# Cisco CVA122/CVA122E Cable Voice Adapter Hardware Installation Guide

May 2001

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The following information is for FCC compliance of Class A devices: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

The following information is for FCC compliance of Class B devices: The equipment described in this manual generates and may radiate radio-frequency energy. If it is not installed in accordance with Cisco's installation instructions, it may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in part 15 of the FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

Modifying the equipment without Cisco's written authorization may result in the equipment no longer complying with FCC requirements for Class A or Class B digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

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

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

• Move the equipment farther away from the television or radio.

• 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.)

Modifications to this product not authorized by Cisco Systems, Inc. could void the FCC approval and negate your authority to operate the product.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

**CONTENTS**

**Cisco CVA122/CVA122E Hardware Installation Guide**

# Preface

This document is the *Cisco CVA122/CVA122E Cable Voice Adapter Hardware Installation Guide* and describes installing, powering on, and troubleshooting a Cisco CVA122/CVA122E Cable Voice Adapter. The document also includes cabling and pinout information.

This section contains:

- Audience
- Purpose
- Organization
- Related Documentation
- Obtaining Documentation
- Obtaining Technical Assistance

## Audience

This guide is intended for coaxial networking transmission installers and technicians who are familiar with the installation, maintenance, and troubleshooting of cable television wiring and equipment. Cable system installers and technicians should be familiar with their cable plant's base operating parameters and subscriber service offerings. Cable system support engineers and administrators should be acquainted with Ethernet, IEEE 802.3, and Universal Serial Bus (USB) type data communications networks.

**Note** This document contains instructions to install or configure the Cisco CVA122/CVA122E Cable Voice Adapter using procedures that only qualified personnel should perform. This document is not intended for subscribers. See the "Related Documentation" section of this preface for the documentation available for subscribers.

## Purpose

This guide covers the physical installation of the Cisco CVA122/CVA122E Cable Voice Adapter. These procedures include site preparation, the physical placement of the cable voice adapter in an appropriate location, the cabling required for the power, Ethernet, USB, voice, and cable connections, and verification of the installation at the cable voice adapter's initial power-on.

These procedures do not require access to the cable voice adapter's command-line interface (CLI). However, CLI access might be required to configure the cable voice adapter and to bring it to full operability. See the *Cisco CVA122 Cable Voice Adapter Features* and *Cisco CVA122E Cable Voice Adapter Features* guides for instructions on configuring the cable voice adapter for network operation.

# Organization

This guide is organized into the following chapters and appendixes:

*Table 1        Organization*

| Chapter | Title | Description |
|---------|-------|-------------|
| Chapter 1 | Product Overview | Describes the Cisco CVA122/CVA122E Cable Voice Adapter, its operation, and its interaction with the Cable Modem Termination System (CMTS). |
| Chapter 2 | Preparing for Installation | Outlines site preparation requirements to meet before installing a Cisco CVA122/CVA122E Cable Voice Adapter at a subscriber site. |
| Chapter 3 | Installing the Cisco CVA122/CVA122E Cable Voice Adapter | Provides instructions to connect the Cisco CVA122/CVA122E Cable Voice Adapter, perform its initial power-on, and verify its basic functionality. |
| Chapter 4 | Troubleshooting | Contains basic installation troubleshooting information appropriate to field service technicians. (This information does not require access to the cable voice adapter's CLI interface.) |
| Appendix A | Technical Specifications | Contains the physical, environmental, power, data, and voice technical specifications for the cable voice adapter. |
| Appendix B | Connector and Cable Specifications | Contains the technical description of the interfaces on the Cisco CVA122/CVA122E Cable Voice Adapter and the most common cables that are used with them. |
| Appendix C | Regulatory Compliance and Safety Information | Contains international agency compliance, safety, and statutory information for the Cisco CVA122/CVA122E Cable Voice Adapter. This appendix also contains safety warnings translated into multiple languages. |

# Conventions

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

**Timesaver** Means *the described action saves time*. You can save time by performing the action described in the paragraph.

⚠

**Caution** Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

# Safety Information Referral Warning

⚠

**Warning** Before you install, operate, or service the system, read the *Site Preparation and Safety Guide*. This guide contains important safety information you should know before working with the system.

**Waarschuwing** Lees de handleiding *Voorbereiding en veiligheid van de locatie Handleiding* voordat u het systeem installeert of gebruikt of voordat u onderhoud aan het systeem uitvoert. Deze handleiding bevat belangrijke beveiligingsvoorschriften waarvan u op de hoogte moet zijn voordat u met het systeem gaat werken.

**Varoitus** Ennen kuin asennat järjestelmän tai käytät tai huollat sitä, lue *Asennuspaikan valmistelu-jaturvaopas* -opasta. Tässä oppaassa on tärkeitä turvallisuustietoja, jotka tulisi tietää ennen järjestelmän käyttämistä.

**Attention** Avant d'installer le système, de l'utiliser ou d'assurer son entretien, veuillez lire le *Guide de sécurité et de préparation du site*. Celui-ci présente des informations importantes relatives à la sécurité, dont vous devriez prendre connaissance.

**Warnung** Warnhinweis Bevor Sie das System installieren, in Betrieb setzen oder warten, lesen Sie die *Anleitung zur Standortvorbereitung und Sicherheitshinweise*. Dieses Handbuch enthält wichtige Informationen zur Sicherheit, mit denen Sie sich vor dem Verwenden des Systems vertraut machen sollten.

**Avvertenza** Prima di installare, mettere in funzione o effettuare interventi di manutenzione sul sistema, leggere le informazioni contenute nella documentazione sulla *Guida alla sicurezza*. Tale guida contiene importanti informazioni che è necessario acquisire prima di iniziare qualsiasi intervento sul sistema.

**Advarsel** Før du installerer, tar i bruk eller utfører vedlikehold på systemet, må du lese *Veiledning for stedsklargjøring og sikkerhet*. Denne håndboken inneholder viktig informasjon om sikkerhet som du bør være kjent med før du begynner å arbeide med systemet.

**Aviso** Antes de instalar, funcionar com, ou prestar assistência ao sistema, leia o *Guia de Preparação e Segurança do Local*. Este guia contém informações de segurança importantes que deve conhecer antes de trabalhar com o sistema.

| ¡Advertencia! | Antes de instalar, manejar o arreglar el sistema, le aconsejamos que consulte la *Guía de prevención y preparación de una instalación*. Esta guía contiene importante información para su seguridad que debe saber antes de comenzar a trabajar con el sistema. |
|---|---|
| Varning! | Innan du installerar, använder eller utför service på systemet ska du läsa *Förberedelser och säkerhet Handbok*. Denna handbok innehåller viktig säkerhetsinformation som du bör känna till innan du arbetar med systemet. |

# Related Documentation

Refer to the following Cisco documents for related information. The documents can be found online at Cisco.com or on the Documentation CD-ROM. You can also order printed copies of most current documents.

✎
**Note** The list that follows is not all-inclusive. New documents and revisions occur frequently.

## Service Provider Subscriber-Related Publications

- *Cisco CVA122/CVA122E Cable Voice Adapter Hardware Installation Guide* (this manual)
- *Cisco CVA122 Cable Voice Adapter Features* guide
- *Cisco CVA122E Cable Voice Adapter Features* guide

## Subscriber Publications

- *Quick Start, Cisco CVA122/CVA122E Cable Voice Adapter Subscriber Setup* card
- *Cisco CVA122/CVA122E Cable Voice Adapter User Guide*
- *Uninterruptible Power Supply for the CVA120 Series Cable Voice Adapters*

✎
**Note** Service provider and subscriber publications for other models of Cisco cable CPE devices are also available on CCO.

