.

If a blackout occurs—even a temporary one—while the system is turned on, turn off the system immediately and disconnect it from the electrical outlet. Leaving the system on may cause problems when the power is restored; all other appliances left on in the area can create large voltage spikes that can damage the system.

Using Power Protection Devices

A number of devices are available that protect against power problems such as power surges, transients, and power failures. The following sections describe some of these devices.

Surge Protectors

Surge protectors are available in a variety of types and usually provide a level of protection commensurate with the cost of the device. Surge protectors prevent voltage spikes, such as those caused during an electrical storm, from entering a system through the electrical outlet. Surge protectors, however, do not offer protection against brownouts, which occur when the voltage drops more than 20 percent below the normal AC line voltage level.

Line Conditioners

Line conditioners go beyond the overvoltage protection of surge protectors. Line conditioners keep a system's AC power source voltage at a fairly constant level and therefore can handle brownouts. Because of this added protection, line conditioners cost more than surge protectors—up to several hundred dollars. However, these devices cannot protect against a complete loss of power.

Uninterruptible Power Supplies

Uninterruptible power supply (UPS) systems offer the most complete protection against variations in power because they use battery power to keep the system running when AC power is lost. The battery is charged by the AC power while it is available, so once AC power is lost, the battery can provide power to the system for a limited amount of time—from 15 minutes to an hour or so—depending on the UPS system.

UPS systems range in price from a few hundred dollars to several thousand dollars, with the more expensive units allowing you to run larger systems for a longer period of time when AC power is lost. Surge protectors should be used with all UPS systems, and the UPS system should be Underwriters Laboratories (UL) safety-approved.

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