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Cisco Wide Area Application Engine 7326 Hardware Installation Guide

January 2007

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• Turn the television or radio antenna until the interference stops.

• Move the equipment to one side or the other of the television or radio.

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• Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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C O N T E N T S

Preface

This preface describes the purpose of the *Cisco Wide Area Application Engine 7326 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 Wide Area Application Engine (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 xv.)

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.

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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 and provides a functional overview of the Cisco Wide Area Application Engine 7326.
Chapter 2	Preparing to Install the 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 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 install adapters and hard disk drives.
Chapter 5	Troubleshooting the System Hardware	Describes troubleshooting procedures for the hardware installation.
Appendix A	Wide Area Application Engine 7326 Hardware Specifications	Gives a summary of the hardware features and specifications.
Appendix B	Maintaining the Wide Area Application Engine	Details procedures for maintaining the Wide Area Application Engine in good working condition.
Appendix C	Using the Configuration/Setup Utility Program	Gives the procedure for using the Configuration/Setup Utility.

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.

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⚠ **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*

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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).

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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

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- 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

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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.htm

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

Obtaining Technical Assistance

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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

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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:

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- *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

Introducing the Cisco Wide Area Application Engine

This chapter provides a basic functional overview of the Cisco Wide Area Application Engine 7326 (WAE-7326), and describes the hardware, major components, and front and back panel indicators and controls.

This chapter contains the following sections:

- Introduction, page 1-1
- Software Functional Description, page 1-4
- Hardware Features, page 1-6

Introduction

The Wide Area Application Engine (WAE-7326) supports 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-7326 appliance:

- WAAS 4.0.1 and later
- WAFS 3.0 and later
- ACNS 5.3.3 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. (See Figure 1-1.)

Figure 1-1   Wide Area Application Engine 7326—Front View
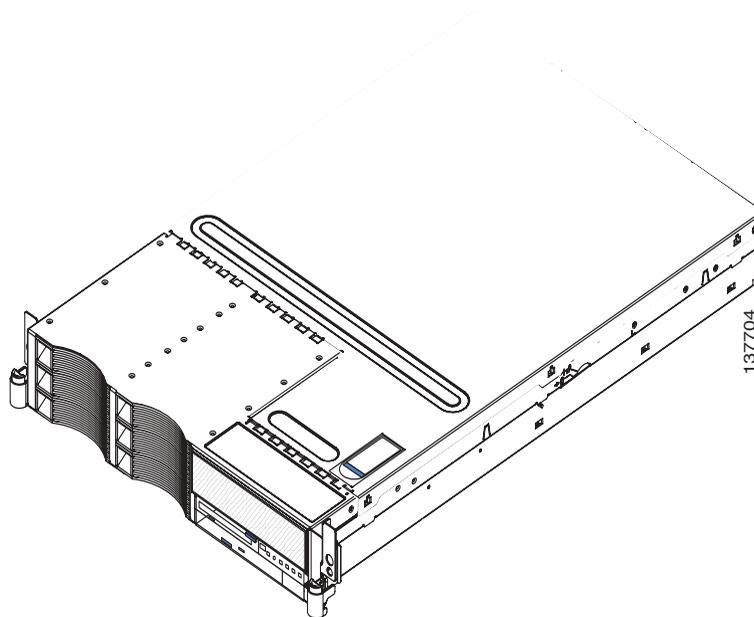
The WAE-7326 has a baseboard management controller that provides environmental monitoring for the appliance. If environmental conditions exceed thresholds or if system components fail, LEDs on the baseboard management indicate the problem. The error log also lists all critical errors. The baseboard management controller also provides remote server management capabilities through the OSA SMBridge management utility program.

Note   The baseboard management controller is also known as the service processor.

The WAE-7326 includes two integrated Broadcom Gigabit Ethernet controllers, which support connection to a 10-Mbps, 100-Mbps, or 1000-Mbps network.

The WAE includes large data-storage and hot-swap capability. The WAE-7326 supports up to six 25.4 mm (1-inch) slim, 3.5-inch hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays in the hot-swap bays. With the hot-swap feature, you can add, remove, or replace hard disk drives without powering down the appliance.

Note   The WAE-7326 hardware supports installing (hot-swapping) hard disk drives without powering off the device. However, Cisco software applications that run on the WAE-7326 appliance do not support hot-swapping. You must reload the WAE appliance before the software recognizes the new hard disk drives.

The Active Memory feature of your WAE-7326 improves the reliability of memory through memory mirroring and online spare memory. Memory mirroring stores data in two pairs of DIMMs simultaneously. Online spare memory disables a failed pair of DIMMs from the system configuration and activates a pair of online spare memory DIMMs.

Your WAE also includes a large system-memory capacity. The memory bus supports up to 16 GB of system memory. The memory controller supports error correcting code (ECC) for up to eight industry-standard, 1.8 V, 240-pin, double-data rate (DDR) II, PC3200, registered SDRAM DIMMs.

The addition of an optional network interface card (NIC) in the WAE-7326 provides a failover capability to a redundant Ethernet connection. If a problem occurs with the primary Ethernet connection, all Ethernet traffic associated with this primary connection is automatically switched to the redundant Ethernet connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.

The WAE-7326 supports up to two Intel Xeon microprocessors. If the appliance comes with only one microprocessor, you can install an additional microprocessor to enhance performance and provide symmetric multiprocessing (SMP) capability.

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-7326 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.

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-7326. It contains the following topics:

- Front Panel Control Buttons, page 1-7

- LED Indicators, page 1-7

- Input/Output Ports and Connectors, page 1-11

- Inline Network Adapter Description, page 1-16

Figure 1-2 shows the WAE-7326 front panel controls and LEDs.

Figure 1-2   *Wide Area Application Engine 7326 Front Panel*
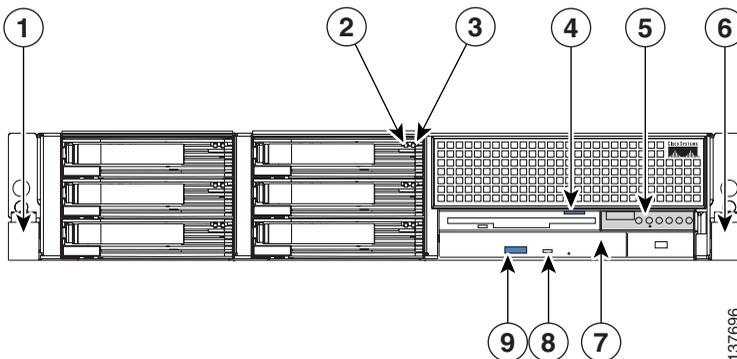
1	Rack release latch	**6**	Release latch
2	Hard disk drive activity LED	**7**	Disk drive activity LED
3	Hard disk drive status LED	**8**	DVD-ROM drive activity LED
4	Operator information panel	**9**	DVD-ROM drive eject button
5	Disk eject button		

Front Panel Control Buttons

Table 1-1 describes the front panel control buttons.

Table 1-1   Front Panel Control Buttons

Item		**Description**
4	Power control button (Operator information panel)	Powers up and powers down the system. A power control button shield comes installed on the system to prevent it from being powered-down accidentally.
5	Disk eject button	Releases a disk from the disk drive.
8	DVD eject button	Releases a DVD from the DVD-ROM drive.

LED Indicators

Table 1-2 describes the front panel LEDs and their functions.

Table 1-2   Front Panel LEDs

LED		**Color**	**State**	**Description**
2	Hard disk drive activity	Green	Flashing	Hard disk drive is in use.

Table 1-2   Front Panel LEDs (continued)

LED		Color	State	Description
3	Hard disk drive status	Amber	On	Drive has failed.
			Flashing slowly (One flash per second)	Drive is being rebuilt.
			Flashing rapidly (Three flashes per second)	Controller is identifying the drive.
4	Operator information panel:			
	System-error	Green	On	System error has occurred.
	Information	Green	On	Noncritical error has occurred.
	System locator	Green	On	Visually locates appliance among other appliances.
	SCSI activity	Green	On	There is activity on the SCSI or IDE bus.
	Power-on	Green	On Flashing Off	Appliance is powered on. Appliance is powered off and still connected to an AC power source. AC power is not present. Power supply or LED has failed.
7	Disk drive activity	Green	On	Disk drive is in use.
8	DVD-ROM drive activity	Green	On	DVD-ROM drive is in use.

Figure 1-3 shows the location of back panel LEDs and connectors, and Table 1-3 describes the LED functions.

Figure 1-3   Back Panel LEDs and Connectors

1	Ethernet link status LED	7	Power cord connector and LED
2	Ethernet activity LED	8	USB connectors (not supported)
3	System locator LED	9	Video connector (not supported)
4	ASM connector (not supported)	10	Mouse connector[1]
5	Remote Supervisor Adapter II connector (not supported)	11	Keyboard connector[1]
6	SCSI connector	12	Serial port connector

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

Table 1-3   *Back Panel LEDs*

LED		Color	State	Description
1	Ethernet link status	Green	On	Active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.
2	Ethernet activity	Green	On	Server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.
3	System locator	Green	On	Visually locate the device among other devices.
7	AC Power	Green	On	AC power supply is on. During typical operation, both the AC and the DC power LEDs are on.

Figure 1-4 shows LEDs for the Fibre Channel adapter card, and Table 1-4 describes their function.

Figure 1-4   *Fibre Channel Adapter LEDs*
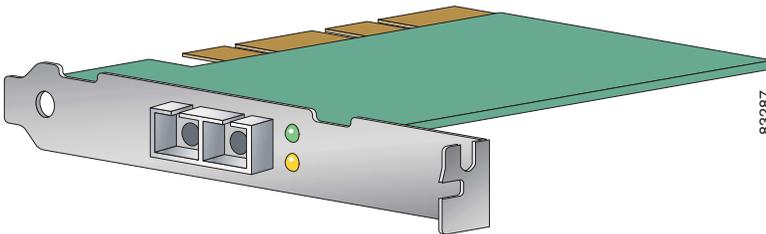
Note   On the adapter, the top LED is green, and the bottom LED is amber.

Table 1-4 **Fibre Channel Adapter LEDs**

LED	State	Description
Green	On	Power is on.
Amber	On	
Green	On	Fibre Channel adapter is on line.
Amber	Off	
Green	Off	Signal has been acquired. (The Fibre Channel adapter firmware is performing or waiting to perform Fibre Channel loop initialization.)
Amber	On	
Green	Off	Loss of synchronization.
Amber	Flashing	
Green	Flashing	Firmware error.
Amber	Flashing	

Input/Output Ports and Connectors

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

- Two Ethernet
- One serial
- One Ultra320 SCSI controller (LVD) SCSI

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 1-5 shows the WAE appliance back panel ports and connectors.

Note   The Fibre Channel adapter is supported in PCI slot 3.

Figure 1-5   *Back Panel Connectors and LEDs*
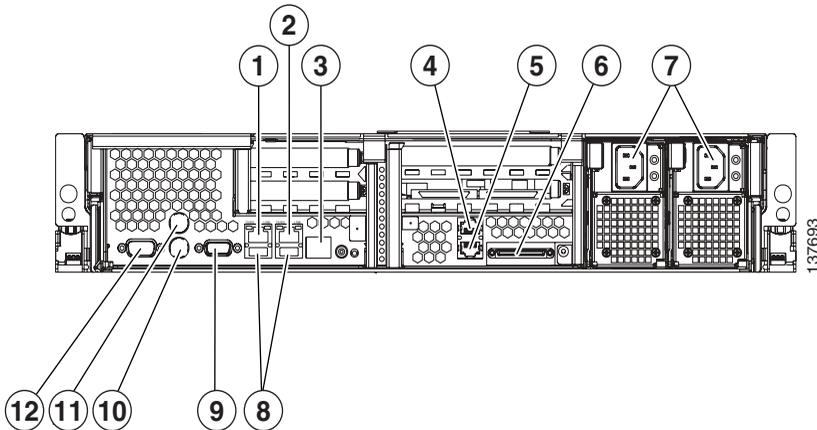
1	Ethernet connector	7	Power cord connector and LED
2	Ethernet connector	8	USB connectors (not supported)
3	System locator LED	9	Video connector (not supported)
4	ASM connector (not supported)	10	Mouse connector (not supported)
5	Remote Supervisor Adapter II connector (not supported)	11	Keyboard connector (not supported)
6	SCSI connector	12	Serial port connector

⚠

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

Ethernet Port Connectors

Connect a Category 3, 4, or 5 unshielded twisted-pair cable to this connector. 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

The WAE-7326 has three Ethernet connectors. Two of the Ethernet connectors are attached to the Ethernet controllers. The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server support auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operate at that rate and mode. You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers.

The third Ethernet connector is the Remote Supervisor Adapter II SlimLine Ethernet connector. Use this connector to enable remote server management through a network. This connector is active only if an optional Remote Supervisor Adapter II SlimLine is installed.

Figure 1-6   *Ethernet Port Connector*

Activity LED (green)   Link LED (green)

8   1

83195
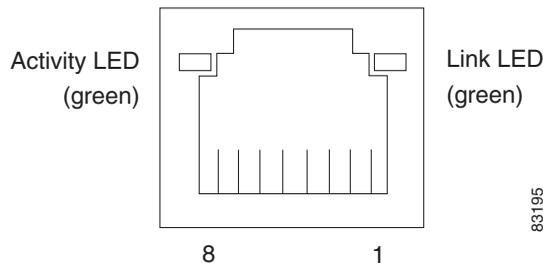
Serial Port Connector

Your WAE has one serial port connector. Use the serial port connector to connect a serial device.

Figure 1-7   *Serial Port Connector*
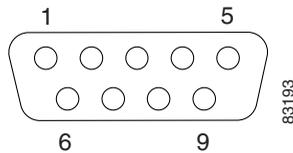
Ultra320 SCSI Controller System Board Connectors

The WAE-7326 has one SCSI LVD port connector located on the back panel. The integrated dual-channel SCSI controller with integrated RAID supports two independent Ultra320 SCSI channels: one external and one internal. Each channel supports up to 15 SCSI devices. You can use the external LVD SCSI channel connector on the rear of the server to connect different types of SCSI devices, such as drives or printers.

This controller uses the following features to perform these actions:

- Double-transition clocking to achieve up to 320 MB-per-second data-transfer rates.
- Domain-name validation to negotiate compatible data-transfer speeds with each device.
- Cyclic redundancy checking (CRC), instead of the usual parity checking, to improve data reliability.
- An active terminator for SCSI bus termination.

The WAE-7326 has one SCSI cable, which connects the internal connector on the system board to the standard hot-swap-drive backplane. If you plan to attach external SCSI devices, you must order additional cables. To select and order the correct cables for use with external devices, contact your Cisco marketing representative or authorized reseller.

SCSI IDs

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensures that different devices on the same SCSI channel do not attempt to transfer data

simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. Table 1-5 lists the SCSI IDs for the hard disk drives and backplanes that are connected to one channel.

Table 1-5   SCSI IDs

Device	SCSI ID
Drive bay 1	0
Drive bay 2	1
Drive bay 3	2
Drive bay 4	3
Drive bay 5	4
Drive bay 6	5
Controller	7
Backplane	8

Figure 1-8 shows a connector that conforms to the SCSI standard.

Figure 1-8   SCSI Connector
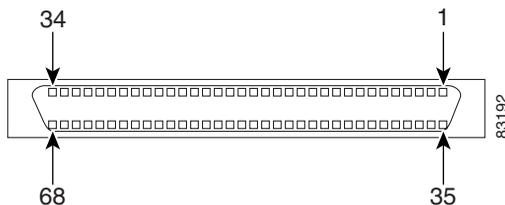
Fibre Channel Connector

The Fibre Channel connector is an LC-style connector that supports non-OFC, multimode fiber-optic cabling using a small form factor (SFF) fiber-optic transceiver module. The Fibre Channel adapter uses LC-LC Fibre Channel cables. Total cable length cannot exceed 1640 feet (500 meters). Fibre Channel cables are not supplied by Cisco Systems.

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-3 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 1-9.)

Figure 1-9   Inline Network Adapter
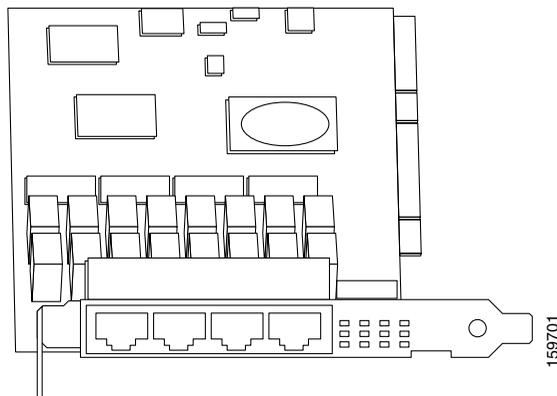
The Cisco WAE inline network adapter provides inline traffic interception capability for your appliance. When your appliance is configured for inline interception mode, you can set attributes to control which interfaces are to be used over which VLANs. By default, the adapter operates on all inline-capable 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 1-10 shows the inline network adapter port numbers, interface designations, and LEDs. Table 1-6 describes the LED functions.

Figure 1-10   Inline Network Adapter Port Numbering and LEDs
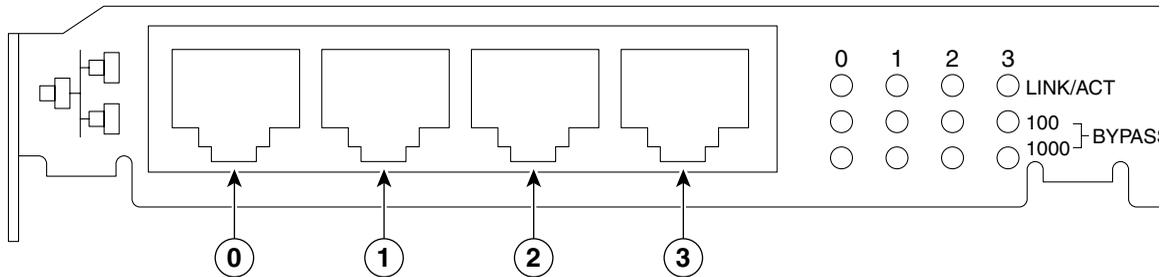
0	Port 0; Group 1 WAN interface	1	Port 1; Group 1 LAN interface
2	Port 2; Group 0 WAN interface	3	Port 3: Group 0 LAN interface

The inline network adapter has three LEDs that correspond to each port (the 0 LEDs correspond to Port 0, and so forth). Table 1-6 describes the LEDs.