## CMTS Hardware Installation Publications

- *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide*
- *Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide*
- *Cisco uBR7200 Series Universal Broadband Router Cable Modem Card Installation and Configuration* publication
- *Cisco uBR7200 Series Universal Broadband Router Port Adapter Installation and Configuration* publication

- *Cisco uBR7200 Series Universal Broadband Router 550-Watt DC-Input Power Supply Replacement Instructions*
- *Cisco uBR7200 Series Universal Broadband Router Subchassis and Midplane Replacement Instructions*
- *Cisco uBR7200 Series Rack-Mount and Cable-Management Kit Installation Instructions*
- *Cisco uBR7200 Series Universal Broadband Router Fan Tray Replacement Instructions*
- *Cisco uBR7200 Series Universal Broadband Router Feature Enhancements publication*

## Cisco IOS Publications

- Cisco IOS Release 12.1 New Feature Sets documentation for feature module descriptions on Cisco IOS 12.1-based releases
- Cisco IOS Release 12.1 Configuration Guides and Command References for task and command descriptions on Cisco IOS 12.1based releases

**Note**  Use the Cisco IOS Release *Command Reference Master Index(es)* to obtain document pointers for specific software release feature sets and commands.

## Configuration Editor and Network Management Publications

- *Cisco Cable Configuration Guide* for information on the Cisco Network Registrar (CNR) product
- *CiscoView Internetworking Device Monitoring and Management*
- *CiscoView Incremental Installation Quick Reference Guide*
- CiscoWorks documentation for networks that use the Simple Network Management Protocol (SNMP) to monitor Cisco CVA122/CVA122E Cable Voice Adapters
- MIB information is available on CCO at ftp://ftp.cisco.com/pub/mibs.

# Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

## World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following sites:

- http://www.cisco.com
- http://www-china.cisco.com
- http://www-europe.cisco.com

## Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or as an annual subscription.

## Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco Product documentation from the Networking Products MarketPlace:

    http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

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

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

## Documentation Feedback

If you are reading Cisco product documentation on the World Wide Web, you can submit technical comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco.

You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Attn Document Resource Connection
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

# Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

# Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

Cisco.com provides a broad range of features and services to help customers and partners streamline business processes and improve productivity. Through Cisco.com, you can find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online technical support, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on Cisco.com to obtain additional personalized information and services. Registered users can order products, check on the status of an order, access technical support, and view benefits specific to their relationships with Cisco.

To access Cisco.com, go to the following website:

http://www.cisco.com

# Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

## Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.

- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

http://www.cisco.com/register/

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

http://www.cisco.com/tac/caseopen

## Contacting TAC by Telephone

If you have a priority level 1(P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.

- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

CHAPTER 1

# Product Overview

This chapter describes the Cisco CVA122/CVA122E Cable Voice Adapter and its interaction with the Cable Modem Termination System (CMTS)—the cable system headend equipment that provides Internet (TCP/IP) connectivity for subscribers over the cable broadband infrastructure. The chapter provides physical and functional overviews of the Cisco CVA122/CVA122E Cable Voice Adapter.

# Cisco CVA122/CVA122E Cable Voice Adapter Description

This section provides an overview of the Cisco CVA122/CVA122E Cable Voice Adapter, its hardware, and its basic operation:

- Introduction
- Initial Power-On and Provisioning
- Data Operations
- Voice Operations

## Introduction

The Cisco CVA122 Cable Voice Adapter and Cisco CVA122E Cable Voice Adapter function at the most basic level as a cable modem—a modulator/demodulator that provides high-speed network access on the cable television system to residential subscribers. The two models are based on

- The Cisco CVA122 Cable Voice Adapter is based on the Data-Over-Cable Service Interface Specifications (DOCSIS), a standard developed with service providers to ensure that any DOCSIS-certified cable modem can interoperate with any bidirectional, DOCSIS-qualified CMTS. The DOCSIS standard supports the North American National Television Systems Committee (NTSC) channel plan, with 6 MHz channel widths, a downstream range of 88 to 860MHz, and an upstream range of 5 to 42 MHz.

- The Cisco CVA122E Cable Voice Adapter is based on the European Data-Over-Cable Service Interface Specifications (EuroDOCSIS), which is almost identical to the DOCSIS standard, except that it supports the European Phase Alternating Line (PAL) and Systeme Electronique Couleur Avec Memoire (SECAM) channel plans, with 8 MHz channel widths, a downstream range of 88 to 860MHz, and an upstream range of 5 to 65 MHz.

**Note** Unless otherwise indicated, all information in this manual applies to both the Cisco CVA122 and Cisco CVA122E Cable Voice Adapters.

Cisco CVA122/CVA122E Hardware Installation Guide

**Tips** Information about DOCSIS and EuroDOCSIS requirements and current specifications are available at the CableLabs web site at http://www.cablelabs.com.

The Cisco CVA122/CVA122E Cable Voice Adapter uses its cable interface to connect to the CMTS over the Hybrid/Fiber Coax (HFC) cable system. A personal computer (PC) connects to the Cisco CVA122/CVA122E Cable Voice Adapter through either the Ethernet or USB interface.

The cable voice adapter then acts as an IP bridge, providing Internet access by forwarding traffic between the PC and the CMTS. Subscribers can use the Cisco CVA122/CVA122E Cable Voice Adapter to create high-speed, permanent access to the Internet, without the need for telco-based services such as leased lines.

If supported by the service provider, the Cisco CVA122/CVA122E Cable Voice Adapter can connect to two PCs by attaching a PC to each interface (Ethernet and USB). In addition, the cable voice adapter's Ethernet interface can connect to an Ethernet hub, and additional computers can then be connected to the hub.

**Note** To be complaint with the USB specification, the Cisco CVA122/CVA122E Cable Voice Adapter does not support networking multiple PCs using a USB bridging hub.

In addition to providing DOCSIS connectivity, the Cisco CVA122/CVA122E Cable Voice Adapter can optionally provide Voice over IP (VoIP) services, allowing subscribers to make telephone, modem, and FAX calls over TCP/IP networks such as the Internet. These calls can be made to other VoIP devices, or to telephone, modem, or FAX devices on the regular telephone network (the Public Telephone Switched Network, commonly known as PTSN).

The Cisco CVA122/CVA122E Cable Voice Adapter can optionally be configured as an IP router, using static routes and the RIPv2 routing protocol. When operating in routing mode, the cable voice adapter can treat its cable, Ethernet, and USB interfaces as separately routable interfaces.

Bridging and routing operations are summarized in the following sections.

## Bridging Operations

When acting as a DOCSIS-compliant cable modem, the Cisco CVA122/CVA122E Cable Voice Adapter provides IP bridging for one or more PCs and other customer premises equipment (CPE). In this mode, traffic from the cable voice adapter's Ethernet and USB interfaces is transparently forwarded on to the cable interface for transmission to the CMTS. Similarly, the cable voice adapter receives traffic on the cable interface and forwards it to the PCs attached to the Ethernet and USB interfaces.

In bridging mode, the PCs must be assigned IP addresses in the same subnet as the CMTS. Typically, a Dynamic Host Configuration Protocol (DHCP) server at the headend automatically assigns the IP addresses to each PC that is authorized to connect to the Cisco CVA122/CVA122E Cable Voice Adapter.

You can connect a PC directly to the Ethernet port, the USB port, or both ports; if supported by the service provider, you can also connect an Ethernet hub directly to the Ethernet port and then connect multiple PCs to the hub. In bridging mode, the Cisco CVA122/CVA122E Cable Voice Adapter supports a maximum 254 PCs, depending on the maximum number allowed by the CMTS.

By default, one PC is supported for each cable voice adapter. The service provider can change this limit by changing the MAX CPE parameter in the DOCSIS configuration file. However, the CMTS at the headend can also enforce its own limit on CPE devices, and the CMTS limit overrides the MAX CPE

parameter. So if the headend allowed only one PC per cable voice adapter, subscribers could connect only one PC to the cable voice adapter, even if the MAX CPE parameter were set to the maximum possible value of 254.