Table 1-6   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.
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 1-7 shows the cable requirements for WAE and non-WAE connections when you are using Gigabit Ethernet end to end.

Table 1-7   *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
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

Table 1-7   Cable Requirements for WAE Connections Using Gigabit Ethernet (continued)

Connection	Required Cable
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 1-8. For illustrations and examples, see the "Installation Scenarios and Cabling Examples for Fast Ethernet Connections" section on page 1-22.)

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

Table 1-8   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).

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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 1-11 through Figure 1-13 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 1-18). The WAE can be physically placed inline between two distinct network paths, creating redundant WAN links. (See Figure 1-11.)

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 1-12.)

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 1-13.)

Figure 1-11   *Cabling for a Single Inline WAE with Redundant WAN Connections*
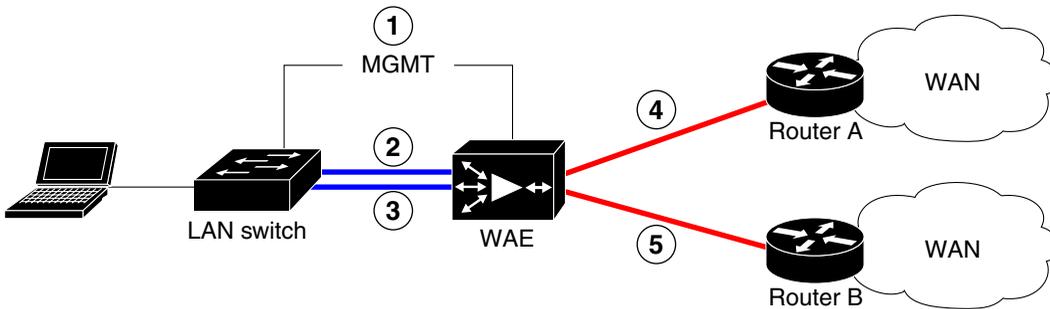
1	Connection: Management Gigabit Ethernet: 1/0 Cable type: Straight-through (recommended)	2	Connection: WAE to LAN switch (using InlineGroup 1/0) Fast Ethernet: LAN0 (InlinePort 1/0/lan) Cable type: Straight-through
3	Connection: WAE to LAN switch (using InlineGroup 1/1) Fast Ethernet: LAN1 (InlinePort 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 1-12   Cabling for Serial Cluster Inline WAEs with a Single WAN Connection
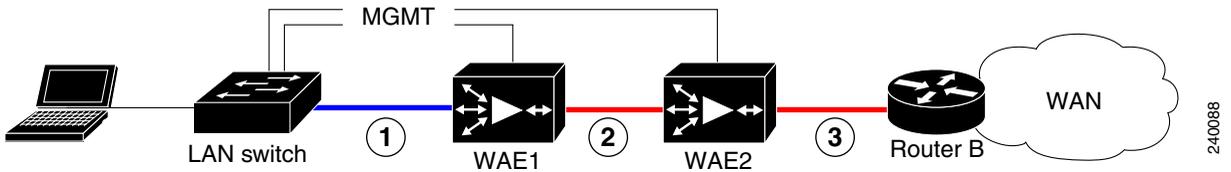
1	Connection: WAE 1 to LAN switch Fast Ethernet: LAN0 (InlinePort 1/0/lan) Cable type: Straight-through	2	Connection: WAE 1 to WAE 2 Fast Ethernet: WAE1 WAN0 (InlinePort 1/0/wan) to WAE 2 LAN0 (InlinePort 1/0/lan) Cable type: Crossover
3	Connection: WAE 2 to WAN router Fast Ethernet: WAE 2 WAN0 (InlinePort 1/0/wan) Cable type: Crossover		

Figure 1-13   Cabling Between Two Inline WAEs

1	Connection: WAE 1 to LAN switch	2	Connection: WAE 1 to WAE 2
	Fast Ethernet: WAE 1 LAN0 (InlinePort 1/0/lan)		Fast Ethernet: WAE 1 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		

Hardware Features

C H A P T E R 2

Preparing to Install the Wide Area Application Engine

This chapter contains important safety information you should know before working with the WAE. Use the guidelines in this chapter to ensure your own personal safety and to help protect your appliance from potential damage.

This chapter contains the following sections:

- Safety Warnings, page 2-1
- Safety Guidelines, page 2-4

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

Safety Warnings

Before you install the WAE, observe the following safety warnings.

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

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

Warning   **Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning   **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

Warning   **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

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 product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).** Statement 13

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

Warning   **Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.** Statement 43

Warning   **When installing or replacing the unit, the ground connection must always be made first and disconnected last.** Statement 1046

Warning   **The safety cover is an integral part of the product. Do not operate the unit without the safety cover installed. Operating the unit without the cover in place will invalidate the safety approvals and pose a risk of fire and electrical hazards.** Statement 117

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

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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

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, extension cord, 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 Content Engine 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. If you must use an extension cord, use a three-wire cord with properly grounded plugs.

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

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

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- 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.

System Reliability Considerations

To help ensure proper cooling and system reliability, make sure the following occurs:

- Each of the drive bays has either a drive or a filler panel installed.

- Each of the power-supply bays has a power supply or a power supply filler panel installed.

- For rack configurations, make sure that space is available around the appliance to enable the cooling system to work properly. See the documentation that comes with the rack for additional information.

- The appliance cover is in place during normal operation.

- The air baffle cover over the microprocessors remains closed during normal operation.

- The air baffle is installed between the fans and the power supply.

- A removed hot-swappable drive is replaced within 2 minutes of removal.

- Cables for optional adapters are routed according to the instructions provided with the adapters.

- A failed fan is replaced within 48 hours.

- The appliance is powered down and the power cords are disconnected before you open the air baffle cover.

- The air baffle assembly is always installed in the appliance except when you are installing or removing the components that are located under the air baffle cover.

- When the air baffle assembly is installed in the appliance, the air baffle cover is always closed.

- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor.

Working Inside the WAE with the Power On

The WAE is designed to operate safely with the cover removed for short periods (less than 30 minutes). You might need to remove the cover while the power is on, for example, to observe the Light Path diagnostic LEDs when troubleshooting. When you work inside an appliance that is powered on, follow these guidelines:

- Avoid loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the appliance; do not wear cuff links while you are working inside the appliance.

- Do not allow your necktie or scarf to hang inside the appliance.

- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wristwatches.

- Remove items from your shirt pocket (such as pens or pencils) that could fall into the appliance as you lean over it.

- Avoid dropping any metallic objects, such as paper clips, hairpins, or screws, into the appliance.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside the appliance. 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.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- Take additional care when handling devices during cold weather, because heating reduces indoor humidity and increases static electricity.

Installing the Wide Area Application Engine

This chapter explains how to install a Wide Area Application Engine (WAE) in an equipment rack. It also provides general instructions for installing a WAE 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 and the *Site Preparation and Safety Guide* that shipped with your chassis.

⚠

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

Rack-Mounting Considerations

Before installing your WAE 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 WAE to a properly grounded outlet.

- Do not overload the power outlet when installing multiple devices in the rack.

⚠
Caution   Use safe practices when lifting.

⚠
Caution   Do not place any object weighing more than 110 lb (50 kg) on top of rack-mounted devices.

Rack Requirements

Install your WAE in a rack that meets the following requirements:

- Minimum depth of 2.76 inches (70 mm) between the front mounting flange and inside of the front door.

- Minimum depth of 6.18 inches (157 mm) between the rear mounting flange and inside of the rear door.

- Minimum depth of 28.27 inches (718 mm) and maximum depth of 30 inches (762 mm) between the front and rear mounting flanges to support the use of the cable-management arm.

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.

Tools and Parts Required

A sliding rail rack-mount kit is included in your shipping container accessory box. The rack-mount kit is suitable for mounting the WAE 7326 appliances in 19-inch (48.26-cm), 4-post equipment racks. (See the "Rack Requirements" section on page 3-2.)

You need the following tools for the installation:

- Flat-blade screwdriver
- Phillips screwdriver

Figure 3-1 shows the items that you need to install the WAE in your rack or cabinet. If any items are missing or damaged, contact your place of purchase.

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

Figure 3-1   **Rack Installation Kit**
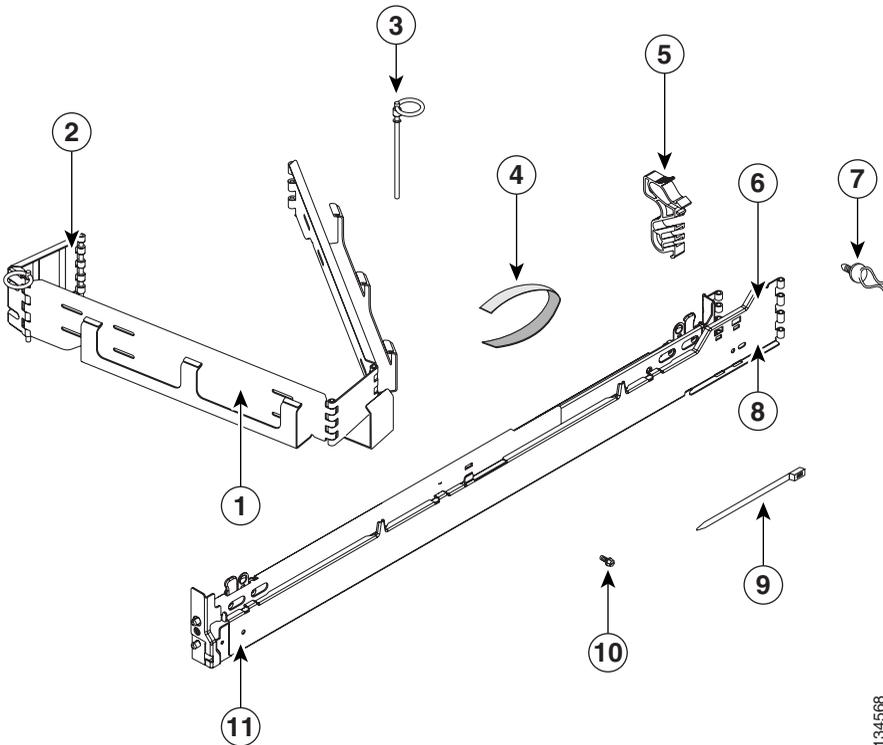
1	Cable-management assembly	7	Cable Clamp (5)
2	Cable-management arm bracket	8	Rear of rail
3	Hinge	9	Cable ties (5)
4	Cable strap (5)	10	M6 screws (5)
5	Cable-restraint bracket(5)	11	Front of rail
6	Slide rail (2)		

Note   The rack kit includes a left and a right slide rail.

Installing the Wide Area Application Engine 7326

Place the WAE 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 appliance in an equipment rack, proceed to the "Installing the Chassis on a Tabletop" section on page 3-11.

To install the WAE in a rack, follow these steps:

Step 1   Push outward on the slide-rail latch (labeled 2 in Figure 3-2). Pull the latch back to open the slide rail. The latch will engage and stay open. Open the other end of the slide rail. Repeat the entire process for the other slide rail.

✎
Note   If you are installing the server in the top of the rack or directly under another server or device, remove the cable-management arm bracket from the cable-management assembly and install the cable-management arm bracket on the slide rail. Go to step 6 to install the cable-management arm bracket; then, continue with step 2.

Figure 3-2   Latching the Slide Rails
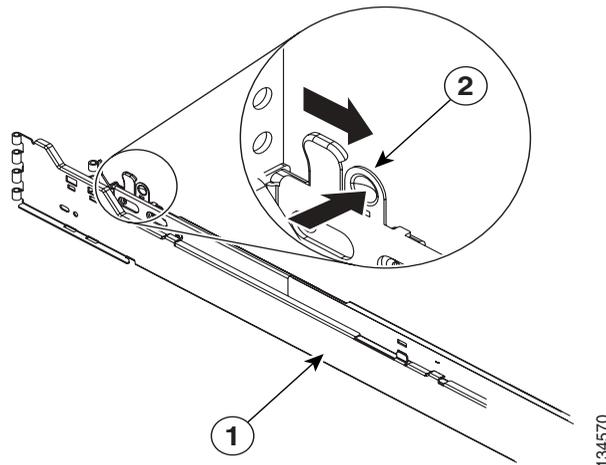
| **1** | Right slide rail | **2** | Slide rail latch |

Step 2   Align the slide rail with the front mounting flange. Use the score mark on the slide rail (labeled 1 in Figure 3-3) to align the slide rail. Push outward on the slide rail latch to close the latch and secure the slide rail. Do the same for the front of the other slide rail. Align the slide rail with the rear mounting flange. The slide rail occupies the full height of the device. Close the latches to secure the rear of both the slide rails.

✎

Note   Make sure that the slide rails are securely seated on the mounting flanges. When the slide is secure, the slide rail pins protrude from the slide rails.

Figure 3-3   Aligning the Slide Rails
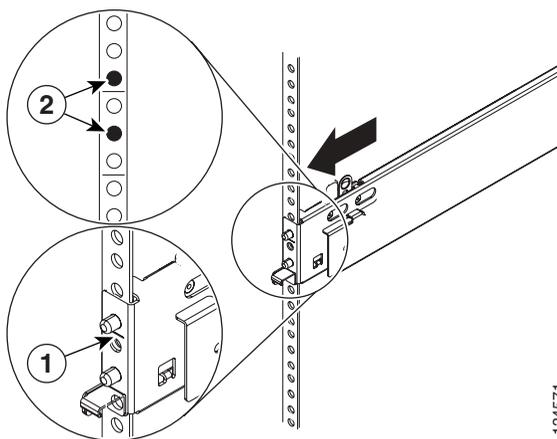
| **1** | Slide rail score mark | **2** | Slide rail pins |

Step 3   Extend the slide rails fully from the rack until the slide rails lock. Align the tabs on the slide rails (labeled 1 in Figure 3-4) with the matching inserts on the appliance and lower the appliance onto the slide rails.

> **Note** Make sure that each slide rail tab is inserted in the matching insert on the appliance and that the appliance is resting on the top edge of the slide rail.

Figure 3-4   *Inserting the WAE*
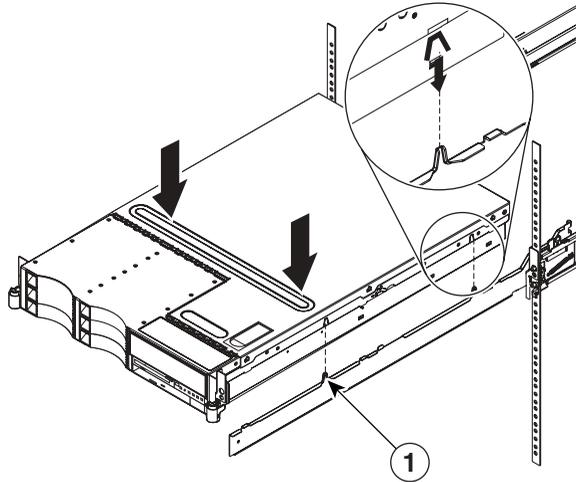
| 1 | Alignment tab (front) |

Step 4 Carefully slide the WAE along the slide rails approximately 1 inch (2.54 cm) toward the rack to lock the WAE on the slide rails. (See Figure 3-5.)

Figure 3-5   Locking the WAE on the Slide Rails

Rear view

134573
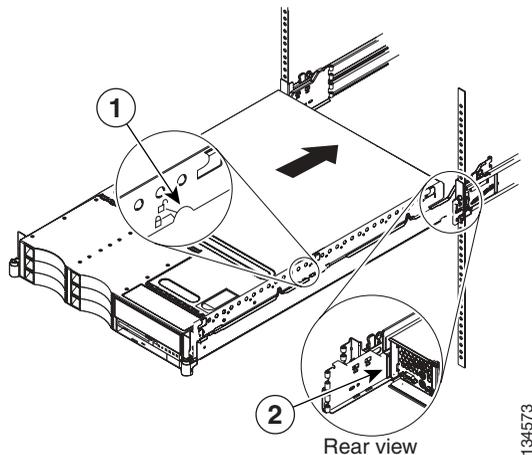
1	Lock indicator	2	Slide Rail Hooks

Note When locked in position, an indicator (labeled 1 in Figure 3-5) is visible on each side of the appliance. To remove the appliance from the rack, lift up on the lock indicator and slide the appliance forward.

Step 5 Lift the locking levers (labeled 1 in Figure 3-6) on the slide rails and slide the appliance into the rack until it extends approximately 4 inches (10.16 cm) from the edge of the rack.

Figure 3-6   *Sliding in the WAE*

83133
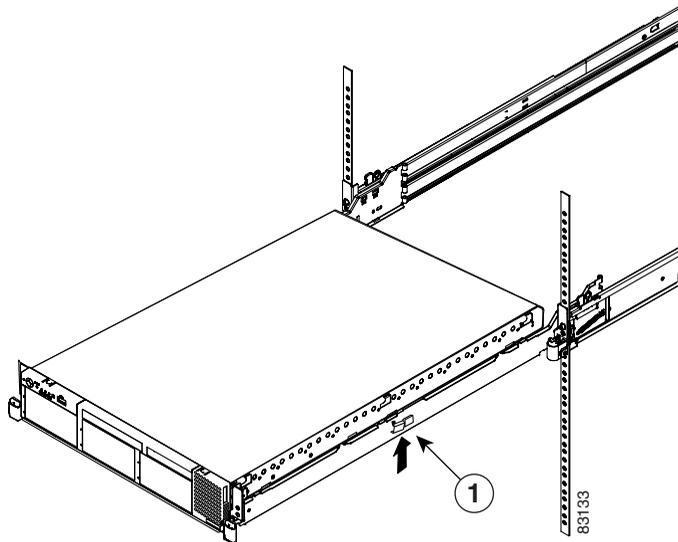
1	Locking levers

Step 6   Attach the cable-management assembly to the rear of the slide rail using a hinge pin (labeled 1 in Figure 3-7). Attach the free end of the cable-management assembly to the slide rail using a hinge pin.

Note   If you installed the cable-management arm bracket in step 1, complete the installation of the cable-management assembly.

Figure 3-7   *Attaching the Cable-Management Assembly*
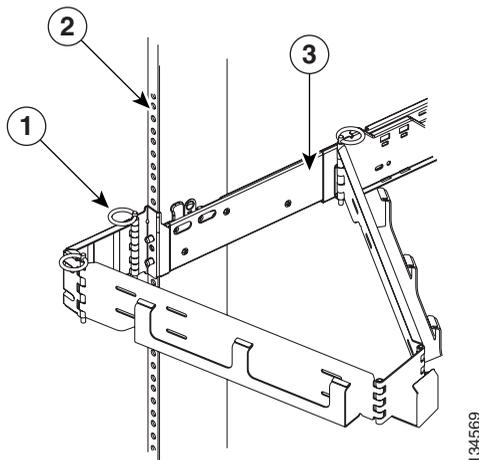
1	Hinge pin	**3**	Slide rail
2	Left mounting flange		

Step 7   Attach the power cords and other cables to the rear of the server (including keyboard, monitor, and mouse, if required). Attach the power cords to the cable-restraint bracket. Secure the cable-restraint bracket to the slide rail.

Use cable clamps to secure the cables across the rear of the server. Route the cables along the cable-management arm channel, securing them with cable straps.

Note   Allow slack in all cables to avoid tension in the cables.

Step 8   Slide the WAE into the rack until the release latches lock into place. To slide the WAE out of the rack, press the release latches.

Note Insert the optional M6 screws (labeled 2 in Figure 3-7) in the front and rear of the appliance when moving the rack, or if you install the rack in a vibration-prone area.

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

Installing the Chassis on a Tabletop

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

- 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 WAE 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 WAE will receive adequate ventilation (it is not being installed in an enclosed cabinet where ventilation is inadequate).

To install the WAE 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 WAE and its new location is unobstructed.

Step 2 Attach the rubber feet to the bottom of the chassis. The rubber feet have an adhesive backing. Peel the protective tape off the adhesive and stick the feet to the bottom of a clean chassis surface. Place one foot in each corner.

Step 3 Place the chassis on the tabletop or workbench.

Step 4 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 cables to your WAE, follow these steps:

Step 1   Power down the appliance before connecting cables to or disconnecting any cables from the appliance.

Step 2   See the documentation that comes with your optional equipment for additional cabling instructions. It might be easier for you to route the cables before you install specific optional equipment.

Step 3   Cable identifiers are printed on the cables that come with the server and options. Use these identifiers to connect the cables to the correct connectors.

Figure 3-8 shows the locations of the input and output connectors on your device.

Figure 3-8   WAE-7326 Ports and Receptacles—AC System Shown
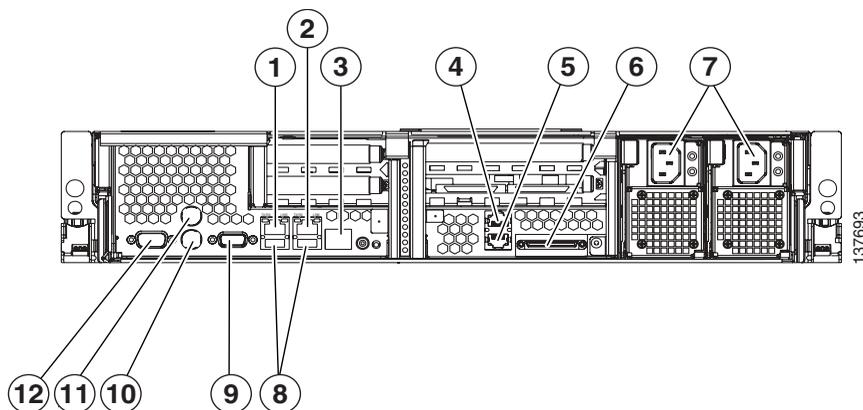
1	Ethernet link status LED	7	Power cord connectors and LED
2	Ethernet activity LED	8	USB connectors (not supported)
3	System locator LED	9	Video connector (not supported)

4	ASM connector (not supported)	10	Mouse connector[1]
5	Remote Supervisor Adapter II connector (not supported)	11	Keyboard connector[1]
6	SCSI connector	12	Serial port connector

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

> **Note**   The WAE-7326 is compatible with the Cisco Storage Array. Refer to the *Cisco Storage Array SA-7 and SA-14 Installation and Configuration Guide*.

Connecting Power and Booting the System

To connect power to your system, follow these steps:

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

Step 2   Plug a power cord into each power cord receptacle on the back of the WAE. (See Figure 3-8.)

> **Note**   You must connect a power cord to both power supplies. If only one power supply is connected, when you turn on the power, the system error LED lights and the system makes a loud noise.

Step 3   Connect the other end of each 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 WAE.

The system should begin booting. Once the operating system boots, you are ready to initialize the basic software configuration. (Refer to the software configuration guide or user guide that shipped with your system.)

> ✎
>
> **Note**   While the WAE is powering up, the green power on LED on the front of the WAE is on.

Checking the LEDs

When the WAE is up and running, observe the front panel LEDs (see Figure 1-2 and Table 1-2) to verify that your system is operating properly.

To troubleshoot using the LEDs, see Chapter 5, "Troubleshooting the System Hardware."

Removing or Replacing a WAE

⚠ **Warning**   **Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.** Statement 1

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

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

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

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

If you remove the last WAE from your network, you can also disable WAE support on the router. However, this action is not necessary because leaving WAE support enabled when there are no WAEs attached has no effect on the router's performance.

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

Installing Hardware Options

This chapter provides basic instructions for installing hardware options in your Wide Area Application Engine (WAE). These instructions are intended for technicians who are experienced with setting up Cisco WAE hardware.

This chapter contains the following sections:

Removing the Cover and Bezel

Warning **Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.** Statement 1

To remove the device top 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 off the device and all attached devices and disconnect all external cables and power cords.

Step 3   Press down on the left and right side latches and pull the device out of the rack enclosure until both slide rails lock.

> ✎
> **Note**   You can reach the cables on the back of the device when the device is in the locked position.

Step 4   Lift the cover-release latch (labeled 2 in Figure 4-1). Lift the cover off the device and set the cover aside.

Figure 4-1   *Removing the Cover and Bezel*
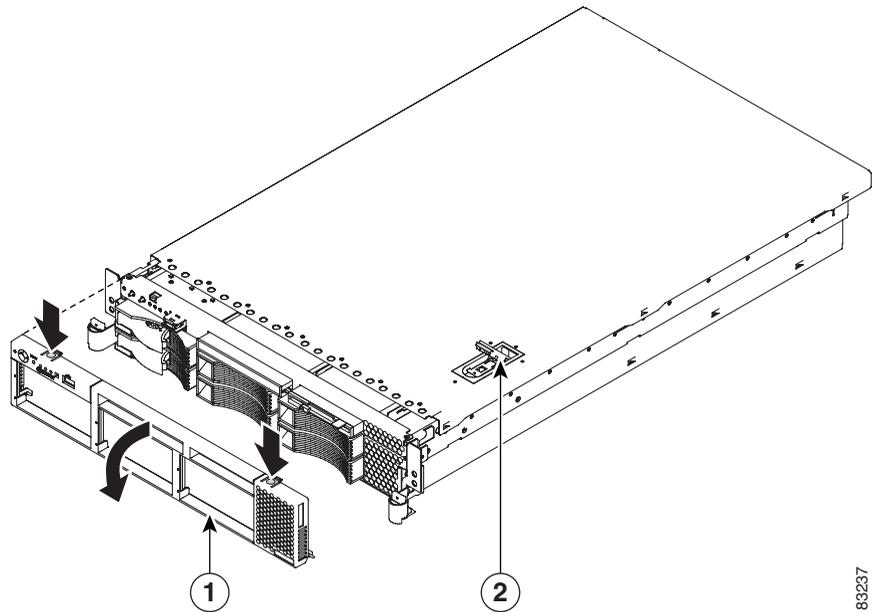
1	Bezel	**2**	Cover release latch

⚠

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.

Step 5   Remove the bezel (labeled 1 in Figure 4-1):

    a.   Press in on the tabs on the top of the bezel, and rotate the bezel away from the device front.

    b.   Store the bezel in a safe place.

Working with Adapters

The WAE 7326 has connectors for up to four PCI adapters on the system board and PCI riser card. This section provides general information about the system board, riser card, adapter, and PCI slot configuration specifications, and generic adapter installation procedures.

Figure 4-2 and Figure 4-3 show the location of the PCI-X adapter expansion slots on the system board and PCI riser card.

Figure 4-2   System Board
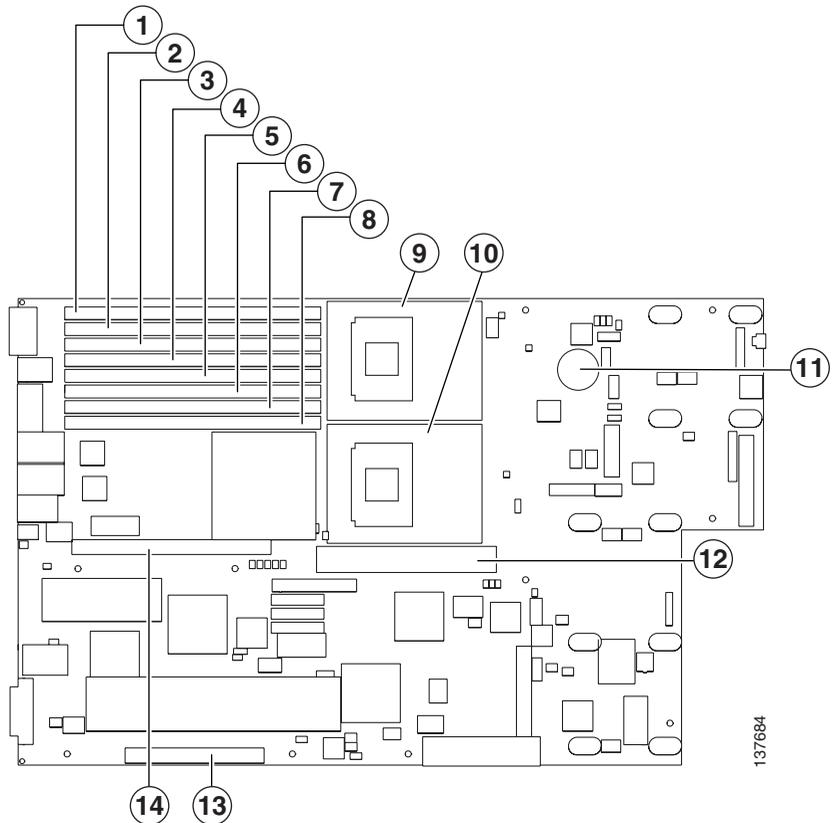
1	DIMM 1 (J1)	8	DIMM 8 (J8)
2	DIMM 2 (J2)	9	Microprocessor 1 (J22)
3	DIMM 3 (J3)	10	Microprocessor 2 (J23)
4	DIMM 4 (J4)	11	Battery (BH1)
5	DIMM 5 (J5)	12	VRM[1] 1 (J72)
6	DIMM 6 (J6)	13	PCI riser card (J73)
7	DIMM 7 (J7)	14	PCI low-profile card (J18)

1. VRM = voltage regulator module

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Figure 4-3   *PCI Riser Card*
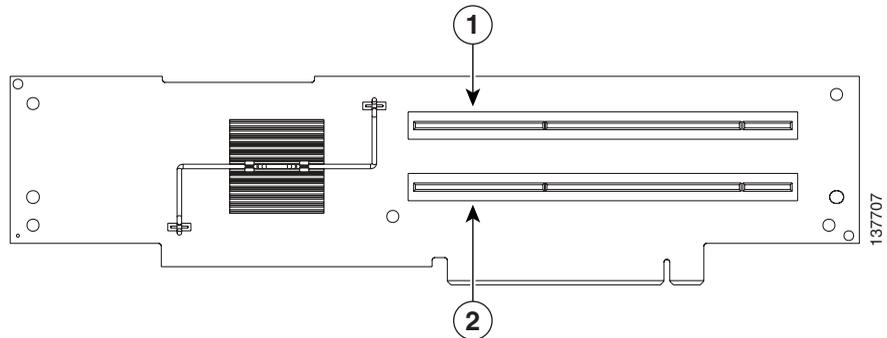
1	PCI-X slot 3, 64-bit 3.3 V 133 MHz (PCI 3)	**2**	PCI-X slot 4, 64-bit 3.3 V 133 MHz (PCI 4)

Adapter Installation Considerations

Before you install an adapter, review the following information:

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.

- PCI slots 1 and 2 support only low-profile adapters.

- PCI slots 3 and 4 support standard full-length adapters.

- WAE-7326 supports only 3.3 V and universal PCI adapters.

- PCI/PCI-X slot 3 and slot 4 are 64-bit slots and support only 3.3-V and universal PCI adapters.

- The PCI bus configuration is as follows:

    - Non-hot-plug, 64-bit PCI-X slots 1 and 2 (PCI bus A, 100 MHz)

    - Non-hot-plug, 64-bit PCI-X slots 3 (PCI bus B, 133 MHz)

    - Non-hot-plug, 64-bit PCI-X slot 4 (PCI bus C, 133 MHz)

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• The system scans PCI and PCI-X slots 1 through 5 to assign system resources. The system starts (boots) the system devices in the following order, if you have not changed the default boot precedence:

– Integrated Ethernet controller

– Integrated SCSI controller (SCSI channel B, then SCSI channel A)

– PCI and PCI-X slots 1,2, 3, and 4.

Installing an Adapter

Figure 4-4 shows how to install a PCI or PCI-X adapter.

Figure 4-4   Installing a PCI or PCI-X Adapter
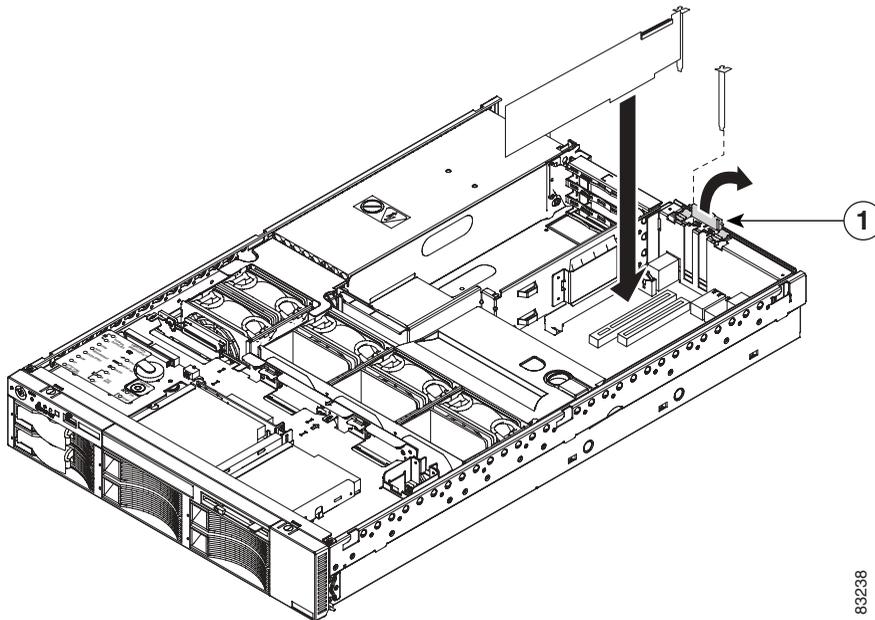
1	Adapter retainer

To install a PCI or PCI-X adapter, 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 peripheral devices and disconnect all power cords and external cables.

Step 3 Remove the cover. (See the "Removing the Cover and Bezel" section on page 4-1.)

Step 4 Determine which expansion slot you will use for the adapter.

Step 5 If you are installing an adapter in PCI slot 1 or 2, remove the PCI low-profile card cage.

If you are installing an adapter in PCI slot 3, 4, or 5, remove the PCI riser card assembly. (See Figure 4-5.)

Step 6 Slide the expansion-slot cover out of the PCI low-profile card cage or PCI riser card cage.

Step 7 Install the adapter.

Step 8 Connect any needed cables to the adapter.

⚠️
Caution When you route cables, do not block any connectors or the ventilated space around any of the fans.

⚠️
Caution Make sure that cables are not routed on top of components under the PCI riser card cage or the PCI low-profile card cage.

⚠️
Caution Make sure that cables are not pinched by the server components.

Figure 4-5 shows the cable routing for an adapter installed in the PCI low-profile card cage.

✎

Note Remove the PCI riser card cage, the PCI low-profile card cage, and the fan guide before you route the cables. Reinstall the components when you complete the cable routing.

Figure 4-5   Cable Routing for the PCI Low-Profile Card Cage
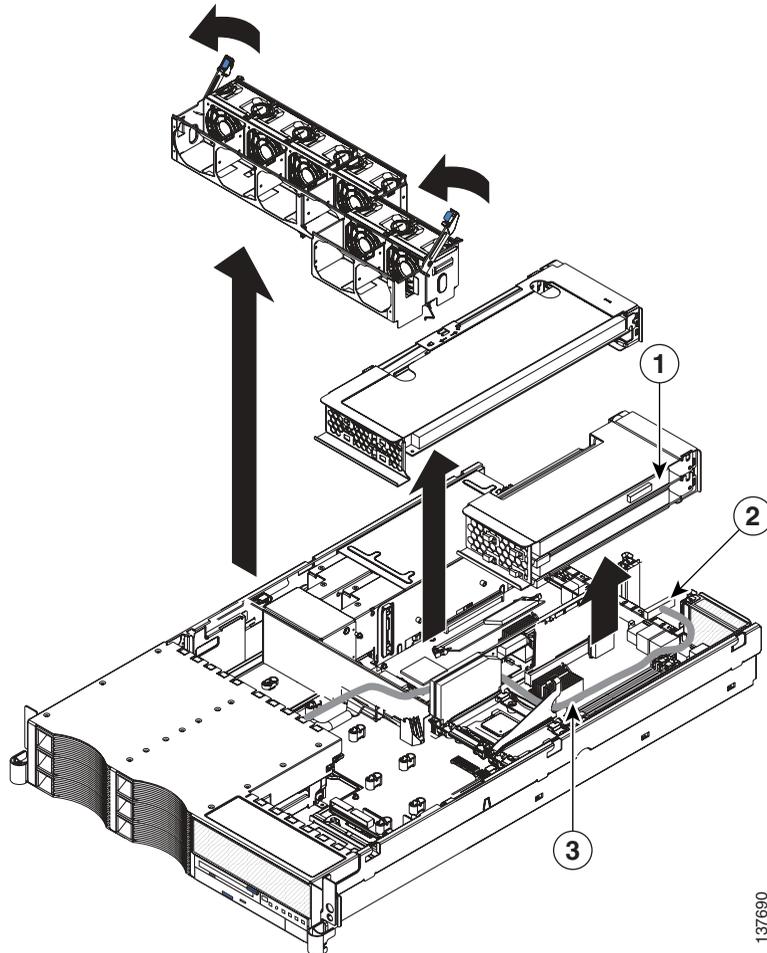
137690

1	Low profile SCSI adapter	**2**	SCSI cable connector
3	SCSI cable		

Figure 4-6 shows the cable routing for an adapter installed in the PCI riser card cage.