**Note**    For better network performance, Cisco recommends a maximum limit of 16 CPE devices; this recommended maximum might be less depending on the services the subscriber has purchased.

See Figure 1-1 for a typical configuration.

*Figure 1-1    Cisco CVA122/CVA122E in a Bridging Configuration*
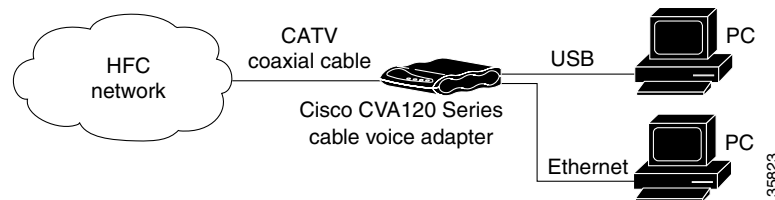


**Note**    All Cisco IOS releases that support the Cisco CVA122/CVA122E Cable Voice Adapter support basic DOCSIS connectivity that provides both high-speed Internet data access and VoIP connectivity.

The cable voice adapter ships from the factory with a Cisco IOS software image stored in nonvolatile Flash memory that supports DOCSIS-compliant bridging data operations. Based on the feature licenses your company purchased, other Cisco IOS images can be downloaded from Cisco Connection Online (CCO). These images might provide additional functionality, depending on the software release.

## Routing Operations

When configured as a router, the Cisco CVA122/CVA122E Cable Voice Adapter can directly connect one PC to each of its Ethernet and USB ports at the rear of the router. The Ethernet port can also be connected to a standard 10BaseT Ethernet hub, which then connects additional computers or Ethernet devices at the site to a local area network (LAN).

In routing mode, the Cisco CVA122/CVA122E Cable Voice Adapter is typically configured to use the IP address of the headend router as its default IP gateway. Routing mode does not have a maximum limitation on the number of CPE devices, as is the case in bridging mode; however, the CMTS can still limit the number of CPE devices by limiting the number of IP addresses that any particular cable modem can provide services for. If this is the case, the cable voice adapter can use NAT/PAT translations to use one IP address for multiple CPE devices.

## Upgrading the Software Image

When Cisco IOS images are updated to new releases, the service provider can download them as needed to Cisco CVA122/CVA122E Cable Voice Adapters installed in the field (based on the software licenses purchased). See the release notes for the cable voice adapter for a complete list of features and Cisco IOS images that are currently supported.

Service providers can use the cable voice adapter's Media Access Controller (MAC) address to uniquely identify each particular unit in the field. The CMTS uses this value to download the proper DOCSIS configuration file to the cable voice adapter before it begins operation.

The DOCSIS configuration file can also contain the name of the software image that the cable voice adapter should be running. If necessary, the CMTS can download the proper software image to the cable voice adapter and force it to reboot using the new image.

The download of the DOCSIS configuration file usually takes only a few seconds and is done every time the Cisco CVA122/CVA122E Cable Voice Adapter reboots. The download of the software image can take several minutes to complete, during which time network connectivity is not available. However, the software image must be downloaded only once, until the subscriber needs to be updated with a new image.

The section "Initial Power-On and Provisioning" explains this process. See the *Cisco CVA122 Cable Voice Adapter Features* guide for a description on how to download a software image and configuration file to a Cisco CVA122/CVA122E Cable Voice Adapter installed in the field.

## Upgrading the ROM Monitor Software

The Cisco CVA122/CVA122E Cable Voice Adapter supports both a primary and secondary ROM Monitor (ROMMON). The primary ROMMON is permanently installed, while the secondary ROMMON is upgradable.

After power-on or a hard system reset, the primary ROMMON initially takes control. It then checks for the presence of a secondary ROMMON and if present, verifies that the secondary ROMMON has the correct checksum. If the secondary ROMMON passes these validation tests, the primary ROMMON passes control to the secondary ROMMON, which first performs a power-on self-test and hardware initialization, and then loads and executes the Cisco IOS software image. Otherwise, the primary ROMMON remains in control and continues the boot process.

This approach allows the secondary ROMMON to be safely upgraded when new software is available. If the file transfer is interrupted, or if the new ROMMON software becomes corrupted, the primary ROMMON is still available to boot the Cisco CVA122/CVA122E Cable Voice Adapter and load the Cisco IOS software image. The upgrade of the secondary ROMMON can then be attempted again.

# Initial Power-On and Provisioning

The cable voice adapter ships from the Cisco factory ready to work in a DOCSIS-compliant bridging data-only mode. However, before the cable voice adapter can transmit traffic, the CMTS at the headend must properly provision the unit as follows:

- The appropriate service must be purchased from the cable system. If certain features, such as VoIP support, are desired, a license for the appropriate Cisco IOS software image must also be purchased.

- When the cable voice adapter is first brought online, the CMTS at the headend downloads a DOCSIS configuration file to the cable voice adapter. This file—which is a binary file that must be in the format required by the DOCSIS specification—configures the cable voice adapter for the appropriate level of services and sets other parameters as needed.

- At this point the cable voice adapter is completely configured for basic DOCSIS operations, but if necessary, the DOCSIS configuration file can also specify that the cable voice adapter should download another Cisco IOS image from the CMTS.

- To customize the cable voice adapter's configuration further, the DOCSIS configuration file can also specify a Cisco IOS configuration file that the CMTS should download to the cable voice adapter. This second configuration file is an ASCII text file that contains the Cisco IOS commands needed to configure the cable voice adapter for advanced features, such as VoIP.

**Note**     The Cisco CVA122/CVA122E Cable Voice Adapter downloads the DOCSIS configuration file each time it is powered on, but it downloads the Cisco IOS image and Cisco IOS configuration file only when needed. A new configuration file or image can be downloaded whenever necessary, such as when the cable service offers new services or subscribers upgrade their services.

To ensure that subscribers obtain the exact services they have ordered, the Cisco CVA122/CVA122E Cable Voice Adapter arrives from the Cisco factory with a unique identifier (UID) that consists of a serial number and MAC address. These factory-assigned values are on a label at the bottom of the cable voice adapter; for convenience, these values are also in a barcode label that can be easily scanned for easy entry into the service provider's provisioning and billing system.

Using the MAC address of the cable voice adapter as the key, the CMTS downloads the DOCSIS configuration file and Cisco IOS image that will provide the services that this particular subscriber has purchased. Service technicians at the headend typically create a number of standard configuration files to match the range of services offered by the provider; these configuration files can be created manually or with tools provided by Cisco Systems for this purpose.

The following sections describe the initial power-on and provisioning sequence in more detail, as well as the requirements that must be met by both the cable voice adapter and the CMTS before provisioning can succeed.

## Initial Power-On Sequence

When connected and first powered on, the Cisco CVA122/CVA122E Cable Voice Adapter performs the following DOCSIS-mandated procedure for automatic installation and configuration:

1. The cable voice adapter boots the Read Only Memory (ROM) from the ROMMON partition of its Flash memory.

2. The cable voice adapter performs a self-test, initializes processor hardware, and boots the main operating system software—the Cisco IOS release image stored in Flash memory.

3. The cable voice adapter acquires a temporary downstream channel by matching the clock sync signal that is regularly sent out by the CMTS in the downstream frequency range.

4. The cable voice adapter then waits for an Upstream Channel Descriptor (UCD) message from the CMTS and configures itself for the upstream frequency specified in that message.

5. The cable voice adapter waits for the next upstream bandwidth allocation map message (MAP). These messages are regularly sent from the CMTS to find the next available shared request timeslot. The cable voice adapter then uses this timeslot to send a ranging request message to the CMTS, communicating the cable voice adapter's user ID (UID, which includes its unique MAC address), using a temporary service identifier (SID) of 0 (zero) to indicate it has not yet been allocated an upstream channel.