Note   Remove the fan guide before you route the cables. Reinstall the fan guide when you complete the cable routing.

Step 9   Perform any configuration tasks required for the adapter.

Figure 4-6   Cable Routing for the PCI Riser Card Cage
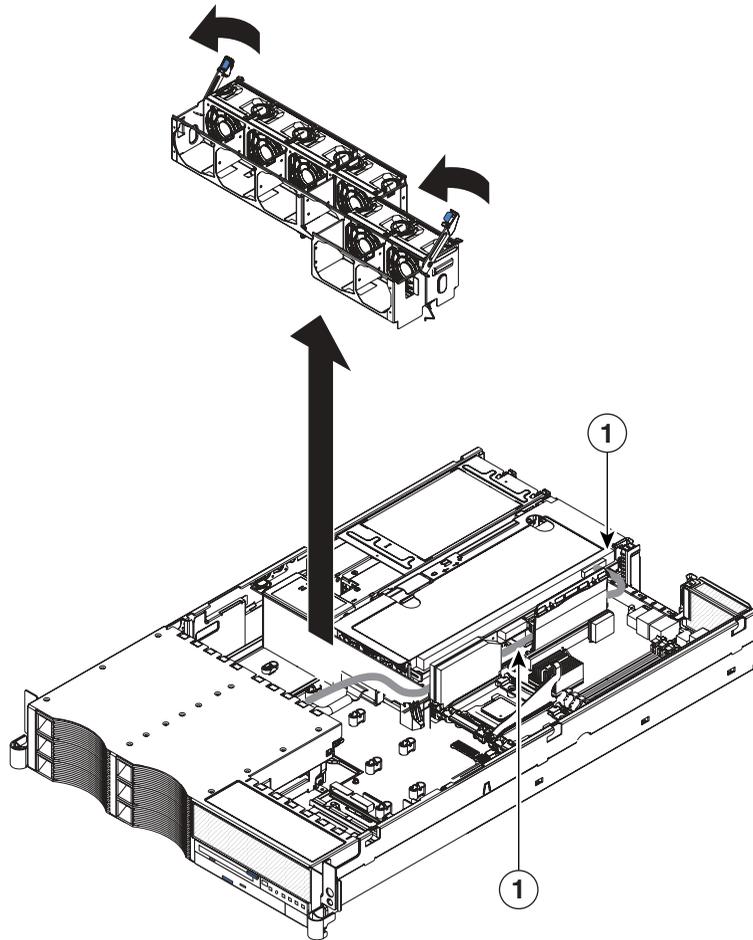
1	SCSI adapter	**2**	SCSI cable

Step 10   If you have other hardware options to install or remove, do so now.

Step 11   Reinstall the cover.

For instructions on completing the installation, see the "Completing the Installation" section on page 4-11.

Completing the Installation

To complete your installation, follow these steps:

Step 1 Install the top cover.

Step 2 Install the device in a rack.

For complete rack installation and removal instructions, see Chapter 3, "Installing the Wide Area Application Engine."

⚠️

Caution Install the device only in a rack cabinet with perforated doors.

⚠️

Caution Do not leave open spaces above or below an installed server in the rack cabinet. To help prevent damage to server components, always install a blank filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with your rack cabinet for more information.

Step 3 Connect the cables and power cords. For information on connecting cables and power cords, see the "Connecting Cables" section on page 3-12.

Installing the WAE Cover and Bezel

To install the WAE cover and bezel, follow these steps:

Step 1   Place the cover release latch (labeled 2 in Figure 4-7) in the open (up) position.

Step 2   Insert the bottom tabs of the top cover into the matching slots in the device chassis.

Step 3   Press down on the cover release latch to lock the cover in place.

Figure 4-7   Installing the Cover and Bezel
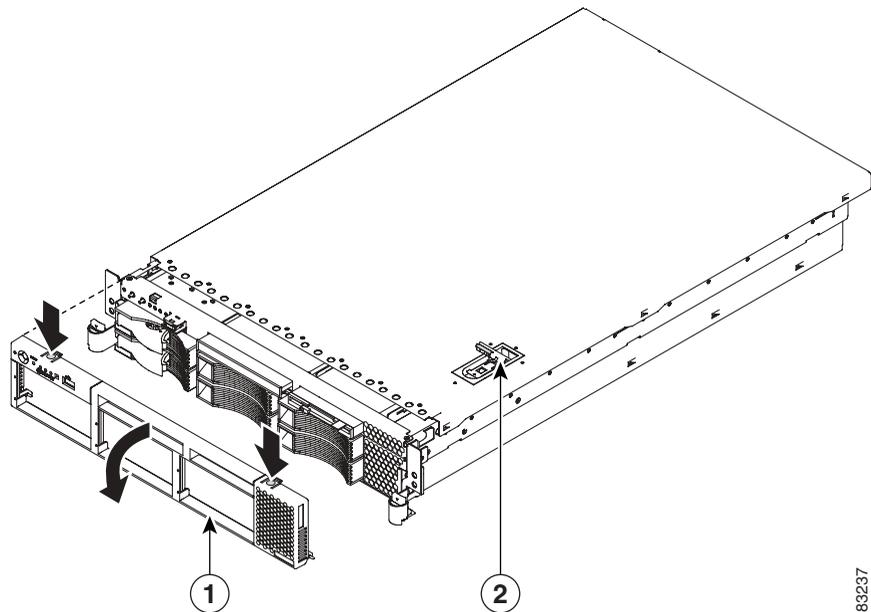
1	Bezel	**2**	Cover release latch

Step 4   Install the bezel.

    a.   Align the hooks on the bottom of the bezel with the device.

b. Press the bezel toward the device until it clicks into place.

Installing a Hard Disk Drive

Your WAE supports six 1-inch (26 mm) slim, 3.5-inch low-voltage differential (LVD) hard disk drives installed on Ultra-Slim hard disk drive trays.

Note All hard disk drives being used in the device 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.

Note The SCSI ID assigned to each bay is printed on the bezel.

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.

To install a hard disk drive in a bay, 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 Remove the filler panel (labeled 3 in Figure 4-8) from one of the empty bays by inserting your finger into the depression at the left side of the filler panel and pulling it away from the device.

Step 3 Place the drive handle in the open position and slide the drive into the bay.

Step 4 Close the drive handle and reload the appliance. You must reload the appliance for the software to recognize the hard disk drive.

Figure 4-8   Installing a Hard Disk Drive
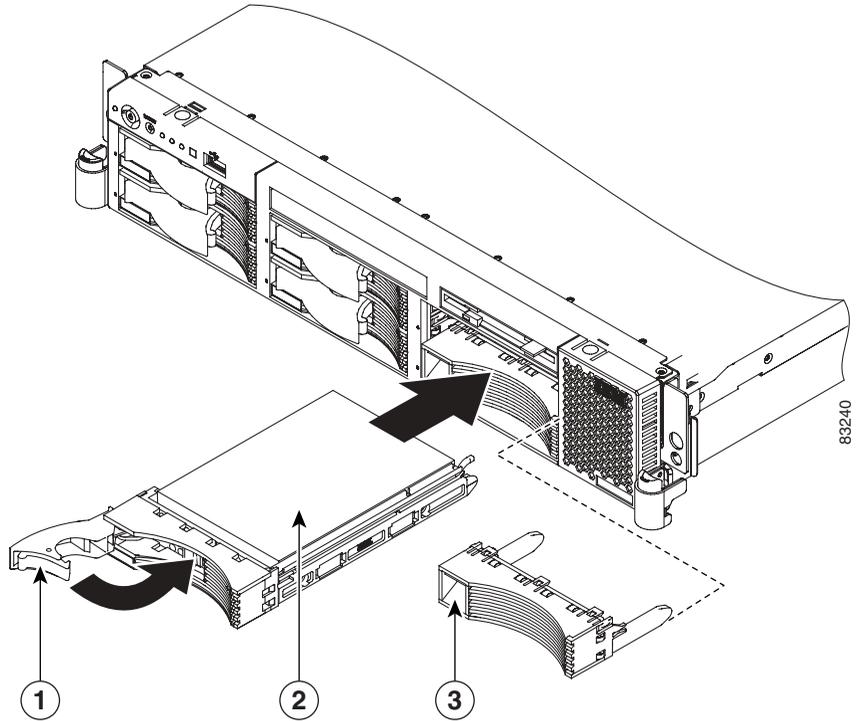
1	Drive tray handle	3	Filler panel
2	Drive tray assembly		

Troubleshooting the System Hardware

This chapter provides basic troubleshooting information to help you identify some common problems that might occur with your Wide Area Application Engine (WAE).

This chapter contains the following sections:

Use the information in this chapter to determine whether a problem originates with the hardware or the software. For further assistance, contact your service representative.

> ✎
> **Note**   Cisco ACNS software does not support the use of a keyboard or mouse
> (Personal System/2 [PS/2] or Universal Serial Bus [USB]) for Linux and ACNS
> software troubleshooting. However, the keyboard and mouse are supported by the
> BIOS for power-on self-test (POST) and diagnostic programs that are located in
> the device ROM.
>
> When console redirection is enabled, all the tests available from a keyboard are
> accessible through the console connection as well. (Mouse support, however, is
> not available through the console connection.)

You can run all the diagnostics and tests that are supported by the BIOS, with a
few exceptions. Tests for a disk drive, for example, are invalid because the device
does not include a disk drive in the hardware configuration.

Tests for peripheral devices (such as mouse, keyboard, and monitor) and ports
(such as the USB port) that are not supported by ACNS software are also invalid.

> ⚠
> **Caution**   Customer-replaceable components include the Fibre Channel adapter and hard
> disk drives. All other components that are not orderable as spare hardware options
> can only be replaced by a qualified service technician. Once you have identified
> a faulty component, contact Cisco Technical Support. (See the "Obtaining
> Documentation" section on page xvii.)

> ✎
> **Note**   Read the "Working Inside the WAE with the Power On" section on page 2-7
> before opening the chassis cover.

Identifying System Problems

To identify system problems, follow these steps:

Step 1   Power down the device and all external devices.

Step 2   Check all cables and power cords. (See the "Checking Connections and Switches"
section on page 5-3.)

Step 3   Set all display controls on the terminal or display device to the middle position.

Step 4   Power up all external devices.

Step 5   Power up the device.

Step 6   Record any POST error messages that are displayed on the screen. If an error is displayed, look up the first error in the "POST Error Codes" section on page 5-52.

Step 7   Check the system error LED on the front panel (see Figure 1-2); if it is on, see the "System Error LED and the Diagnostic Panel LEDs" section on page 5-33.

Step 8   Check the system error log. If an error was recorded by the system, see the "Symptoms and Solutions" section on page 5-28.

Step 9   Start the diagnostic programs and check for the following responses:

- One beep

- Readable instructions or the main menu

Step 10   Take one of the following actions:

- If you received both responses, run the diagnostic programs. For information on how to use the diagnostic programs, see the "Using the System Diagnostic Programs" section on page 5-5.

  If the diagnostic programs were completed successfully and you still suspect a problem, see the "Undetermined Problems" section on page 5-25.

- If you did not receive both responses, find the failure symptom in the "Symptoms and Solutions" section on page 5-28.

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 1-2 for the location of front panel controls and indicators. See Figure 1-3 for the location of back panel connectors 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 xx.)

Using the System Diagnostic Programs

The device diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the following major components of the device: the system board, Ethernet controller, RAM, serial ports, and hard disk drives. You can also use the diagnostic programs to test some external devices. See the "Diagnostic Programs and Error Messages" section on page 5-7.

If you cannot determine whether a problem is caused by the hardware or by the software, you can run the diagnostic programs to confirm that the hardware is working properly.

When you run the diagnostic programs, a single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After the cause of the first error message is corrected, the other error messages might not occur the next time you run the test.

When troubleshooting, note the following points:

- If multiple error codes are displayed, diagnose the first error code that is displayed.

- If the computer stops with a POST error, go to the "POST Error Codes" section on page 5-52.

- If the computer stops and no error message is displayed, go to the "Undetermined Problems" section on page 5-25.

- For power supply problems, see the "Power Supply LED Errors" section on page 5-50.

- For safety information, see Chapter 2, "Preparing to Install the Wide Area Application Engine."

- For intermittent problems, check the error log.

Diagnostic Tools Overview

The following tools are available to help you identify and resolve hardware-related problems:

- POST beep codes and error messages

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The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See the next section, "POST," for more information.

- Error log

    The POST error log contains the three most recent error codes and messages that the system has generated during POST. The system error log contains all the error messages that were issued during POST.

- SCSI error messages

    For information on SCSI errors, see the "SCSI Errors" section on page 5-60.

- Diagnostic programs and error messages

    The device diagnostic programs are stored in ROM on the system board. These programs are the primary method of testing the major components of your device. See the "Diagnostic Programs and Error Messages" section on page 5-7 for more information.

- Light Path Diagnostics

    Your device has LEDs to help you identify problems with device components. These LEDs are part of the Light Path Diagnostics that are built into your device. By following the path of LEDs, you can quickly identify the type of system error that occurred. See the "Using Light Path Diagnostics" section on page 5-21 for more information.

- Error symptom charts

    These charts list problem symptoms, along with suggested steps to correct the problems. See the "Error Symptoms" section on page 5-43 for more information.

POST

When you power up the device, it performs a series of tests to check the operation of device components and some of the hardware options installed in the device. This series of tests is called the power-on self-test, or POST.

If POST finishes without detecting any problems, a single beep sounds, and the first screen of your operating system or application program appears.

If POST detects a problem, more than one beep sounds, and an error message appears on your screen. See the "Beep Symptoms" section on page 5-28 and "POST Error Codes" section on page 5-52 for more information.

Note   If you have a power-up password or administrator password set, you must enter the password and press **Enter** when prompted, before POST will continue.

Note   A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will not occur the next time that you run the test.

The POST error log contains the three most recent error codes and messages that the system generated during POST. The system error log contains all messages issued during POST and all system status messages from the service processor.

You can view the contents of the system error log from the diagnostic programs.

Diagnostic Programs and Error Messages

The device diagnostic programs are stored in upgradable ROM on the system board. These programs are the primary method of testing the major components of your device.

Diagnostic error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems that are indicated by error messages should be performed by trained service personnel.

Sometimes the first error to occur causes additional errors. In this case, the device displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

The following sections contain the error codes that might appear in the detailed test log and summary log when the diagnostic programs are run.

The error code format is as follows:

fff-ttt-iii-date-cc-text message

The following are the meanings of the error message elements:

Error Message Element	Explanation
fff	3-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.
ttt	3-digit failure code that indicates the exact test failure that was encountered. (These codes are for trained service personnel; see the "Diagnostic Error Codes" section on page 5-37.)
iii	3-digit device ID. (These codes are for trained service personnel; see the "Diagnostic Error Codes" section on page 5-37.)
date	The date that the diagnostic test was run and the error recorded.
cc	Check value that is used to verify the validity of the information.
text message	Message that indicates the reason for the problem.The format is as follows: Function Name: Result (test-specific string) where: Function Name is the name of the function being tested when the error occurred. This corresponds to the function code (fff) shown in the error code format in the previous section. Result can be one of the following: - Passed—This result occurs when the diagnostic test is completed without any errors. - Failed—This result occurs when the diagnostic test discovers an error. - User Aborted—This result occurs when you stop the diagnostic test before it is complete. - Not Applicable—This result occurs when you specify a diagnostic test for a device that is not present. - Aborted—This result occurs when the test could not proceed, for example, because of the system configuration. - Warning—This result occurs when a possible problem is reported during the diagnostic test, such as when a device driver is not found. - Test-specific string—This is additional information that you can use to analyze the problem.

Starting the Diagnostic Programs

To start the diagnostic programs, follow these steps:

Step 1   Power up the device and watch the console.

> ✎
>
> **Note**   To run the diagnostic programs, you must start the device with the highest level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the power-up password, to run the diagnostic programs.

Step 2   Press **F2** when this message appears:

```
F2 for Diagnostics
```

Step 3   Enter the appropriate password and then press **Enter**.

Step 4   From the top of the window, choose either **Extended** or **Basic**.

Step 5   When the Diagnostic Programs window appears, choose the test that you want to run from the list that appears. Follow the instructions in the window:

- Press **F1** while running the diagnostic programs to obtain help information. You also can press **F1** from within a help window to obtain online documentation from which you can choose different categories. To exit from the help information and return to your last location, press **Esc**.

- If the device stops during testing and you cannot continue, restart the device and try running the diagnostic programs again. If the problem remains, the component that was being tested when the device stopped needs to be replaced.

- If you run the diagnostic programs with either no mouse or a USB mouse attached to your device, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.

> ✎
>
> **Note**   Cisco ACNS software does not support USB peripheral devices.

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- You can view device configuration information (such as system configuration, memory contents, interrupt request [IRQ] use, direct memory access [DMA] use, device drivers, and so on) by choosing **Hardware Info** from the top of the window.

If the diagnostic programs do not detect any hardware errors but the problem persists during normal device operations, a software error might be the cause. If you suspect a software problem, see the information that comes with your software package.

Viewing the Test Log

When the tests are completed, you can view the test log by choosing **Utility > View Test Log**.

Note You can view the test log only while you are in the diagnostic programs. When you exit the diagnostic programs, the test log is cleared. The Save Log option in the diagnostic programs window is *not* supported because the device does not support a disk drive.

Viewing Error Logs

Start the diagnostic programs. Choose **Hardware Info > System Error Log,** and then follow the instructions in the window.

Viewing Diagnostic Error Message Tables

For descriptions of the error messages that might appear when you run the diagnostic programs, see the "Diagnostic Error Codes" section on page 5-37.

Note Depending on your device configuration, some of the error messages might not appear when you run the diagnostic programs.

Note If diagnostic error messages appear that are not listed in the tables, make sure that your device has the latest levels of BIOS and diagnostics microcode installed.

Checking the Power Subsystem

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

To perform a general procedure for troubleshooting power problems, follow these steps:

Step 1 Power down the device and disconnect all AC power cords.

Step 2 Check for loose cables in the power subsystem. Also check for short circuits, for example, if there is a loose screw causing a short circuit on a circuit board.

Step 3 Remove adapters and disconnect the cables and power connectors to all internal and external devices until the device is at the minimum configuration required to start it.

Step 4 Reconnect all AC power cords and power up the device. If the device starts up successfully, replace adapters and devices one at a time until the problem is isolated. If the device does not start up from the minimal configuration, replace components of a minimal configuration one at a time until the problem is isolated.

To use this method, it is important to know the minimum configuration required for a system to start.

Note   The following are the minimum operating requirements:

- One power supply

- Power cage assembly

- System board

- One microprocessor and voltage regulator module (VRM)

- Memory module (with a minimum of two 128-MB DIMMs)

Troubleshooting the Ethernet Controller

This section provides troubleshooting information for problems that might occur with the 10/100/1000-Mbps Ethernet controller.

Network Connection Problems

If the Ethernet controller cannot connect to the network, check the following conditions:

- Make sure that the cable is installed correctly.

  The network cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.

  If you set the Ethernet controller to operate at either 100 Mbps or 1000 Mbps, you must use Category 5 or higher cabling.

- Determine whether the hub supports autonegotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.

- Check the Ethernet controller LEDs on the device back panel. (See Figure 1-3.)

These LEDs indicate whether a problem exists with the connector, cable, or hub.

- The Ethernet activity LED is on when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.

- The Ethernet link status LED is on when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.

- Make sure that you are using the correct device drivers that are supplied with your device.

- Check for operating system-specific causes for the problem.

- Make sure that the device drivers on the client and the device are using the same protocol.

- Test the Ethernet controller.

  The method used to test the Ethernet controller depends on which operating system you are using (see the Ethernet controller device driver README files).

Ethernet Controller Troubleshooting Chart

Use Table 5-1 to find solutions to 10/100/1000-Mbps Ethernet controller problems that have definite symptoms.

Table 5-1   ***Ethernet Troubleshooting Chart***

Ethernet Controller Problem	Actions
Ethernet link status LED does not work.	Check the following: • Make sure that the hub is powered on. • Check all connections at the Ethernet controller and the hub. • Use another port on the hub. • If the hub does not support autonegotiation, manually configure the Ethernet controller to match the hub. • If you manually configured duplex mode, make sure that you also manually configure the speed. • Run diagnostics on the LEDs. • Reseat or replace the adapter.
The Ethernet activity LED does not work.	Check the following: • The network might be idle. Try sending data from this device. • Run diagnostics on the LEDs.
Data is incorrect or sporadic.	Check the following: • Make sure that you are using Category 5 or higher cabling when operating the device at 100 Mbps or 1000 Mbps. • Make sure that the cables do not run close to noise-inducing sources such as fluorescent lights.

Table 5-1   *Ethernet Troubleshooting Chart (continued)*

Ethernet Controller Problem	Actions
The Ethernet controller stopped working when another adapter was added to the device.	Check the following: • Make sure that the cable is connected to the Ethernet controller. • Make sure that your PCI system BIOS code is current. • Reseat the adapter. • Determine if the interrupt (IRQ) setting assigned to the Ethernet adapter is also assigned to another device in the system. Use the configuration/setup utility program to determine if this is the case. • Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet adapter or the other device. • Reseat or replace the adapter.
The Ethernet controller stopped working without apparent cause.	Check the following: • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reseat or replace the adapter.

Identifying Problems Using Trouble Indicators and Status LEDs

If the system error LED on the front of the device is on, one or more LEDs inside the device or on the power supply will be on. Your device has LEDs to help you identify problems with some device components. These LEDs are part of the Light Path Diagnostics feature built into the device. By following the path of lights, you can quickly identify the type of system error that occurred.

Your device is designed so that any LEDs that are on remain on when the device shuts down as long as the AC power source is good and the power supply can supply +5 VDC current to the device. This feature helps you isolate the problem if an error causes the device to shut down. (See Table 5-4.)

Power Supply LEDs

The AC power LED on the power supply provides status information about the power supply. Table 5-2 describes the AC power LED.

Table 5-2   *Power Supply LED*

AC Power LED	Description and Action
On	The power supply is on and operating correctly.
Off	There is an AC power problem. Possible causes are: 1. There is no AC power to the power supply. 　Verify these items: 　a. The electrical cord is properly connected to the device. 　b. The electrical outlet functions properly. 2. Disconnect the ribbon cable from connector J25 on the system board. If the AC power LED comes on, see the "Undetermined Problems" section on page 5-25. 3. The power supply has failed and needs to be replaced. Have the system serviced.

System Error LED

If the system error LED on the front of the device is on, one or more LEDs inside the device might be on. Use the Light Path Diagnostic panel to quickly identify the type of error that occurred. For LED locations, see Figure 5-1.

Your device is designed so that LEDs remain on when the device shuts down as long as the power supply is operating properly. This feature helps you to isolate the problem even if an error causes the device to shut down.

Figure 5-1   ***System Board LED Locations***
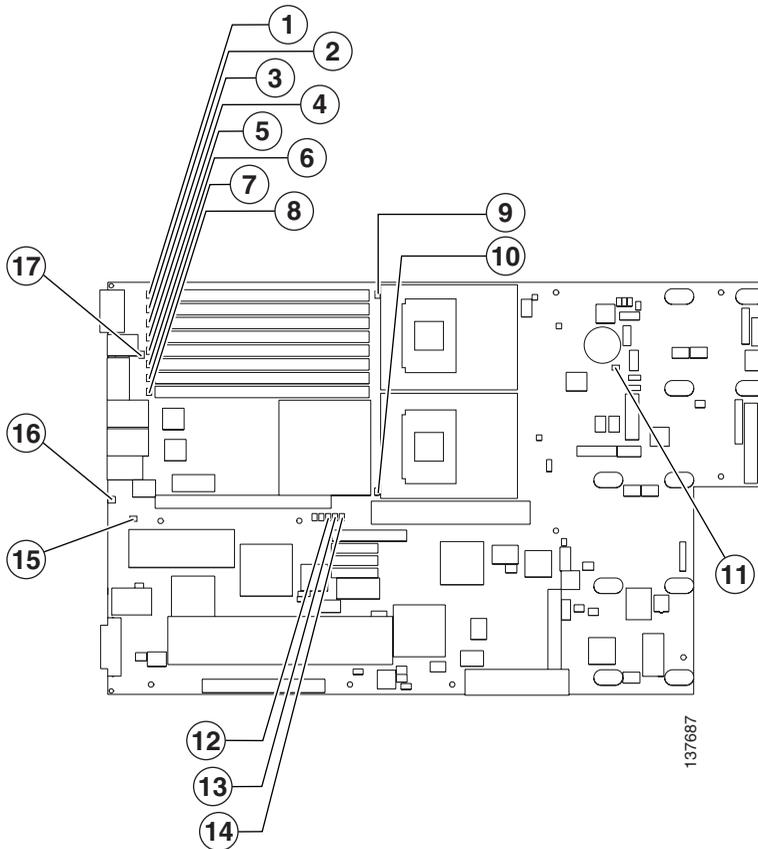
1	DIMM 1 Error LED	8	DIMM 8 Error LED
2	DIMM 2 Error LED	9	Microprocessor 1 Error LED
3	DIMM 3 Error LED	10	Microprocessor 2 Error LED
4	DIMM 4 Error LED	11	3V Battery Error LED

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5	DIMM 5 Error LED	12	NVRAM Battery Error LED
6	DIMM 6 Error LED	13	System Board Error LED
7	DIMM 7 Error LED	14	VRM Error LED

Diagnostic Panel LEDs

Figure 5-2 shows the LEDs on the diagnostic panel inside the device. See Table 5-4 for information about identifying problems using these LEDs.

Figure 5-2   Diagnostic Panel LEDs
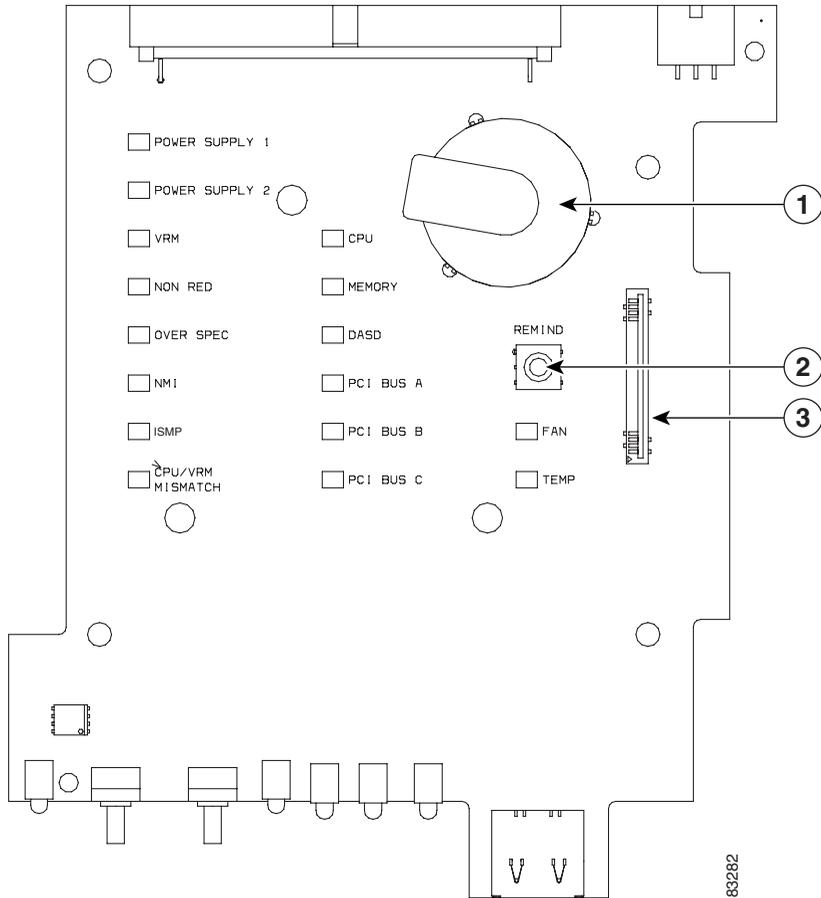
1	Speaker	3	Disk drive connector (not supported)
2	Remind button		

The Light Path Diagnostics LEDs are described in Table 5-3.

Note Depending on your device model, these items might appear in a different order on the LED panel than what is shown in the figure.

Table 5-3   Diagnostic Panel LEDs

Diagnostic Panel LED	Description
POWER SUPPLY 1	The power supply in bay 1 failed.
POWER SUPPLY 2	The power supply in bay 2 failed.
VRM	An error occurred on microprocessor voltage regulator module (VRM).
CPU	One or both microprocessors failed, or one is seated in the wrong socket.
NON-RED	Device power supplies are no longer redundant (applicable only with the redundant power feature).
MEMORY	Memory failure. One or more dual inline memory modules (DIMMs) failed.
OVER SPEC	The system has shut down because of a system overload condition.
DASD	The SCSI backplane or a device connected to a SCSI bus failed.
	DASD devices are not supported in Cisco ACNS software.
NMI	Nonmaskable interrupt occurred.
PCI BUS A	An error occurred on an adapter in PCI-X slots 1 or 2 or one of the integrated PCI devices on the system board.
ISMP BUS	Service processor failure.
PCI BUS B	An error occurred on an adapter in PCI-X slots 3 or 4.
FAN	A fan (1, 2, 3, 4, 5, 6, 7, or 8) failed or is operating slowly.
CPU/VRM MISMATCH	The service processor detected a CPU or VRM mismatch.
PCI BUS C	An error occurred on an adapter in PCI slot 5.
TEMP	System temperature exceeded maximum rating.

Note   The device supports a maximum of three PCI buses.

Remind Button

You can use the Remind button to place the front panel system error LED into the Remind mode. By pressing the button, you acknowledge the failure but indicate that you will not take immediate action. If a new failure occurs, the system error LED comes on again.

In the Remind mode, the system error LED flashes every 2 seconds. The system error LED remains in the Remind mode until one of the following situations occurs:

- All known problems are resolved.

- The system is restarted.

- A new problem occurs.

You can use the Remind button to delay device maintenance until a later time. Also, resetting the system error LED enables the LED to react to another error. If the LED is still flashing from the first error, it masks additional errors.

Using Light Path Diagnostics

The system error LED on the front of the device is on when certain system errors occur. If the system error LED on your device is on, use Table 5-4 to help determine the cause of the error and the action needed. These actions should only be performed by qualified service personnel.

Table 5-4   *Light Path Diagnostics*

System Error LED (on the Outside Front Panel)	Diagnostic Panel LED	Cause	Action
On A system error was detected. Check to see which LEDs on the diagnostic panel inside the device are on.	None	The system error log is 75% or more full or a PFA alert was logged.	Check the system error log and correct any problems. Disconnecting the device from all power sources for at least 20 seconds turns off the system error LED.
On	CPU	One of the microprocessors has failed, or a microprocessor is installed in the wrong socket.	1. Check the microprocessor error LEDs on the system board. If a microprocessor error LED is on for a microprocessor socket that is empty, the microprocessors are not installed in the correct order. 2. If the problem remains, the microprocessor needs to be reseated or replaced. Have the system serviced.
On	VRM	One of the microprocessor VRMs has failed.	1. Check the microprocessor VRM connectors on the system board to locate the error LED next to the failing component. 2. If the problem remains, the microprocessor VRM needs to be reseated or replaced. Have the system serviced.

Table 5-4   Light Path Diagnostics (continued)

System Error LED (on the Outside Front Panel)	Diagnostic Panel LED	Cause	Action
On	MEMORY	A memory error occurred.	1. Check the DIMM error LEDs on the system board. 2. The DIMM indicated by the DIMM error LED needs to be replaced. Have the system serviced.
On	PCI BUS A PCI BUS B PCI BUS C	An error occurred on PCI bus A, B, or C. An adapter in PCI slot 1, 2, 3, 4, or 5 or the system board caused the error.	1. Check the adapter slots to locate the error LED next to the failing bus. 2. Check the error log for additional information. 3. If you cannot identify the problem from the error LED or information in the error log, try to identify the failing adapter by removing one adapter at a time from PCI bus A (PCI-X slots 1 or 2), PCI bus B (PCI-X slots 3 or 4), or PCI bus C (PCI slot 5) and restarting the device after each adapter is removed.
On	DASD	A hard disk drive has failed on SCSI channel B.	The error pertains to DASD devices, which are not supported in Cisco ACNS software.
On	NMI	A nonmaskable interrupt occurred. The PCI BUS LED will probably also be on.	If the PCI BUS LED is on, follow the instructions for those LEDs. If the PCI BUS LED is not on, restart the device.

Table 5-4   *Light Path Diagnostics (continued)*

System Error LED (on the Outside Front Panel)	Diagnostic Panel LED	Cause	Action
On	SP BUS	The service processor has failed.	The service processor needs to be replaced. Have the system serviced.
On	POWER SUPPLY 1	The power supply in bay 1 has failed.	The power supply in bay 1 needs to be replaced. Have the system serviced.
On	POWER SUPPLY 2	The power supply in bay 2 has failed.	The power supply in bay 2 needs to be replaced. Have the system serviced.
On	NON-RED	The device is operating in a nonredundant power mode and one of these two conditions exists: • Two power supplies are installed in the device, and one power supply has either failed or is not connected to a functioning AC electrical outlet. • The system has exceeded the power capabilities of one of the redundant power supplies.	**Note** This LED will not be on if your device has only one power supply; however, the power is not redundant with only one power supply installed. Check the power supply LEDs to identify the failing power supply. 1. Check the power supply connections. 2. If a power supply has failed, it needs to be replaced. Have the system serviced. 3. If neither LED is on, you can remove optional devices from the device to restore redundancy.

Table 5-4   Light Path Diagnostics (continued)

System Error LED (on the Outside Front Panel)	Diagnostic Panel LED	Cause	Action
On	FAN	One of the fans has failed or is operating too slowly. The LED on the failing fan is on. **Note** A failing fan can also cause the TEMP LED to be on.	The fan needs to be replaced. Have the system serviced.
On	TEMP	The system temperature has exceeded the maximum rating.	1. Check to see whether a fan has failed. If it has, the fan needs to be replaced. Have the system serviced. 2. Make sure that the room temperature is not too high. (See the "Wide Area Application Engine 7326 Hardware Specifications" section on page A-1.)

Undetermined Problems

Use the information in this section if the diagnostic tests did not identify the failure, the devices list is incorrect, or the system is inoperative.

Note   Damaged data in CMOS can cause undetermined problems.

Note   Damaged data in BIOS code can cause undetermined problems.

Check the LEDs on all the power supplies. If the LEDs indicate the power supplies are working correctly, follow these steps:

Step 1   Power down the device.

Step 2   Be sure the device is cabled correctly.

Step 3   Remove or disconnect the following devices (one at a time) until you find the failure (power up the device and reconfigure it each time):

- Any external devices
- Surge suppressor device (on the device)
- Modem, printer, mouse, or non-Cisco devices
- Each adapter
- Disk drives
- Memory modules (minimum requirement = 256 MB [two banks of 128-MB DIMMs])

> **Note**   Any component that is internal to the device, with the exception of customer-replaceable adapters, must be serviced by a licensed service technician. Contact your service representative.

Step 4   Power up the device. If the problem remains, suspect the following parts in the order listed:

a.   Power supply

b.   Power cage assembly

c.   System board

> **Note**   If the problem goes away when you remove an adapter from the system, and replacing that adapter does not correct the problem, suspect the system board.