6. In reply to the cable voice adapter's ranging request, the CMTS sends a ranging response containing a temporary SID to be used for the initial cable voice adapter configuration and bandwidth allocation. As needed, the cable voice adapter adjusts its transmit power levels using the power increment value given by the CMTS in its ranging response message.

> **Note** At this point, the cable voice adapter has established connectivity with the CMTS but is not yet online. The next steps allocate permanent upstream and downstream frequencies, as well the configuration required for IP network connectivity.

7. After the next MAP message broadcast, the cable voice adapter uses a shared request timeslot to invoke the Dynamic Host Configuration Protocol (DHCP) to establish IP connectivity with the TCP/IP network at the headend.

8. The DHCP server—typically a dedicated server at the headend, but it could also be a CMTS such as a Cisco uBR7200 series universal broadband cable voice adapter—sends a response containing the cable voice adapter's IP address, as well as the IP addresses for the default gateway and time of day (ToD) server. It also sends the IP address for the authorized Trivial File Transfer Protocol (TFTP) server from which the cable voice adapter should download its DOCSIS configuration file. Depending on the particular network configuration, other information could be provided, such as the IP addresses for a syslog server or security server.

9. The cable voice adapter configures itself for the specified IP address and gets the current date and time from the specified ToD server.

10. Using the TFTP protocol, the cable voice adapter downloads the specified DOCSIS configuration file and configures itself for the appropriate parameters. The DOCSIS configuration file defines the cable voice adapter's operating mode such as the provisioned downstream and upstream service assignments, assigned frequencies, data rates, modulation schemes, Class of Service (CoS), type of services to support, and other parameters. Cisco provides tools to help automate the creation of configuration files.

> **Caution** The DOCSIS configuration file must be in the exact format given by the DOCSIS specification. An incorrect DOCSIS configuration file can cause the Cisco CVA122/CVA122E Cable Voice Adapter to constantly cycle offline. Such errors include: wrong downstream frequency; wrong UCD; wrong downstream Channel ID; invalid CoS; incorrect BPI privacy configurations or shared secret strings.

11. The cable voice adapter sends another registration request to the CMTS containing the CoS parameters given in the DOCSIS configuration file.

12. The CMTS verifies that the cable voice adapter is using the appropriate CoS profile and converts the temporary SID into a data SID with a service class index that points to the applicable CoS profile.

> **Note** Depending on the software image being run and the capabilities of the CMTS, the DOCSIS configuration file can also specify multiple CoS profiles. Each CoS profile is assigned its own SID, either dynamically or statically, depending on the capabilities of the CMTS and software image being used.

13. The cable voice adapter completes its secondary ranging and is then online, passing data between the cable network and the PCs and other CPE devices connected to the cable voice adapter.

> **Note** At this point the cable voice adapter is online and operational in the basic DOCSIS
> bridging mode ("plug and play" mode). The next step is done only if the DOCSIS
> configuration file specifies that the cable voice adapter must also download a
> Cisco IOS configuration file and new Cisco IOS image.

14. If the DOCSIS configuration file specifies that the cable voice adapter must download another
    Cisco IOS image and a Cisco IOS configuration file, the cable voice adapter uses TFTP to
    download the image and configuration files into its local memory. It then installs the new Cisco IOS
    image and runs the configuration file.

15. If Baseline Privacy Interface (BPI) encryption is configured and enabled on both the cable voice
    adapter and CMTS, the cable voice adapter and CMTS negotiate the appropriate
    encryption/decryption parameters. After encryption is enabled, all information sent over the cable
    interface is encrypted to prevent interception or modification by an unauthorized party.

Figure 1-2 illustrates the traffic flow during this process.

*Figure 1-2    Cisco CVA122/CVA122E Cable Voice Adapter Provisioning Overview*
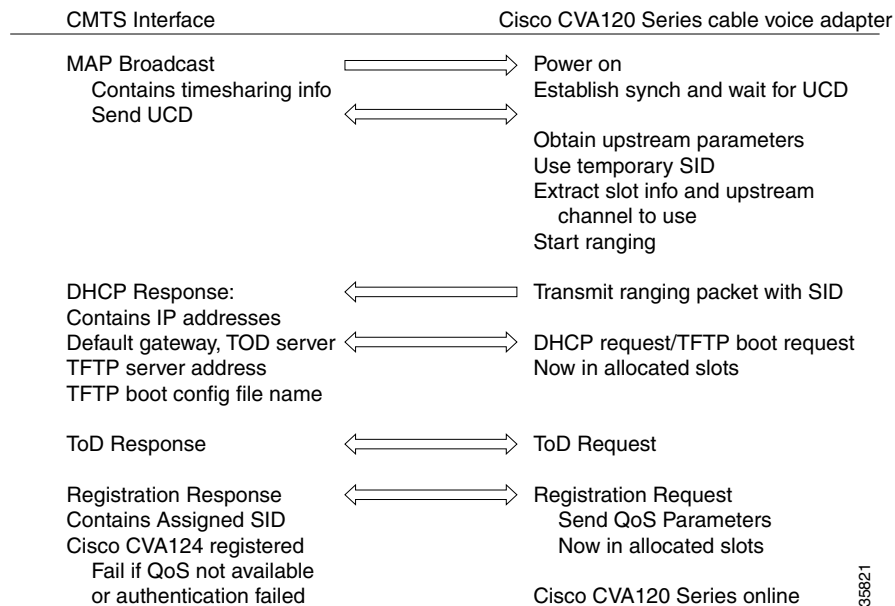


> **Note** For more detail on the provisioning process, see the DOCSIS Radio Frequency Interface
> (RFI) specification (SP-RFII01-990731 or later revision).

After the Cisco CVA122/CVA122E Cable Voice Adapter goes online, it sends traffic between the
attached PCs and other CPE devices and the network (Internet, Intranet, VoIP). Because the cable voice
adapter is operating in DOCSIS bridging mode, the service provider typically provides the IP addresses
to the PCs and other CPE devices. The number of IP addresses each subscriber can obtain depends on
the services purchased from the provider.

## Provisioning Prerequisites

The following requirements must be met before a cable voice adapter can be provisioned:

- All required CMTS routing and network interface equipment must be installed, configured, and operational. This includes all headend routers, servers (DHCP, TFTP, and TOD), network management systems, and/or other configuration or billing systems required for your network.

- Based on the quality and capacity of your cable plant, your system administrator or network planner must have defined your network's IP address allocation plan; spectrum management plan outlining the recommended operating parameters to optimize performance; channel plan identifying the channels available to assign to specific Cisco CVA122/CVA122E Cable Voice Adapters; and dial plan to match the supported VoIP protocol.

- A CMTS customer service representative must have recorded all needed subscriber information, initiated a work order, and arranged an installation date with the subscriber. For subscriber sites that support multiple telephones or fax devices on a telephone line, all wiring associated with the telephone line extension must be in place. Inside wiring must be in compliance with the country of operation to prevent degradation of service.

- The CMTS system administrator or appropriate personnel must have specified the policy parameters for the Cisco CVA122/CVA122E Cable Voice Adapter and all computers and other CPE devices to be supported at the subscriber site. See Cisco's Network Registrar (CNR) product documentation for more information.

- The CMTS system administrator or appropriate personnel must have defined and pushed DHCP and DOCSIS configuration files to the appropriate servers so that each cable voice adapter, when initialized, can transmit a DHCP request, receive its IP address, obtain its TFTP and TOD server addresses, and download its DOCSIS configuration file. Cisco IOS images and Cisco IOS configuration files must also be prepared for subscribers who are purchasing services that require new software images and advanced configurations.

> **Note**  The CMTS uses the cable voice adapter's unique MAC address for the cable interface to ensure that the cable voice adapter downloads only the file(s) appropriate for the levels of service that have been purchased.

- If DHCP is also being used to provision the IP addresses used by the CPE devices at the subscriber's site, the DHCP server must be able to respond to those requests as well.

- The CMTS system administrator must ensure appropriate databases are updated to activate and support the new subscriber account in the provisioning, billing, and/or network management systems in place for your network after each cable voice adapter is registered with the CMTS.

- The following files should be prepared and available on the TFTP server:

  - DOCSIS configuration file—This is required for every installation. The DOCSIS configuration file specifies the DOCSIS-mandated parameters, such as upstream and downstream frequencies, as well as optional features, such as whether to download a new software image or a Cisco IOS configuration file.

  - Cisco IOS image—If upgrading to a Cisco IOS image different from the factory default, that image must be specified in the DOCSIS configuration file and available on a TFTP server that is accessible through the cable interface.

  - Cisco IOS configuration file—This text file contains the Cisco IOS command-line interface (CLI) commands that configure the cable voice adapter for any special configurations and optional features. It must be made available on a TFTP server that is accessible through the cable interface.

# Data Operations

This section provides an overview of how data is transmitted to and from the Cisco CVA122/CVA122E Cable Voice Adapter across the cable system's HFC network. Figure 1-3 illustrates a typical broadband data cable system, showing the network path between the Cisco CVA122/CVA122E Cable Voice Adapter and the CMTS headend equipment (Cisco uBR7200 series universal broadband router or other DOCSIS-compliant CMTS).

*Figure 1-3    Cisco Broadband Data Cable System*
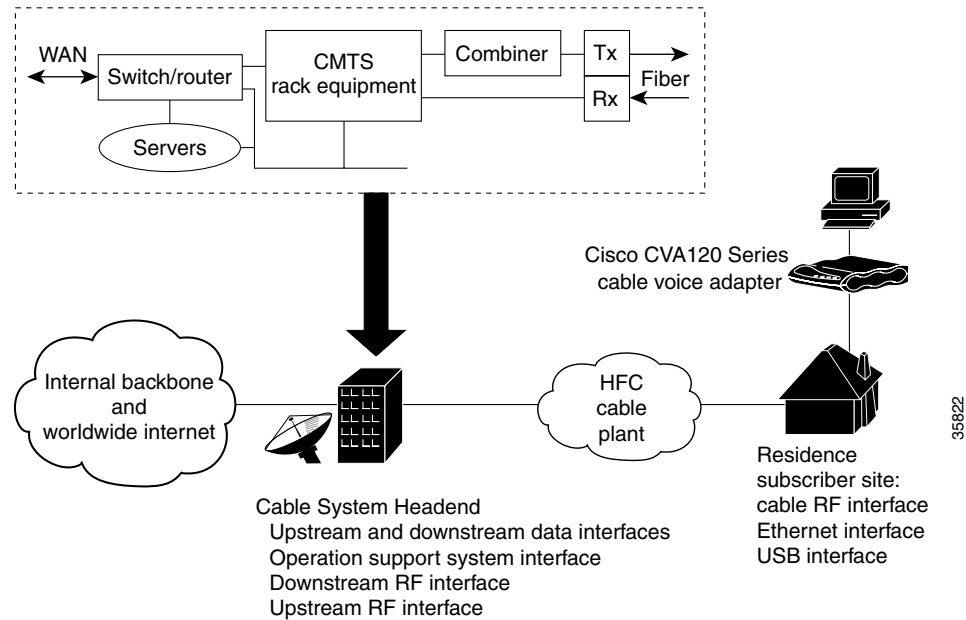


The Cisco CVA122/CVA122E Cable Voice Adapter provides the connection between the PC and the cable system, modulating the data transmitted to and from the PC so that it can be carried over the coaxial cable installed by the service provider. To avoid interfering with the cable video signals that are also transmitted over this same coaxial cable, the DOCSIS specification allows only certain frequencies to be used for data transmissions. Separate frequencies are used for the data sent from the CMTS to the cable modem (the downstream direction) and for the data sent from the cable modem to the CMTS (the upstream direction).

The CMTS divides the cable plant into downstream channels and upstream segments or clusters of nodes. Each Cisco CVA122/CVA122E Cable Voice Adapter on the network is configured to receive data on a particular downstream channel. A downstream channel contains one or more upstream segments; partitioning the upstream plant into smaller segments significantly reduces the number of potential ingress sources and failure points.

## Downstream Transmissions

Because 90% of the data transmitted on the Internet is, on average, sent from the network to the user, the cable system allocates the majority of bandwidth for downstream data (data sent from the CMTS to the cable voice adapter). Downstream transmissions use a 6 MHz data channel in the 88 to 860 MHz range, providing an approximate maximum bandwidth of 27 or 26 Mbps. This bandwidth is shared among all subscribers who have been assigned to this particular downstream channel.

The CMTS receives the downstream data from its Internet or other WAN connections. It addresses the data to the appropriate Cisco CVA122/CVA122E Cable Voice Adapter and modulates it for transmission on the cable network. When the data arrives at the subscriber's site, the cable voice adapter modulates it for transmission over the Ethernet or USB connection to the appropriate CPE device.

## Upstream Transmissions

The data transmitted in the upstream direction (from the user to the network) is typically much less than that on the downstream direction, so a smaller bandwidth is allocated to it. The upstream transmissions share a 200 kHz-wide to 3.2 MHz-wide channel in the 5 to 42 MHz range, providing a bandwidth of up to 10 Mbps.

Depending on the quality of the physical plant and the CMTS used at the headend, users on a single downstream can be allocated across several upstreams to ensure a responsive network. Service providers can allocate different upstream bandwidths depending on the services purchased by a subscriber. For example, a subscriber purchasing basic home service might be allocated a 128 kbps upstream, while businesses purchasing premium services might be allocated a 384 kbps upstream.

The Cisco CVA122/CVA122E Cable Voice Adapter receives the upstream data from the CPE devices to which it is connected. It modulates this data for transmission on the coaxial cable system to the CMTS. The CMTS then routes the data to the appropriate destination (local server, Internet, and so forth) through its WAN interfaces.

All DOCSIS cable modems use a request/grant mechanism to obtain bandwidth on the upstream. The CMTS grants the bandwidth according to the requestor's level of service, ensuring that the cable modem is not exceeding the maximum bandwidth for upstream transmissions that has been specified by the subscriber's service agreement.

> **Note**  End-to-end throughput varies based on the design and loading of network components, the mix of traffic, the processing speed and interface of the host server(s), the processing speed and network performance of the subscriber's computer, as well as other parameters. Because the network can be configured to support multiple levels of service with different performance requirements, the subscriber's service level agreement also affects throughput. DOCSIS also specifies fundamental performance limitations to ensure that the majority of subscribers experience good performance, rather than permitting a few users to consume the entire capacity.

# Voice Operations

The Cisco CVA122/CVA122E Cable Voice Adapter supports Voice over IP (VoIP), which transmits voice, modem, and FAX calls over a TCP/IP network such as the Internet. Depending on the services purchased from the cable service provider, subscribers can place and receive calls without using the local exchange carrier.

The cable voice adapter contains two voice ports, which support two simultaneous voice, modem, and FAX calls. You can connect a single-line telephone or FAX device to each voice port, or you can connect a dual-line telephone or FAX device to the first voice port.

Subscribers can connect standard analog telephones, modems, and FAX machines to the Cisco CVA122/CVA122E Cable Voice Adapter; IP telephones are not required. Depending on the voice network set up by the service provider, subscribers can place calls to numbers that are in the existing telco network; the called party does not have to be using VoIP telephone service.

**Note**    The Cisco CVA122/CVA122E Cable Voice Adapter provides FXS (Foreign Exchange Station) services and supports analog phones, faxes, and modems. The Cisco CVA122/CVA122E Cable Voice Adapter's voice ports do not support devices requiring Foreign Exchange Office (FXO) services, such as PBX devices.