✎

Note   If you suspect a networking problem and all the system tests pass, suspect a network cabling problem external to the system.

Problem-Solving Tips

Because of the variety of hardware and software combinations that can be encountered, use the following information to assist you in identifying the problems. If possible, have this information available when requesting technical assistance.

- Machine type and model

- Microprocessor or hard disk upgrades

- Failure symptom

    - Do diagnostics fail?

    - What, when, where; single or multiple systems?

    - Is the failure repeatable?

    - Has this configuration ever worked?

    - If it has been working, what changes were made before it failed?

    - Is this the original reported failure?

- Diagnostics type and version level

- Hardware configuration

    - Print (print screen) configuration currently in use

    - BIOS level

- Operating system software type and version level

To eliminate confusion, identical systems are considered identical only if they meet all these conditions:

- Are the exact machine type and models

- Have the same BIOS level

- Have the same adapters or attachments in the same locations

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- Have the same address jumpers, terminators, and cabling

- Have the same software versions and levels

- Have the same diagnostics code

- Have the same configuration options set in the system

- Have the same setup for the operating system control files

Comparing the configuration and software setup in working and nonworking systems often leads to resolution of the problem.

Symptoms and Solutions

This section lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this symptom-to-solution index to help you decide which components your service representative needs to have available when servicing the system.

The first column of the three-column tables in this section lists the error code or message, the second column describes the error, and the third column lists one or more suggested actions or components that need to be reseated or replaced. Use the table to identify possible causes for the error message and then call your service representative.

The POST BIOS code displays POST error codes and messages on the screen.

Beep Symptoms

Beep symptoms are short tones or a series of short tones separated by pauses (intervals without sound). See the examples in the following table.

Beeps	Description
1-2-3	**1.** One beep
	2. A pause (or break)
	3. Two beeps
	4. A pause (or break)
	5. Three beeps
4	Four continuous beeps

One beep after a successful POST indicates that the system is functioning properly.

Table 5-5 lists the beep symptoms, describes the error, and suggests causes and possible actions to solve the problems. The most likely cause of the symptom is listed first.

Table 5-5   *Beep Symptoms*

Beep Symptom	Error	Cause and Action
1-1-2	Microprocessor register test failed.	**1.** Check the optional microprocessor (if installed).
		2. Check the microprocessor.
		3. Check the system board.
1-1-3	CMOS[1] write/read test failed.	**1.** Check the battery.
		2. Check the system board.
1-1-4	BIOS EEPROM checksum failed.	**1.** Recover the BIOS.
		2. Check the system board.
1-2-1	Programmable interval timer failed.	Check the system board.
1-2-2	DMA[2] initialization failed.	Check the system board.
1-2-3	DMA page register write/read failed.	Check the system board.

Table 5-5   *Beep Symptoms (continued)*

Beep Symptom	Error	Cause and Action
1-2-4	RAM refresh verification failed.	1. Check the DIMM. 2. Check the system board.
1-3-1	First 64K RAM test failed.	Check the DIMM.
2-1-1	Secondary DMA register failed.	Check the system board.
2-1-2	Primary DMA register failed.	Check the system board.
2-1-3	Primary interrupt mask register failed.	Check the system board.
2-1-4	Secondary interrupt mask register failed.	Check the system board.
2-2-1	Interrupt vector loading failed.	Check the system board.
2-2-2	Keyboard[3] controller failed.	Not applicable.
2-2-3	CMOS power failure and checksum checks failed.	1. Check the battery. 2. Check the system board.
2-2-4	CMOS configuration information validation failed.	1. Check the battery. 2. Check the system board.
2-3-1	Screen initialization failed.	Check the system board.
2-3-2	Screen memory failed.	Check the system board.
2-3-3	Screen retrace failed.	Check the system board.
2-3-4	Search for video ROM failed.	The video feature is not supported in the Wide Area Application Engine 7326.
2-4-1	Video failed; screen believed operable.	The video feature is not supported in the Wide Area Application Engine 7326.
3-1-1	Timer tick interrupt failed.	Check the system board.
3-1-2	Interval timer channel 2 failed.	Check the system board.
3-1-3	RAM test failed above address OFFFFH.	1. Check the DIMM. 2. Check the system board.
3-1-4	Time of day clock failed.	1. Check the battery. 2. Check the system board.

Table 5-5   Beep Symptoms (continued)

Beep Symptom	Error	Cause and Action
3-2-1	Serial port failed.	Check the system board.
3-2-2	Parallel port failed.	Check the system board.
3-2-3	Math coprocessor test failed.	1. Check the microprocessor. 2. Check the system board.
3-2-3	Failure comparing CMOS memory size against actual.	1. Check the DIMM. 2. Check the battery.
3-3-1	Memory size mismatch occurred.	1. Check the DIMM. 2. Check the battery.
3-3-2	Critical SMBUS error occurred.	1. Check the power cord connection. Disconnect the device power cord from the outlet, wait 30 seconds, and retry. 2. Check the system board. 3. Check the DIMMs. 4. Check the power supply. 5. Check the power cage assembly. 6. Check the I2C cable.
3-3-3	No operational memory in system.	1. Check the memory modules. The memory modules need to be installed or reseated and then a 3-boot reset needs to be performed. Contact your service representative. 2. Check the DIMMs. 3. Check the memory board. 4. Check the system board.
4-4-4	Optional system management adapter not installed in slot 1 or not functioning correctly.	Pertains to a nonavailable hardware option. Not applicable to the device.

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Table 5-5   Beep Symptoms (continued)

Beep Symptom	Error	Cause and Action
Two short beeps	Information only, the configuration has changed.	1. Run diagnostics. 2. Run the configuration/setup utility program.
Three short beeps		1. Check the DIMM. 2. Check the system board.
One continuous beep		1. Check the microprocessor. 2. Check the optional microprocessor (if installed). 3. Check the system board.
Repeating short beeps		This error pertains to keyboards, which are not supported in Cisco ACNS software.
One long and one short beep		This error pertains to video adapters, which are not supported in the Wide Area Application Engine 7326.
One long and two short beeps		This error pertains to video adapters, which are not supported in the Wide Area Application Engine 7326.
One long and three short beeps		This error pertains to monitors or video adapters. These items are not supported in the Wide Area Application Engine 7326.
Two long and two short beeps		This error pertains to video adapters, which are not supported in the Wide Area Application Engine 7326.

1. CMOS = Complementary Metal Oxide Semiconductor

2. DMA = Direct Memory Access

3. ACNS software does not support keyboards. No keyboard errors are expected; however, if a keyboard error appears during bootup, contact the Cisco Technical Assistance Center.

No Beep Symptoms

Table 5-6 describes the no beep symptoms.

Table 5-6   *No Beep Symptoms*

No Beep Symptom	Error	Cause and Action
No beep and the system operates correctly.		1. Check the speaker cables. 2. Check the speaker. 3. Check the system board.
No beeps occur after POST is successfully completed.	The power-on status is disabled.	1. Set the start options power-up status to enable. 2. Check the speaker connection. 3. Check the system board.
No AC power.	Power supply AC LED is off.	1. Check the power cord. 2. Check the power supply. (If two are installed, swap them to determine if one is defective.) 3. Disconnect the ribbon cable from connector J25 on the system board. If the AC power LED comes on, see the "Undetermined Problems" section on page 5-25. 4. Check the power cage assembly.
No beep and no video.		The video feature is not supported in the Wide Area Application Engine 7326.
System will not start.	Power supply AC LED is on.	See the "Power Supply LED Errors" section on page 5-50.

System Error LED and the Diagnostic Panel LEDs

The system error LED is on when an error is detected. If the system error LED is on, remove the cover and check the diagnostic panel LEDs. Table 5-3 lists all the diagnostic panel LEDs followed by the component or action for correcting the problem. The information in the table is valid only when the system error LED is on.

When checking the diagnostic panel LEDs, note the following information:

- If a diagnostic panel LED is on and the front panel system error LED is off, there is probably an LED problem. Run the LED diagnostics.

- To locate the LEDs on the system board, see Figure 5-1 on page 5-17.

- Check the system error log for additional information before replacing a component. (See the "Viewing Error Logs" section on page 5-10.)

- The DIMM error LEDs, microprocessor error LEDs, and VRM error LEDs on the system board go off when the system is powered down.

Table 5-7 provides the diagnostic panel LED error definitions. The third column lists one or more suggested actions or components that need to be reseated or replaced. Use this table to identify possible causes for the error message and then call your service representative.

Table 5-7   ***Diagnostic Panel LED Error Definitions***

Diagnostic Panel LED	Description	Cause and Action
All LEDs off	Check system error log for error condition and then clear the system error log when the problem is found.	1. System error log is 75% full; clear the log. 2. PFA alert; check log for failure; clear PFA alert; disconnect AC power for at least 20 seconds, reconnect, and then power up the system. 3. Run Light Path Diagnostics.
Fan LED on	The LED next to the failing fan is on.	1. Failing fan. 2. Check the system board.
Memory LED on	The LED next to the failing DIMM is on.	1. Failing DIMM. 2. Check the system board.
CPU LED on	The LED next to the failing CPU is on.	1. Verify that all microprocessors have identical cache sizes, dock speeds, and clock frequencies. 2. Check microprocessor 1 or 2. 3. Check the system board.

Table 5-7   Diagnostic Panel LED Error Definitions (continued)

Diagnostic Panel LED	Description	Cause and Action
PCI BUS LED on	An error has occurred on a PCI Bus.	1. Remove all PCI adapters from slots on the affected bus. (See Figure 5-1 on page 5-17 for bus information, and see the "Working with Adapters" section on page 4-3.) 2. Check the system board.
VRM LED on	The LED next to the failing VRM is on.	1. Check the voltage regulator module indicated by the VRM LED. 2. Check the microprocessor indicated by the microprocessor LED.
DASD LED on	The LED located next to the drive bay of the failing drive is on. Check the amber drive LED for the failing hard drive.	The error pertains to DASD devices, which are not supported in Cisco ACNS software.
Service processor bus LED is on	The service processor has failed.	1. Unplug the device for 30 seconds, and then retry. 2. Reflash or update firmware for the ISMP and BIOS. 3. Check the system board.
Power supply 1 LED on	When the LED is lit, the power supply in bay 1 has failed. When the LED flashes, an invalid power-supply configuration has occurred.	1. Check the DC good LED on power supply 1. If it is off, power supply 1 needs to be replaced. Have the system serviced. 2. Check the power cage assembly.
Power supply 2 LED on	When the LED is lit, the power supply in bay 2 has failed. When the LED flashes, an invalid power-supply configuration has occurred.	1. Check the DC good LED on power supply 2. If it is off, power supply 2 needs to be replaced. Have the system serviced. 2. Check the power cage assembly.
NMI LED on	A machine check error has occurred.	1. Restart the device. 2. Check the system error log.

Table 5-7   Diagnostic Panel LED Error Definitions (continued)

Diagnostic Panel LED	Description	Cause and Action

Temperature LED on	The system temperature has exceeded a threshold level.	1. Ambient temperature must be within normal operating specifications. See the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications.".
		
		2. Ensure that fans are operating correctly.
		
		3. Ensure that both air baffles are installed.
		
		4. Examine the system error log.
		
		   a. System is over recommended temperature.
		      Check the information LED panel.
		
		   b. System is over recommended temperature for CPU x (where x is 1 or 2) (CPU LED is also on).
		      Check CPU x.
		      Check the system board.
		
		5. If the CPU LED on the diagnostic panel is also on, one of the microprocessors has caused the error.

Fan LED on	When the LED is lit, a fan has failed or is operating too slowly. A failing fan can also cause the TEMP LED to be lit. When the LED flashes, an invalid fan configuration has occurred.	1. Check individual fan LEDs. 2. Have the respective fan replaced. 3. Check the fan cable. 4. Check the system board. 5. Check the power cage assembly.

Diagnostic Error Codes

In the following error codes, if *XXX* is 000, 195, or 197, *do not* replace a component. The descriptions for these error codes are as follows:

- 000—The test passed.

- 195—The Esc key was pressed to stop the test.

- 197—Warning; a hardware failure might not have occurred.

For all remaining error codes, the solution is to check the component or take the action indicated. Table 5-8 lists all the diagnostic error codes. Use this table to identify a faulty component, and then call your service representative for assistance.

Table 5-8   Error Code Definitions

Error Code	Problem	Action
001-XXX-000	Failed core tests.	Check the system board.
001-XXX-001	Failed core tests.	Check the system board.
001-250-000	Failed system board ECC.	Check the system board.
001-250-001	Failed system board ECC.	Check the system board.
005-XXX-000	Failed video test.	The video feature is not supported in the Wide Area Application Engine 7326.
011-XXX-000	Failed COM1 serial port test.	Check the system board.
011-XXX-001	Failed COM2 serial port test.	Check the system board.
014-XXX-000	Failed parallel port test.	Check the system board.
015-XXX-001	USB[1] interface not found, board damaged.	Not applicable. The USB interface is not supported in ACNS software.
015-XXX-015	Failed USB[1] external loopback test.	Not applicable. The USB interface is not supported in ACNS software.
015-XXX-198	USB[1] device connected during USB test.	Not applicable. USB peripheral devices are not supported in ACNS software.
020-XXX-000	Failed PCI interface test.	Check the system board.

Table 5-8   *Error Code Definitions (continued)*

Error Code	Problem	Action
020-XXX-001	Failed hot-swappable slot 1 PCI latch test.	1. Check the PCI hot-swappable latch assembly. 2. Check the system board.
020-XXX-002	Failed hot-swappable slot 2 PCI latch test.	1. Check the PCI hot-swappable latch assembly. 2. Check the system board.
020-XXX-003	Failed hot-swappable slot 3 PCI latch test.	1. Check the PCI hot-swappable latch assembly. 2. Check the system board.
020-XXX-004	Failed hot-swappable slot 4 PCI latch test.	1. Check the PCI hot-swappable latch assembly. 2. Check the system board.
030-XXX-000	Failed internal SCSI interface test.	Check the system board.
035-XXX-099		1. No adapters were found. 2. If an adapter is installed, recheck the connection.
035-XXX-S99	Failed RAID[2] test on PCI slot S. S = number of failing PCI slot. Check system error log before replacing a FRU.[3]	1. Check the adapter. 2. Check the SCSI backplane. 3. Check the cable.
035-XXX-SNN	Check system error log before replacing a FRU. *s* = number of failing PCI slot. *nn* = SCSI ID of failing fixed disk.	Hard disk drive with SCSI ID *nn* on RAID adapter in PCI slot *s*.

Table 5-8   Error Code Definitions (continued)

Error Code	Problem	Action
035-253-S99	RAID adapter initialization failure.	1. ServeRAID adapter in slot *s* is not configured properly. 2. Check the cable. 3. Check the SCSI backplane. 4. Check the adapter.
075-XXX-000	Failed power supply test.	Check the power supply.
089-XXX-001	Failed microprocessor test.	1. Check VRM 1 for microprocessor 1. 2. Check the microprocessor 1.
089-XXX-002	Failed optional microprocessor test.	1. Check VRM 2 for optional microprocessor 2. 2. Check the optional microprocessor 2.
166-198-000 System Management: Aborted	Unable to communicate with ASM[4]. It may be busy. Run the test again.	1. Run the diagnostic test again. 2. Correct other error conditions, including other failed system management tests, and retry. 3. Disconnect all device and option power cords from the device, wait 30 seconds, reconnect, and retry. 4. Check the system board.
166-201-001 System Management: Failed	I2C bus error(s). See SERVPROC and DIAGS entries in event log.	1. Memory DIMMs need to be reseated. Call your service representative. 2. Check the memory DIMMs. 3. Check the system board.
166-201-002 System Management: Failed	I2C bus error(s). See SERVPROC and DIAGS entries in event log.	1. I2C cable between the operator information panel and the system board (J22) might need to be reseated. Call your service representative. 2. Check the diagnostic panel. 3. Check the system board.

Table 5-8   Error Code Definitions (continued)

Error Code	Problem	Action
166-201-003 System Management: Failed	I2C bus error(s). See SERVPROC and DIAGS entries in event log.	1. Cables between the system board and the power supply or power cage assembly might need to be reseated. Call your service representative. 2. Check the power cage assembly. 3. Check the system board.
166-201-004 System Management: Failed	I2C bus error(s). See SERVPROC and DIAGS entries in event log.	Check the system board.
166-201-005 System Management: Failed	I2C bus error(s). See SERVPROC and DIAGS entries in event log.	1. Memory DIMMs might need to be reseated. Have your system serviced. 2. Microprocessors might need to be reseated. Have your system serviced. 3. Check the memory DIMMs. 4. Check the microprocessors. 5. Check the system board.
166-250-000 System Management: Failed	I2C cable is disconnected.	1. Check the I2C cables. 2. Check the ASM. 3. Check the system board.
166-260-000 System Management: Failed	Restart ASM error. After restarting, communication was lost. Unplug and cold boot to reset ASM.	Disconnect all device and hardware option power cords from the device, wait 30 seconds, reconnect, and retry.
166-342-000 System Management: Failed	ASM processor BIST[5] indicates failed tests.	1. Ensure that you have the latest firmware levels for the BIOS. 2. Disconnect all device and hardware option power cords from Wide Area Application Engine, wait 30 seconds, reconnect, and retry.

Table 5-8   Error Code Definitions (continued)

Error Code	Problem	Action
166-400-000 System Management: Failed	ISMP self-test result failed tests: x where x = Flash, RAM, or ROM.	1. Reflash or update firmware for ISMP. 2. Check the system board.
180-XXX-000	Diagnostics LED failure.	Run diagnostic panel LED test for the failing LED.
180-XXX-001	Failed front LED panel test.	1. Check the operator information panel. 2. Check the system board.
180-XXX-002	Failed diagnostic LED panel test.	1. Check the diagnostic panel. 2. Check the system board.
180-361-003	Failed fan LED test.	1. Check the fan(s). 2. Check the system board.
180-XXX-003	Failed system board LED test.	Check the system board.
180-XXX-005	Failed SCSI backplane LED test.	1. Check the SCSI backplane. 2. Check the SCSI backplane cable. 3. Check the system board.
201-XXX-0NN	Failed memory test.	1. Check the DIMM location slots 1–6 where nn = DIMM location. **Note** nn 1 = DIMM 1 nn 2 = DIMM 2 nn 3 = DIMM 3 nn 4 = DIMM 4 2. Check the system board.
201-XXX-999	Multiple DIMM failure; see error text.	1. See error text for failing DIMMs. 2. Check the system board.
202-XXX-001	Failed system cache test.	1. Check VRM 1. 2. Check microprocessor 1.