You can also connect multiple telephones, modems, and FAX devices to a single voice line. However, each multiple device acts as an extension to that voice line, so only one call at a time can be made per voice line. The Cisco CVA122/CVA122E Cable Voice Adapter supports multiple devices per voice line, however, the total REN value for all devices must not exceed the maximum number given in Appendix A, "Technical Specifications."

**Note**    The REN value is a measure of the AC load that the device places on a voice line and is typically listed on each device. If too many devices are connected to the line, the telephones might not ring properly, and you might have difficultly completing telephone calls.

Telephones at each subscriber site must support touch-tone dialing; rotary dialing is not supported. Special telephone features such as call waiting, forwarding, and conferencing are supported only if using a Cisco IOS image that supports those particular features.

**Note**    FAX devices—standard Group III and computer-based Group III machines up to 14,400 baud—are supported.

**Caution**    In certain countries, the provisioning of voice telephony over the Internet or use of these products may be prohibited and/or subject to laws, regulations or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; customer must comply with all such applicable laws in the country where the customer intends to use the product.

# Features

The Cisco CVA122/CVA122E Cable Voice Adapter is a compact, easy-to-install device that contains:

- One F-connector interface to the cable system.
- One RJ-45 (10BaseT half-duplex Ethernet) interface to connect a PC directly to the cable voice adapter. If supported by the service provider, this port can connect an Ethernet hub, which then connects to multiple PCs.
- One USB device (type "B" connector) port to connect a PC directly to the cable voice adapter.

**Note**    The Cisco CVA122/CVA122E Cable Voice Adapter does not support networking multiple PCs using a USB bridging hub.

- Two RJ-11 Foreign Exchange Station (FXS) ports to connect analog telephones, modems, and fax devices to the cable system and IP backbone.

Figure 1-4 depicts the front of the Cisco CVA122/CVA122E Cable Voice Adapter. Figure 1-5 shows the rear of the unit.

*Figure 1-4      Cisco CVA122/CVA122E Cable Voice Adapter Front View*
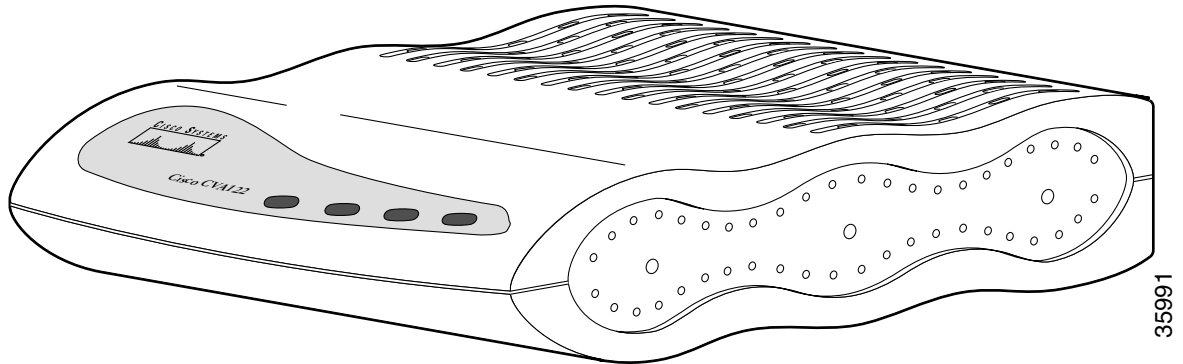


*Figure 1-5      Cisco CVA122/CVA122E Cable Voice Adapter Rear View*
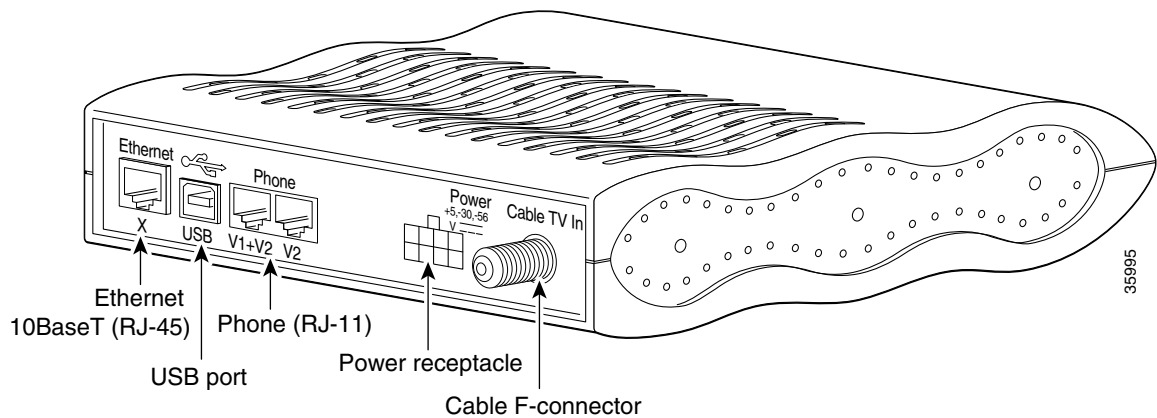


The following sections describe the cable voice adapter and its features in more detail:

- LED Descriptions
- Data Ports
- Voice Ports
- Power Supply

See Appendix B, "Connector and Cable Specifications," for the pinouts and cabling information for each of these connectors.

## LED Descriptions

The front panel on the Cisco CVA122/CVA122E Cable Voice Adapter contains 4 LEDs to provide information about the cable voice adapter's status and network connections. Figure 1-6 illustrates each LED and Table 1-1 lists its meaning.

*Figure 1-6    Cisco CVA122/CVA122E Cable Voice Adapter Front Panel LEDs*



Cable Status        Ethernet Status        USB Status        Message        35779
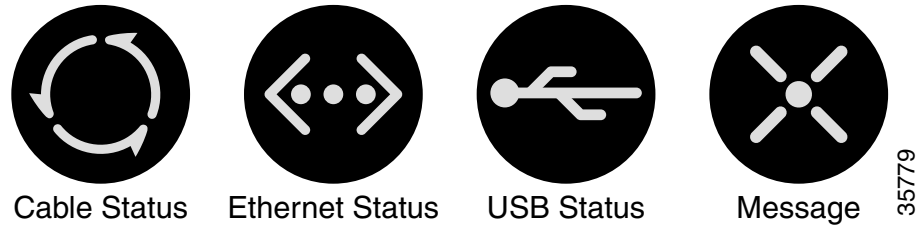
*Table 1-1    Cisco CVA122/CVA122E Cable Voice Adapter Front Panel LED Description*

| Label | Description | Color | Function |
|---|---|---|---|
|  | Cable Status | Green | On = RF link is up, and the Cisco CVA122 power-on and self-test diagnostics have completed successfully, the system image has been booted, and the system is operational.<br><br>Blink = Cisco CVA122 is searching for a downstream frequency or has lost downstream lock.<br><br>Off = No Power; RF link down. |
|  | Ethernet Status | Green | On = Link Up.<br>Blink = Activity on the Ethernet interface.<br>Off = Link Down or Ethernet cable disconnected. |
|  | USB Status | Green | On = Link Up.<br>Blink = Activity on the USB interface.<br>Off = Link Down or USB cable disconnected. |
|  | Message | Green | Reserved for service provider use (for example, it could indicate that messages are waiting in the subscriber's voicemail or email, but the exact usage depends on the service provider).<br><br>Blink = After power-on and self-test diagnostics have completed successfully, LED blinks as the system image is booted. |

**Note**    If the cable voice adapter fails one of its self-tests, the LEDs also contain information about the type of failure. See Table 4-1 on page 4-3 for more details.

## Data Ports

As shown in Figure 1-5, the Cisco CVA122/CVA122E Cable Voice Adapter contains a coaxial cable F-connector, one Ethernet 10Base T (RJ-45) connector, and one USB device (device, type "B") connector. The cable F-connector must always be connected to the cable system for proper operation. The Ethernet and USB connectors can be connected in one of the following configurations:

- A PC can be connected to either the Ethernet or USB connector.