Table 5-8   Error Code Definitions (continued)

Error Code	Problem	Action
202-XXX-002	Failed system cache test.	1. Check VRM 2. 2. Check microprocessor 2.
206-XXX-000	Failed disk[6] drive test.	Not applicable. No disk drive installed.
215-XXX-000	Failed IDE CD-ROM drive test.	1. Check the CD-ROM drive cables. 2. Check the CD-ROM drive. 3. Check the system board.
217-198-XXX	Could not establish drive parameters.	1. Check cable and termination. 2. Check the SCSI backplane. 3. Check the hard disk.
217-XXX-000	Failed BIOS hard disk test.	Check hard disk 1.
217-XXX-001	Failed BIOS hard disk test.	Check hard disk 2.
217-XXX-002	Failed BIOS hard disk test.	Check hard disk 3.
217-XXX-003	Failed BIOS hard disk test.	Check hard disk 4.
217-XXX-004	Failed BIOS hard disk test.	Check hard disk 5.
217-XXX-005	Failed BIOS hard disk test	Check hard disk 6.
264-XXX-0NN	Failed tape drive[7] test	Not applicable. No tape drive installed.
264-XXX-999	Errors on multiple tape drives, see error text for more information.	Not applicable. No tape drive installed.
301-XXX-000	Failed keyboard[8] test.	Not applicable.
405-XXX-000	Failed Ethernet test on controller on the system board.	1. Verify that Ethernet is not disabled in the BIOS. 2. Check the system board.
405-XXX-00N	Failed Ethernet test on adapter in PCI slot *n*.	1. Check the adapter in PCI slot *n*. 2. Check the system board.
415-XXX-000	Failed modem[9] test.	Not applicable. No modem installed.

1. USB = Universal Serial Bus. ACNS software does not support USB peripheral devices.

2. RAID = redundant array of inexpensive disks.

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3. FRU = field-replaceable unit.

4. ASM = advanced system management adapter.

5. BIST = built-in self-test.

6. ACNS software does not support disk drives. No disk drive errors are expected; however, if a disk drive error appears during bootup, contact the Cisco Technical Assistance Center.

7. ACNS software does not support tape drives. No tape drive errors are expected; however, if a tape drive error appears during bootup, contact the Cisco Technical Assistance Center.

8. ACNS software does not support keyboards. No keyboard errors are expected; however, if a keyboard error appears during bootup, contact the Cisco Technical Assistance Center.

9. ACNS software does not support modems. No modem errors are expected; however, if a modem error appears during bootup, contact the Cisco Technical Assistance Center.

Error Symptoms

You can use the error symptom tables to find solutions to problems that have definite symptoms.

If you cannot find the problem in the error symptom tables, go to the "Starting the Diagnostic Programs" section on page 5-9 to test the device.

If you have just added new software or a new hardware option and your device is not working, complete the following steps before using the error symptom tables:

Step 1   Remove the software or hardware option that you just added.

Step 2   Run the diagnostic tests to determine if your device is running correctly.

Step 3   Reinstall the new software or new hardware option.

In the following tables (Table 5-9 to Table 5-19), the first entry in the "Cause and Action" column is the most likely cause of the symptom.

Table 5-9   *CD-ROM Drive Problems*

Symptom	Cause and Action
CD-ROM drive is not recognized.	1. Verify the following items: a. The IDE channel to which the CD-ROM drive is attached (primary or secondary) is enabled in the configuration/setup utility program. **Note** On a device with a single IDE channel, only the primary channel can be used. b. All cables and jumpers are installed correctly. c. The correct device driver is installed for the CD-ROM drive. 2. Run CD-ROM drive diagnostics. 3. Check the CD-ROM drive.

Table 5-10   *Expansion Enclosure Problems*

Symptom	Cause and Action
The SCSI expansion enclosure used to work but does not work now.	Verify the following items: 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI hardware option before powering on the device.

Table 5-11   Hard Disk Drive Problems

Symptom	Cause and Action
Not all drives are recognized by the hard disk drive diagnostic test (fixed disk test).	1. Remove the first drive not recognized and try the hard disk drive diagnostic test again. 2. If the remaining drives are recognized, the drive that you removed needs to be replaced.
System stops responding during hard disk drive diagnostic test.	1. Remove the hard disk drive being tested when the device stopped responding and try the diagnostic test again. 2. If the hard disk drive diagnostic test runs successfully, the drive that you removed needs to be replaced.

Table 5-12   General Problems

Symptom	Cause and Action
Problems such as broken cover locks or indicator LEDs not working.	Broken component. Call your service representative.

Table 5-13   Intermittent Problems

Symptom	Cause and Action

A problem occurs only occasionally and is difficult to detect.	1. Verify the following items:
	
	   a. All cables and cords are connected securely to the rear of the device and attached hardware options.
	
	   b. When the device is powered on, air is flowing from the rear of the device at the fan grille. If there is no airflow, the fan is not working. This causes the device to overheat and shut down.
	
	   c. Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly.
	
	2. Check the system error log.

Table 5-14   Memory Problems

Symptom	Cause and Action

The amount of system memory displayed is less than the amount of physical memory installed.	**1.** Verify the following items:
	
	   a. The memory modules are seated properly.
	
	   b. The correct type of memory has been installed.
	
	   c. All banks of memory on the DIMMs are enabled. The device might have automatically disabled a DIMM bank when it detected a problem, or a DIMM bank could have been manually disabled.
	
	2. Check the POST error log for error message 289:
	
	   a. If the DIMM was disabled by a system management interrupt (SMI), the DIMM needs to be replaced. Have the system serviced.
	
	   b. If the DIMM was disabled by the user or by POST, follow these steps:
	
	     – Start the configuration/setup utility program.
	
	     – Enable the DIMM.
	
	     – Save the configuration and restart the device.
	
	3. Check the DIMM.
	
	4. Check the system board.

Table 5-15   Microprocessor Problems

Symptom	Cause and Action
The device emits a continuous tone during POST. (The startup [boot] microprocessor is not working properly.)	**1.** Verify that the startup microprocessor is seated properly. **2.** Check the startup microprocessor.

Table 5-16   *Hardware Option Problems*

Symptom	Cause and Action

A hardware option that was just installed does not work.	**1.** Verify the following items:
	
	  a. The hardware option is designed for the device.
	
	  b. You followed the installation instructions that came with the hardware option.
	
	  c. The hardware option is installed correctly.
	
	  d. You have not loosened any other installed hardware options or cables.
	
	  e. You updated the configuration information in the configuration/setup utility program. Whenever a hardware option is changed, you must update the configuration.
	
	2. Check the hardware option that you just installed.

A hardware option that used to work does not work now.	**1.** Verify that all of the hardware options and cable connections are secure.
	
	2. If the hardware option comes with its own test instructions, use those instructions to test the option.
	
	3. If the failing hardware option is a SCSI option, verify these items:
	
	  a. The cables for all external SCSI options are connected correctly.
	
	  b. The last hardware option in each SCSI chain, or the end of the SCSI cable, is terminated correctly.
	
	  c. Any external SCSI option is turned on. You must turn on an external SCSI option before powering on the device.
	
	4. Check for a failing hardware option.

Table 5-17   **Power Problems**

Symptom	FRU or Action
The device does not power up.	**1.** Verify the following items: **a.** The power AC LEDs are on. **b.** The power cables are properly connected to the device. **c.** The electrical outlet functions properly. **d.** The type of memory installed is correct. **e.** If you just installed a hardware option, remove it, and restart the device. If the device now powers up, you might have installed more hardware options than the power supply supports. **2.** If LEDs for CPUs or VRMs are on, verify these items: **a.** A VRM is populated for each microprocessor. **b.** All microprocessors have identical cache sizes, dock speeds, and clock frequencies. **c.** Override the front panel push button by turning on switch 7 of SW1; if power comes on, then there is a service processor error and the power reset card needs to be replaced. **3.** See the "Undetermined Problems" section on page 5-25.
The device does not power down.	**1.** Determine whether you are using an ACPI [1] or non-ACPI operating system. If you are using a non-ACPI operating system: **a.** Press **Ctrl+Alt+Delete**. **b.** Power down the system by holding the power control button for 4 seconds. **c.** If the device fails during BIOS POST and the power control button does not work, remove the AC power cord. **2.** If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

1. APCI = Advanced Configuration and Power Interface.

Table 5-18   *Serial Port Problems*

Symptom	FRU or Action
The number of serial ports identified by the operating system is less than the number of serial ports installed.	**1.** Verify the following items: **a.** Each port is assigned a unique address by the configuration/setup utility program and none of the serial ports is disabled. **b.** The serial port adapter, if you installed one, is seated properly. **2.** Check for failing serial port adapter.
A serial device does not work. For more information about the serial port, see the "Serial Port Connector" section on page 1-13.	**1.** Verify the following items: **a.** The device is compatible with the WAE. **b.** The serial port is enabled and is assigned a unique address. **c.** The device is connected to the correct port (see the "Input/Output Ports and Connectors" section on page 1-11). **2.** Check for a failing serial device. **3.** Check the serial adapter, if installed. **4.** Check the system board.

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Table 5-19   Software Problems

Symptom	Cause and Action
Suspected software problem.	1. To determine if problems are caused by the software, verify the following items: **a.** Your device has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. **Note** If you have just installed an adapter or memory, you might have a memory address conflict. **b.** The software is designed to operate on your device. **c.** Other software works on your device. **d.** The software that you are using works on another device. If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 2. If you have verified these items and the problem remains, contact your place of purchase.

Power Supply LED Errors

Use the information in this section to identify power supply problems.

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

The following items are necessary for the DC good LED to be on:

- Power supply
- Power cage assembly
- System board (switch 7 of SW1 should be set to bypass the power switch; contact your service representative for assistance)

Table 5-20 lists and describes the power supply LED error codes.

Table 5-20   Power Supply Error LEDs

AC Good LED	DC Good LED	Description	Cause and Action
Off	Off	No power to system or AC problem.	1. Check AC power to the system. 2. Disconnect the ribbon cable from connector J25 on the system board. If the AC power LED comes on, see the "Undetermined Problems" section on page 5-25. 3. Check the power supply.

On	Off	Standby mode or DC problem.	1. Check the system board cable connectors J4 and J10. Move switch 7 of SW1 to bypass power control. If the DC good LED is on, press **Ctrl+Alt+Delete**. Watch the console for any POST errors. Check the system error log for any listed problems. If the system starts with no errors, your service technician should reseat or replace the following items:
			    a. Power switch assembly
			    b. System board

Table 5-20   Power Supply Error LEDs (continued)

AC Good LED	DC Good LED	Description	Cause and Action
On	Off		(continued) 2. Remove the adapters and disconnect the cables and power connectors to all internal and external devices. Power up the system. If the DC good LED is on, replace the adapters and devices one at a time until you isolate the problem. 3. Check the power supply. 4. Check the power cage assembly. 5. Check the system board.
On	On	Power is working properly.	No action is required.

POST Error Codes

In the error codes in Table 5-21, *X* can be any number or letter.

Table 5-21   POST Error Codes

Error Code	Symptom	Cause and Action
062	Three consecutive startup failures using the default configuration.	1. Run the configuration/setup utility program. 2. Check the battery. 3. Check the system board. 4. Check the microprocessor.
101, 102	System and processor error.	Check the system board.
106	System and processor error.	Check the system board.

Table 5-21   POST Error Codes (continued)

Error Code	Symptom	Cause and Action
111	Channel check error.	1. Check the memory DIMM. 2. Check the system board.
114	Adapter read-only memory error.	1. Check for failing adapter. 2. Run diagnostics.
129	Internal cache error.	1. Check the microprocessor. 2. Check the optional microprocessor (if installed).
151	Real-time clock error.	1. Run diagnostics. 2. Check the battery. 3. Check the system board.
161	Real-time clock battery error.	1. Check the battery. 2. Check the system board.
162	Device configuration error. Note Be sure to load the default settings and any additional desired settings, and then *save the configuration*.	1. Check the battery. 2. Check for failing device. 3. Check the system board.
163	Real-time clock error.	1. Check the battery. 2. Check the system board.
164	Memory configuration changed.	1. Check the DIMM. 2. Check the system board.
175	Hardware error.	Check the system board.
176	Computer cover or cable cover was removed without a key being used.	Check the system board.
177, 178	Security hardware error.	Check the system board.
184	Power-up password damaged.	Check the system board.
185	Drive startup sequence information corrupted.	Check the system board.

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Table 5-21 **POST Error Codes (continued)**

Error Code	Symptom	Cause and Action
186	Security hardware control logic failed.	Check the system board.
187	VPD serial number not set.	Check the system board.
188	Bad EEPROM CRC #2.	Check the system board.
189	An attempt was made to access the device with invalid passwords.	Check your passwords.
201	Memory test error. If the device does not have the latest level of BIOS installed, update the BIOS to the latest level and run the diagnostic program again.	1. Check the DIMM. 2. Check the system board.
229	Cache error.	1. Check the microprocessor. 2. Check the optional microprocessor (if installed).
262	DRAM parity configuration error.	1. Check the battery. 2. Check the system board.
289	DIMM disabled by POST or user.	Check for a disabled DIMM, if not disabled by the user.
301	Keyboard[1] or keyboard controller error.	Not applicable.
303	Keyboard[1]controller error.	Not applicable.
602	Invalid disk[2] boot record.	The device does not support a disk drive.
604	Disk[2] drive error.	The device does not support a disk drive.
605	Unlock failure.[2]	The device does not support a disk drive.
662	Disk[2] drive configuration error.	The device does not support a disk drive.
762	Coprocessor configuration error.	1. Check the battery. 2. Check the microprocessor.

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Table 5-21   *POST Error Codes (continued)*

Error Code	Symptom	Cause and Action
962	Parallel port error.	1. Disconnect the external cable on the parallel port. 2. Check the system board.
11XX	System board serial port 1 or 2 error.	1. Disconnect the external cable on the serial port. 2. Check the system board.
1301	I2C cable to front panel not found.	1. Check the cable. 2. Check the front panel. 3. Check the power switch assembly. 4. Check the system board.
1302	I2C cable from system board to power up and reset switches not found.	1. Check the cable. 2. Check the power switch assembly. 3. Check the system board.
1303	I2C cable from system board to power backplane not found.	1. Check the cable. 2. Check the power cage assembly. 3. Check the system board.
1304	I2C cable to diagnostic LED board not found.	1. Check the power switch assembly. 2. Check the system board.

1600	The system management processor is not functioning.	1. Complete the following steps before replacing a FRU:
		  a. Ensure that a jumper is not installed on J34.
		  b. Remove the AC power to the device, and wait 20 seconds.
		  c. Reconnect the AC power and wait 30 seconds.
		  d. Power up the device.
		2. Check the system board.

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Table 5-21   POST Error Codes (continued)

Error Code	Symptom	Cause and Action

1601	The system is able to communicate to the system management processor, but the system management processor failed to respond at the start of POST.	1. Complete the following steps before replacing a FRU:
		
		   a. Remove the AC power to the device, and wait 20 seconds.
		
		   a. Reconnect the AC power and wait 30 seconds.
		
		   b. Power up the device.
		
		   c. Flash update the system management processor.
		
		2. Check the system board.

1602	Cable for optional service processor adapter not installed.	Disconnect all device and hardware option power cords from the device, wait 30 seconds, reconnect, and retry.
1762	Hard disk configuration error.	1. Check the hard disk drive. 2. Check the hard disk cables. 3. Check the hard disk adapter. 4. Check the SCSI backplane. 5. Check the system board.
178X	Fixed disk error.	1. Check the hard disk cables. 2. Run diagnostics. 3. Check the hard disk adapter. 4. Check the hard disk drive. 5. Check the system board.
1800	No more hardware interrupts available for PCI adapter.	1. Check for failing adapter. 2. Check the system board.

Table 5-21   POST Error Codes (continued)

Error Code	Symptom	Cause and Action
1962	Drive does not contain a valid boot sector.	1. Verify that a startable operating system is installed. 2. Run diagnostics. 3. Check the hard disk drive. 4. Check the SCSI backplane. 5. Check the cable. 6. Check the system board.
2400	Video controller test failure.	The video feature is not supported in the Wide Area Application Engine 7326.
2462	Video memory configuration error.	The video feature is not supported in the Wide Area Application Engine 7326.
5962	IDE CD-ROM drive configuration error.	1. Check the CD-ROM drive. 2. Check the CD-ROM power cable. 3. Check the IDE cable. 4. Check the system board. 5. Check the battery.
8603	Pointing device error.	This feature is not supported in Cisco ACNS software.
0001200	Machine check architecture error.	1. Check microprocessor 1. 2. Check optional microprocessor 2.
00012000	Microprocessor machine check.	1. Check the microprocessor. 2. Check the system board.
00019501	Microprocessor 1 is not functioning.	1. Check VRM and microprocessor LEDs. 2. Check VRM 1. 3. Check microprocessor 1. 4. Check the system board.

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Table 5-21   POST Error Codes (continued)

Error Code	Symptom	Cause and Action
00019502	Microprocessor 2 is not functioning.	1. Check VRM and microprocessor LEDs. 2. Check VRM 2. 3. Check the microprocessor 2.
00019701	Microprocessor 1 failed.	1. Check microprocessor 1. 2. Check the system board.
00019702	Microprocessor 2 failed.	1. Check microprocessor 2. 2. Check the system board.
00180100	A PCI adapter has requested memory resources that are not available.	1. Reorder the adapters in the PCI slots. It is important that your startup device is positioned early in the startup device order so that it is run by POST. 2. Ensure that the PCI adapter and all other adapters are set correctly in the configuration/setup utility program. If the memory resource settings are not correct, change the settings. 3. If all memory resources are being used, you might need to remove an adapter to make memory available for the PCI adapter. Disabling the adapter BIOS on the adapter might correct the error. (Refer to the documentation provided with the adapter.)
00180200	No more I/O space available for PCI adapter.	1. Check the adapter. 2. Check the system board.
00180300	No more memory (above 1 MB) for PCI adapter.	1. Check the adapter. 2. Check the system board.
00180400	No more memory (below 1 MB) for PCI adapter.	1. Move the failing adapter to slot 1. 2. Check the adapter. 3. Check the system board.