- If supported by the service provider, two PCs can be connected, one to the Ethernet connector and the second to the USB connector.

- If supported by the service provider, an Ethernet hub can be connected to the Ethernet connector, and multiple PCs can be connected to the hub.

> **Note** The USB specification does not support networking multiple PCs using a USB bridging hub.

The Cisco CVA122/CVA122E Cable Voice Adapter supports up to 254 PCs (and other CPE devices) in bridging mode. No maximum limit exists in routing mode. However, the CMTS can impose its own limitation on the maximum number of PCs and CPE devices.

> **Note** For network performance reasons Cisco recommends a maximum limit of 16 CPE devices. The service provider may also set a different limit by changing the MAX CPE parameter in the DOCSIS configuration file—the default MAX CPE value is one CPE device.

## Voice Ports

The Cisco CVA122/CVA122E Cable Voice Adapter contains two analog (FXS) voice ports at the rear of the unit. These ports can be connected directly to analog telephones, modems, or FAX devices in the following ways:

- A single-line telephone, modem, or FAX device can be connected to each voice port, using a two-wire connection.

- A two-line analog telephone, modem, or FAX device can be connected to the first voice port (labeled "V1+V2"), using a four-wire cable. When a two-line telephone is plugged into this port, the second line acts as if it were plugged into the V2 port. If a two-line telephone is used, a device plugged into the V2 port acts as an extension to the second line of the two-line telephone.

- Adapters can be used to connect multiple analog devices to a single voice port. When multiple telephones connected to a voice port, they function as extensions.

The Cisco CVA122/CVA122E Cable Voice Adapter supports up to two simultaneous voice connections, one on each voice port. Only one voice call—telephone, modem, or FAX —per VoIP line is active at a time. The actual number of voice ports and voice devices supported depends on the services purchased from the service provider.

> **Caution** Do not connect the voice ports to telephone wires that exit the building under any circumstances—this is a safety hazard. The Cisco CVA122/CVA122E Cable Voice Adapter is not designed to connect to the Public Telephone Switched Network (PTSN).

Multiple analog telephone devices can be connected to each of the VoIP telephone lines, provided the total Ringer Equivalence Number (REN) for all telephones does not exceed the limits given in Appendix A, "Technical Specifications."

> **Note** A REN value is assigned to each terminal device to denote the percentage of the total load to be connected to the telephone loop used by the device, to prevent overloading. When the REN value is exceeded, the telephones might not ring properly or at all.

# Power Supply

The Cisco CVA122/CVA122E Cable Voice Adapter uses an external AC-input power supply. See Table A-1 in Appendix A, "Technical Specifications," for the AC-input power supply power specifications, including input voltage and operating frequency ranges.

The Cisco CVA122/CVA122E Cable Voice Adapter does not contain a power switch. After the cable system technician installs, connects, powers on, and initializes the unit, it is intended to remain connected to the broadband network when operating normally.

The same power supply supports both U.S. and international operation. Different power cords are required, however, depending on the country of operation.

⚠️
**Caution**    Use only a Cisco-provided power supply and a cord appropriate to the country of operation. Using any other vendor's power supply and cord can cause loss of data or permanent damage.

# Preparing for Installation

This chapter recommends general safety guidelines to follow and identifies requirements to meet before going to a subscriber site to install a Cisco CVA122/CVA122E Cable Voice Adapter. For safety and regulatory information, see Appendix C, "Regulatory Compliance and Safety Information."

⚠️

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

The chapter includes the following sections:

- Safety
- Site Requirements
- Required Tools and Equipment

## Safety

This section describes the general, electrical, and electrostatic discharge guidelines that should be followed when installing the Cisco CVA122/CVA122E Cable Voice Adapter.

## Warnings and Cautions

Follow these guidelines to ensure general safety:

- Install the Cisco CVA122/CVA122E Cable Voice Adapter in compliance with national and local electrical codes:
  - In the United States: National Fire Protection Association (NFPA) 70, United States National Electrical Code.
  - In Canada: Canadian Electrical Code, part I, CC22.1.
  - In other countries: International Electro-technical Commission (IEC) 364, part 1 through part 7.
- Ensure the shield of the coaxial cable is connected to the grounding system of the residence or building as close to the point of cable entry as practical. In the United States, the cable system must be in accordance with Article 820-40 of the National Electric Code.
- Keep the work area clear and dust free during and after installation.

- Keep tools and other components away from walk areas.

- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught on the cable voice adapter. Fasten your tie or scarf and roll up your sleeves.

- Use the Cisco-provided power supply and power cord to connect the Cisco CVA122/CVA122E Cable Voice Adapter to its power supply and the power supply to the power outlet.

- Operate the Cisco CVA122/CVA122E Cable Voice Adapter in accordance with its marked electrical ratings and product usage instructions.

- Always unplug the power cable before installing or removing a cable voice adapter.

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

# Electrical

Follow these guidelines when working with electrical equipment:

- Disconnect all power and external cables before installing or removing a cable voice adapter.

- Do not work alone when potentially hazardous conditions exist.

- Never assume that power has been disconnected from a circuit; always check.

- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

- Never install equipment that appears damaged.

- Carefully examine your work area for possible hazards such as moist floors.

In addition, follow these guidelines when working with equipment that is disconnected from a power source, but still connected to cable wiring.

- Never install coaxial wiring during a lightning storm.

- Never install cable jacks in wet locations unless the jack is specifically designed for wet locations.

- Never touch uninsulated cable wires or terminals unless the line has been disconnected at the network interface.

- Use caution when installing or modifying cable lines.

# Electrostatic Discharge

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. The Cisco CVA122/CVA122E Cable Voice Adapter consists of a printed circuit board that is housed in a shielded enclosure. Electromagnetic interference (EMI) shielding and connectors are integral components of the enclosure. Although the enclosure helps protect the boards, use an antistatic strap whenever handling the Cisco CVA122/CVA122E Cable Voice Adapter. This will minimize the possibility that ESD damage can occur to the internal boards by touching the external connectors.

Following are guidelines for preventing ESD damage:

- If you use an ESD wrist strap or ankle strap, ensure that it makes good skin contact and that the equipment end of the ESD strap is attached to an unfinished surface of the Cisco CVA122/CVA122E Cable Voice Adapter.

- Always place the cable voice adapter on an antistatic surface or in a static shielding bag. If you are returning the item to the factory, immediately place it in a static shielding bag.

⚠️

**Caution**    For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohm (Mohm).

# Site Requirements

Before going to a subscriber site to install the Cisco CVA122/CVA122E Cable Voice Adapter, verify that the following have been done:

- Ensure that a coaxial cable connection is run from the cable TV trunk to the subscriber building or residence.

    📝

    **Note**    Cisco recommends that a dedicated (new) CATV cable drop be run from the grounding block directly to the Cisco CVA122/CVA122E Cable Voice Adapter. If such a drop is not available, careful qualification of existing cable is often necessary. Cable ground should be connected to the grounding system of the building or residence as close to the point of cable entry as practical and according to the local and national electrical regulations (for the United States, see the National Electrical Code Section 820-40 guidelines for proper grounding).

- Verify that each subscriber site is characterized at the headend to support upstream transmission and meets DOCSIS upstream and downstream RF requirements. Observe procedures in the *NCTA Recommended Practises for Measurements on Cable Television Systems*. Also see the "Cabling" section on page 5.

- Some sites specify that high pass filters must be installed on every tap drop that does not carry upstream data, voice, or IPPV services.

    📝

    **Note**    Installing a high pass filter between the cable voice adapter and the headend will prevent the cable voice adapter from connecting to the headend.

- Ensure that all required headend routing and network interface equipment is installed, configured, and operational. Ensure that DHCP, Cisco IOS images, and configuration files have been created and pushed to appropriate servers such that each Cisco CVA122/CVA122E Cable Voice Adapter, when initialized, can transmit a DHCP request, receive an IP address, obtain TFTP and TOD server addresses, and download a configuration file (and/or updated software image) in compliance with DOCSIS and the procedures in place for your network.