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Table 5-21   POST Error Codes (continued)

Error Code	Symptom	Cause and Action
00180500	PCI option ROM checksum error.	1. Remove the failing PCI card. 2. Check the system board.
00180600	PCI to PCI bridge error.	1. Move the failing adapter to slot 1. 2. Check the adapter. 3. Check the system board.
00180700, 00180800	General PCI error.	1. Check the system board. 2. Check the PCI card.
00181000	PCI error.	1. Check the adapter. 2. Check the system board.
01295085	ECC checking hardware test error.	1. Check the system board. 2. Check the microprocessor.
01298001	No update data for microprocessor 1.	1. Ensure that all processors have the same cache size. 2. Check microprocessor 1.
01298002	No update data for microprocessor 2.	1. Ensure that all processors have the same cache sizes, dock speeds, and clock frequencies. 2. Check microprocessor 2.
01298101	Bad update data for microprocessor 1.	1. Ensure that all processors have the same cache sizes, dock speeds, and clock frequencies. 2. Check microprocessor 1.
01298102	Bad update data for microprocessor 2.	1. Ensure that all processors have the same cache sizes, dock speeds and clock frequencies. 2. Check microprocessor 2.
19990301	Hard disk sector error.	1. Check the hard disk drive. 2. Check the SCSI backplane. 3. Check the cable. 4. Check the system board.

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Table 5-21   *POST Error Codes (continued)*

Error Code	Symptom	Cause and Action
19990305	Hard disk sector error, no operating system installed.	Install operating system on the hard disk.
19990650	AC power has been restored.	1. Check the power cable.
		2. Check for interruption of power.

1. ACNS software does not support keyboards. No keyboard errors are expected; however, if a keyboard error appears during bootup, contact the Cisco Technical Assistance Center.

2. ACNS software does not support disk drives. No disk drive errors are expected; however, if a disk drive error appears during bootup, contact the Cisco Technical Assistance Center.

Service Processor Error Codes

When viewed from POST, service processor error codes appear in hexadecimal form (generally beginning with A2, A3, A4, A5, A6, A7, AD, AE, or E1). However, when viewed from the system error log, the messages appear as text. To identify a possible error condition for the service processor, see the system error log. (See the "Diagnostic Programs and Error Messages" section on page 5-7.)

SCSI Errors

Note   If your device does not have a hard disk drive, ignore any message that indicates that the BIOS is not installed.

Table 5-22 describes possible SCSI errors.

Table 5-22   *SCSI Errors*

SCSI Error Causes	Action
All SCSI errors. One or more of the following might be causing the problem: • A failing SCSI device (adapter, drive, controller) • An improper SCSI configuration or SCSI termination jumper setting • Duplicate SCSI IDs in the same SCSI chain • A missing or improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable	1. External SCSI devices must be turned on before you power up the device. 2. Make sure that the cables for all external SCSI devices are connected correctly. 3. If you have attached an external SCSI device to the device, make sure that the external SCSI termination is set to automatic. 4. Make sure that the last device in each SCSI chain is terminated correctly. 5. Make sure that the SCSI devices are configured correctly.

Temperature Error Messages

Table 5-23 describes the temperature error messages.

Table 5-23   *Temperature Error Messages*

Message	Action
Power supply *x* Temperature Fault (level—critical; power supply *x* had overtemperature condition)	Ensure that the system is being properly cooled; see "System Reliability Considerations" section on page 2-6. Power supply *x* needs to be replaced. Have the system serviced.
System board is over recommended temperature (level—warning; system board is over recommended temperature)	Ensure that the system is being properly cooled; see the "System Reliability Considerations" section on page 2-6. The system board needs to be replaced. Have the system serviced.

Table 5-23   Temperature Error Messages (continued)

Message	Action
System board is under recommended temperature (level—warning; system board is under recommended temperature)	Ambient temperature must be within normal operating specifications; see the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications.".
System over temperature for CPU *x* (level—warning; CPU *x* reporting overtemperature condition)	Ensure that the system is being properly cooled; see the "System Reliability Considerations" section on page 2-6.
System under recommended CPU *x* temperature (level—warning; system reporting undertemperature condition for CPU *x*)	Ambient temperature must be within normal operating specifications; see the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications.".

Fan Error Messages

Table 5-24 describes the fan error messages.

Table 5-24   Fan Error Messages

Message	Action
Fan *x* failure (level—critical; fan *x* had a failure)	1. Check connections to fan *x*. 2. Fan *x* needs to be replaced. Have the system serviced.
Fan *x* fault (level—critical; fan *x* beyond recommended RPM range)	1. Check connections to fan *x*. 2. Fan *x* needs to be replaced. Have the system serviced.
Fan *x* outside recommended speed action	Fan *x* needs to be replaced. Have the system serviced.

Power Error Messages

Table 5-25 describes the power error messages.

Table 5-25   *Power Error Messages*

Message	Action
Power supply *x* current share fault (level—critical; excessive current demand on power supply *x)*	Power supply *x* needs to be replaced. Have the system serviced.
Power supply *x* DC good fault (level—critical; power good signal not detected for power supply *x)*	Power supply *x* needs to be replaced. Have the system serviced.
Power supply *x* temperature fault	Power supply *x* needs to be replaced. Have the system serviced.
Power supply *x* removed	No action required: information only.
Power supply *x* fan fault (level—critical; fan fault in power supply *x)*	Power supply *x* needs to be replaced. Have the system serviced.
Power supply *x* 12 V fault (level—critical; overcurrent condition detected)	See the "Checking the Power Subsystem" section on page 5-11.
Power supply x 3.3 V fault (level—critical; 3.3 V power supply *x* had an error)	See the "Checking the Power Subsystem" section on page 5-11.
Power supply *x* 5 V fault (level—critical; 5 V power supply *x* had an error)	See the "Checking the Power Subsystem" section on page 5-11.
System running nonredundant power (level—noncritical; system does not have redundant power)	1. Add another power supply. 2. Remove hardware options from the system. 3. The system can continue to operate without redundancy protection if Step1 and Step 2 are not followed.
System under recommended voltage for *x* (level—warning; indicated voltage supply under nominal value; value for *x* can be +12, –12, or +5)	1. Check connections to the power subsystem. 2. Check the power supply. 3. Check the power cage assembly.

System Shutdown

Use Table 5-26 and Table 5-27 for troubleshooting when experiencing system shutdown related to voltage or temperature problems.

Table 5-26   Voltage-Related System Shutdown

Error Message	Cause and Action
System shutoff due to *x* current over max value (level—critical; system drawing too much current on voltage *x* bus)	See the "Checking the Power Subsystem" section on page 5-11.
System shutoff due to *x*V overvoltage (level—critical; system shutoff due to *x* supply overvoltage)	1. Check the power supply connectors. 2. Check the power supply. 3. Check the power cage assembly.
System shutoff due to *x* undervoltage (level—critical; system shutoff due to *x* supply undervoltage)	1. Check the power supply connectors. 2. Check the power supply. 3. Check the power cage assembly.
System shutoff due to VRM *x* overvoltage	The VRM *x* needs to be replaced. Have the system serviced.
System shutoff due to excessive (< 240 VAC) loading	1. See the "Checking the Power Subsystem" section on page 5-11. 2. Cycle AC power on and off.

Table 5-27   Temperature-Related System Shutdown

Message	Action
System shutoff due to board overtemperature (level–critical; board is over temperature)	1. Ensure that the system is being properly cooled; see the "System Reliability Considerations" section on page 2-6. 2. The board needs to be replaced. Have the system serviced.
System shutoff due to CPU *x* overtemperature (level–critical; CPU *x* is over temperature)	1. Ensure that the system is being properly cooled; see the "System Reliability Considerations" section on page 2-6. 2. CPU *x* needs to be replaced. Have the system serviced.
System shutoff due to CPU *x* undertemperature (level–critical; CPU *x* is under temperature)	Ambient temperature must be within normal operating specifications; see the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications."
System shutoff due to high ambient temperature (level–critical; high ambient temperature)	Ambient temperature must be within normal operating specifications; see the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications."
System shutoff due to system board under temperature (level–critical; system board is under temperature)	Ambient temperature must be within normal operating specifications; see the Appendix A, "Wide Area Application Engine 7326 Hardware Specifications."

Host Built-In Self-Test

Table 5-28 describes the host Built-In Self-Test (BIST) error message.

Table 5-28   Host BIST Error Message

Error Message	Action
Host fail (level—informational; built-in self-test for the host failed)	1. The microprocessor might need to be reseated. Contact your service representative. 2. The VRM might need to be reseated. Contact your service representative. 3. The microprocessor CPU needs to be replaced. Have the system serviced.

Bus Fault Messages

Table 5-29 describes the bus fault error messages.

Table 5-29   Bus Fault Messages

Bus Fault Message	Cause and Action
Failure reading I2C device. Check devices on bus 0.	1. Check the memory DIMMs. 2. Check the system board.
Failure reading I2C device. Check devices on bus 1.	1. The I2C cable between the operator information panel and the system board (J22) might need to be reseated. Contact your service representative. 2. Check the operator information panel. 3. Check the system board.
Failure reading I2C device. Check devices on bus 2.	1. The cable between the system board and the power supply (power cage assembly) (J10) might need to be reseated. Contact your service representative. 2. Check the power cage assembly. 3. Check the power supply. 4. Check the system board.

Table 5-29   ***Bus Fault Messages (continued)***

Bus Fault Message	Cause and Action
Failure reading I2C device. Check devices on bus 3.	Error message pertains to DASD devices, which are not supported in Cisco ACNS software.
Failure reading I2C device. Check device on bus 4.	Check the system board.

Wide Area Application Engine 7326 Hardware Specifications

This appendix provides hardware specifications for the WAE-7326 appliance and the optional Cisco WAE inline network adapter. It contains the following sections:

Appliance Specifications

Table A-1 provides a summary of the features and specifications of the Wide Area Application Engine (WAE) 7326.

Table A-1 WAE 7326 Features and Specification

Specification	Description
Microprocessor	• 2 3.2-GHz Nocona processors • 1 MB Level 2 cache • 800-MHz front-side bus (FSB) ✎ **Note** Use the Configuration/Setup utility program to determine the type and speed of the microprocessors.

Table A-1   WAE 7326 Features and Specification (continued)

Memory	• Minimum: 512 MB • Maximum: 16 GB • Type: 2-way interleaved PC3200, ECC DDR II SDRAM, registered DIMMs only • Sizes: 256 MB, 512 MB, 1 GB, or 2 GB
Drives standard	• CD-ROM
Expansion bays	• 6 hot-swap, 3.5-inch disk drive bays • 1 5.25-inch (13.34-cm) bay (CD-ROM drive installed)
Hot-swap Fans	• Minimum: 6 • Maximum: 12—Provide redundant cooling
Hot-swap Power supplies	625 watts (100–240 V AC) • Minimum: 1 • Maximum: 2—Provide redundant power
Expansion slots	• 2 PCI-X non-hot-pluggable 133-MHz/64-bit • 2 PCI-X non-hot-pluggable 100-MHz/64-bit (low profile)
Size	• Height: 3.36 in. (85.4 mm) • Depth: 27.64 in. (702.0 mm) • Width: 17.5 in. (443.6 mm)
Weight	Weight: 46.5 lb (21.09 kg) to 64 lb (29.03 kg) depending upon configuration

Table A-1   WAE 7326 Features and Specification (continued)

Integrated functions	• Baseboard management controller
	• Two Broadcom 10/100/1000 Ethernet controllers (dual-port design) with Wake on LAN® support
	• One serial port
	• One external and one internal Ultra320 SCSI port (dual-channel controller with integrated RAID)
	✎
	Note The baseboard management controller is also known as the service processor.
Electrical Input	• Sine wave input (50 - 60 Hz) required
	• Input voltage range automatically selected
	• Input voltage low range:
	– Minimum: 100 V AC
	– Maximum: 137 V AC
	• Input voltage high range:
	– Minimum: 200 V AC
	– Maximum: 240 V AC
	• Input kilovolt-amperes (kVA) approximately:
	– Minimum: 0.36 kVA
	– Maximum: 0.83 kVA

Table A-1   WAE 7326 Features and Specification (continued)

Environment	• Air temperature:
	– Server on: 50 to 95° F (10 to 35° C); altitude: 0 to 2133 m (6998.0 ft)
	– Server off: 50° to 109.4° F (10° to 43° C); maximum altitude: 2133 m (6998.0 ft)
	• Humidity
	– Server on: 8% to 80%
	– Server off: 8% to 80%
[1]Acoustical noise emissions	• Declared sound power, idle: 6.6 bel[2]
	• Declared sound power, operating: 6.6 bel
[3]Heat Output	• Minimum configuration: 1230 Btu[4] (360 watts)
	• Maximum configuration: 2840 Btu (830 watts)

1. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

2. In acoustics, logarithm of the ratio of a quantity to a reference quantity of the same kind is called a level. The base of the logarithm (always ten, unless otherwise specified), the reference quantity, and the kind of level shall be specified.bel is a unit of level when the base of the logarithm is ten, and the quantities concerned are proportional to power.

3. Power consumption and heat output vary depending on the number and type of optional features installed, and the power-management optional features in use.

4. 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 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-3   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

Table A-3   Inline Network Adapter Specifications (continued)

Specification	Description
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	32º to –122º F (0º to 50º C)
Storage temperature	–4º to –149º F (–20º to –65º C)

Maintaining the Wide Area Application Engine

Proper use of preventive maintenance procedures can keep the Wide Area Application Engine (WAE) in good operating condition and minimize the need for costly, time-consuming service procedures. This chapter contains maintenance procedures that you should perform regularly.

This chapter covers the tasks required for maintaining a WAE or a WAE farm:

- Maintaining Your Site Environment, page B-1
- Using Power Protection Devices, page B-7

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 $32°$ F $(0°$ C) or hotter than $104°$ F $(40°$ 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 5 to 95 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 6500 feet (2000 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 B-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

Shock and Vibration

Excessive shock can damage the function, external appearance, and physical structure of a system. Each system has been designed to operate properly even after withstanding a minimum of six consecutively executed shock pulses in the

positive and negative x, y, and z axes (one pulse on each side of the system). Each shock pulse can measure up to 5 gravities (G) for up to 11 milliseconds (ms). In storage, the system can withstand shock pulses of 20 G for 11 ms.

Excessive vibration can cause the same problems as mentioned earlier for shock, as well as causing components to become loose in their sockets or connectors. Systems can be subject to significant vibration when being transported by vehicle or when operated in an environment with machinery that causes vibration.

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 B-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 subsections 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. UPS systems that provide only 5 minutes of battery power let you conduct an orderly shutdown of the system, but are not intended to provide continued operation. Surge protectors should be used with all UPS systems, and the UPS system should be Underwriters Laboratories (UL) safety-approved.

Using the Configuration/Setup Utility Program

This appendix describes the Configuration/Setup Utility program and contains the following sections:

About the Configuration/Setup Utility Program

The Configuration/Setup Utility program is part of the basic input/output system (BIOS) code in your WAE device. Use the Configuration/Setup Utility program to accomplish the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords
- Set and change the startup characteristics of the device and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View, set, and change settings for power-management features

---

- View and clear the error log

- Enable USB keyboard and mouse support

Starting the Configuration/Setup Utility Program

To start the Configuration/Setup Utility program, follow these steps:

Step 1   Turn on the device.

Step 2   When the prompt **Press F1 for Configuration/Setup** appears, press **F1**.

If you have set both a user (power-on) password and a supervisor (administrator) password, you must type the supervisor password to access the full Configuration/Setup Utility menu. If you do not type the supervisor password, a limited Configuration/Setup Utility menu is available.

Step 3   Follow the instructions in the window.

Step 4   Choose settings to view or change.

Configuration/Setup Utility Menu Options

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of your BIOS code, some menu choices might differ slightly from these descriptions.

System Summary

Choose this option to view configuration information, including the type, speed, and cache sizes of the microprocessors and the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

This option is on the full and limited Configuration/Setup Utility menu.

System Information

Choose this option to view information about your device. When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

This option is on the full Configuration/Setup Utility menu only.

Product Data

Choose this option to view the machine type and model of your device, the serial number, and the revision level or issue date of the BIOS code stored in electrically erasable programmable ROM (EEPROM).

Devices and I/O Ports

Choose this option to view or change assignments for devices and input/output (I/O) ports.

Choose this option to enable or disable integrated SCSI and Ethernet controllers and all standard ports (such as serial and parallel). If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the device will have no Ethernet capability. If you disable the integrated USB controller, the device will have no USB capability; to maintain USB capability, make sure that **Enabled** is selected for the USB Host Controller and USB BIOS Legacy Support options.

This option is on the full Configuration/Setup Utility menu only.

Start Options

Choose this option to view or change the start options. Startup sequences take effect when you start the device. The startup sequence specifies the order in which the device checks devices to find a boot record. The device starts from the first boot record that it finds.

This option is on the full Configuration/Setup Utility menu only.

Date and Time

Choose this option to set the date and time in the device, in 24-hour format (hour:minute:second). This option is on the full Configuration/Setup Utility menu only.

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System Security

Choose this option to set passwords. This option is on the full Configuration/Setup Utility menu only.

Advanced Setup

Choose this option to change settings for advanced hardware features.

⚠️
Caution   The device might malfunction if these options are incorrectly configured. Follow the instructions in the window carefully.

This option is on the full Configuration/Setup Utility menu only.

Power Management

Choose this option to enable or disable the automatic power-on feature.

Error Log

Choose this option to view the three most recent error codes and messages that the system generated during POST. You can use the arrow keys to move between pages in the error log. Choose **Clear error logs** to clear the POST error log.

Save Settings

Choose this option to save the changes you have made in the settings.

Restore Settings

Choose this option to cancel the changes you have made in the settings and restore the previous settings.

Load Default Settings

Choose this option to cancel the changes you have made in the settings and restore the factory settings.

Exit Setup

Choose this option to exit from the Configuration/Setup Utility program. If you have not saved the changes you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

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