- Ensure that each subscriber site meets the operating requirements specified in the "Site Requirements" section.

- Ensure that all supported equipment at a subscriber site—PCs, telephones, modems, FAX devices, Ethernet hub, and USB hub—is installed and operational. Ensure telephones at subscriber sites support touch-tone (DTMF) dialing.

- Verify that all PCs at all subscriber locations meet the minimum computing requirements. If using USB connectivity, verify that the USB driver software has been installed; otherwise, verify that Internet connectivity is set for the Ethernet interface. See the "PC Subsystem" section on page 4-10 for procedures to verify TCP/IP and DHCP PC settings when onsite.

Each service provider has its own recommendations and requirements for the CPE devices connected to its network. However, at the very minimum a PC should meet the requirements listed in Table 2-1.

*Table 2-1    PC Minimum Requirements for the Cisco CVA122/CVA122E Cable Voice Adapter*

|  | Ethernet Connectivity | USB Connectivity |
|---|---|---|
| Operating System[1] | Windows 95, Windows NT, Windows 98, Windows 98 Second Edition, Windows 2000, Windows Millennium | Windows 98, Windows 98 Second Edition, Windows 2000, Windows Millennium |
| Processor | 33 MHz 486 processor (75 MHz Pentium or greater is recommended) | 75 MHz 486 processor (Windows 98) 150 MHz Pentium processor (Windows Millennium), 133 MHz Pentium processor (Windows 2000) |
| Memory | 16 MB | 24 MB (Windows 98), 32MB (Windows Millennium), 128 MB (Windows 2000) |
| Internet Software | Internet browser | Internet browser |
| Networking Hardware | Ethernet network interface card (NIC) | USB-capable computer |
| Networking Cable | Straight-through 10Base T Ethernet cable with RJ-45 connectors[2] | Host-to-device USB cable (type "A" to type "B") |
| Networking Software | Ethernet software driver and TCP/IP networking software (typically supplied with the Ethernet network card) | USB software driver and TCP/IP networking software[2] |
| Configuration | DHCP enabled ("Obtain an IP address automatically") | DHCP enabled ("Obtain an IP address automatically") |

1. The service provider might support other types of PCs and CPE devices for network connectivity. At the minimum, these CPE devices must meet the following requirements: 10Base T Ethernet connectivity, TCP/IP networking software, and the ability to obtain an IP address using the DHCP protocol.

2. Supplied with the Cisco CVA122/CVA122E Cable Voice Adapter.

- Ensure that you bring sufficient cables to connect all devices at all subscriber locations. For simultaneous TV and computer usage at a subscriber site, obtain cable splitters and directional couplers as appropriate to install when you install the cable voice adapter.

- The Cisco CVA122/CVA122E Cable Voice Adapter automatically obtains its IP address from the headend DHCP server at power-up. Typically, the PCs at the subscriber site are also configured to use DHCP to obtain their IP addresses; if this is not the case, obtain the static IP addresses for each PC from the applicable system administrator, along with the appropriate gateway and DNS information.

- If supporting VoIP devices, obtain the phone numbers and/or IP addresses that the service provider has assigned to each of the voice ports on the Cisco CVA122/CVA122E Cable Voice Adapter.

# Environmental

Appendix A, "Technical Specifications," lists the operating and nonoperating environmental site requirements for operation of the Cisco CVA122/CVA122E Cable Voice Adapter. The values given indicate the minimum and maximum values allowed for the cable voice adapter's operation, but if a measurement approaches the minimum or maximum of a range, it could indicate a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach a maximum operating range.

⚠️

**Caution**    For proper airflow, keep the top, sides, and back of the cable voice adapter clear of obstructions and away from the exhaust of other equipment.

# Power

The Cisco CVA122/CVA122E Cable Voice Adapter does not contain a power switch. After the unit is installed and powered on, it is intended to remain connected to the network and CPE devices during normal operations. Before plugging the unit in, verify that the power source is within the values given in Appendix A, "Technical Specifications" (Table A-1, "Cisco CVA122/CVA122E Cable Voice Adapter Physical Specifications").

✎

**Note**    The same power supply supports both domestic (U.S.) and international operation. Different power cords are required, however, depending on the country of operation.

⚠️

**Caution**    Use only a Cisco-provided power supply and the appropriate power cord for the country of operation. Using any other vendor's power supply or an inappropriate power cord can cause loss of data or permanent damage.

⚠️

**Warning**    **This equipment has been designed for connection to TN and IT power systems.**

# Cabling

When running the coaxial line from the cable TV trunk connection to the subscriber site, consider the issues of electromagnetic interference (EMI), coaxial cable quality, and distance limitations for signaling, as described in the following sections.

✎

**Note**    See Appendix B, "Connector and Cable Specifications," for the specifications for the Ethernet, telephone, USB, and power cables.

## Interference Considerations

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires. This fact has two implications for the construction of plant wiring:

* Bad wiring practice can result in radio interference emanating from the plant wiring.

* Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the Cisco CVA122/CVA122E Cable Voice Adapter, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the *"Electrical" section on page 2-2*.

**Note** Category 5 data wiring and telco wiring is much more susceptible to EMI than high-grade well-shielded coaxial CATV cable.

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unsaddled conductors to destroy electronic devices. If you have had problems of this sort in the past, you might want to consult experts in electrical surge suppression and shielding.

## Coaxial Cable Quality

CATV coaxial cable quality can vary dramatically at each installation site. Poor insulation, improperly installed additional outlets, the condition and length of the cable's center conductor, and the quality of the cable can negatively affect the connectivity and performance of the cable voice adapter for digital data transmission. Coaxial cable tolerances for the transmission of two-way digital data are much lower than the tolerances for the transmission of downstream-only video. Coaxial cable used to carry two-way digital data must be of very high quality.

**Note** A 5 dB reduction in signal quality for analog downstream video might cause a slight degradation of picture clarity, which might or might not be noticeable to a subscriber.

A 1 dB reduction in signal quality for digital data might completely disrupt service to a cable voice adapteruser.

Check the cables for general quality level, tears or cuts in the insulation, insulation that is at least 80% braid with foil, a broken or bent center conductor at the conductor ends, the length of the center conductor, and splitters or amplifiers that have been added to extend video connectivity at the installation site.

**Note** The center conductor should extend 1/8 inch (3.2 mm) beyond the end of the conductor.

**Tips** Cisco recommends that you replace any cable that is in question and begin the installation with clean, two-way digital data transmission media. If the cable is of high-quality and was recently installed, replacing the connectors with high-quality connectors can also improve performance and eliminate future service calls.

⚠

**Caution**    If you replace a connector, be careful not to score the center conductor. A scored conductor can reduce or impair performance for channels broadcast between 550 and 860 MHz. If the center conductor is too short, signals between 5 and 42 MHz might be affected.

## Distance Limitations

The size of your networks and the distances between connections on the CATV network can affect the successful installation of a Cisco CVA122/CVA122E Cable Voice Adapter, which must be within 100 miles of the CMTS. This distance can also be defined in relation to the speed of light through the transmission network as being less than 2 msec from the CMTS to the Cisco CVA122/CVA122E Cable Voice Adapter and back again.

✎

**Note**    Exceeding this distance is a violation of the DOCSIS RFI specification.

When preparing a site for network connections to the Cisco CVA122/CVA122E Cable Voice Adapter, consider the following:

- The number of amplifiers from the installation site to the nearest node
- The number of outlets and amplifiers at the installation site
- Cable pinouts if you plan to build your cables

Potential distance limitation problems in the CATV network can be reduced by doing the following:

- A correct, linear unity gain two-way sweep procedure is in place
- Industry-standard configuration practices are used at the headend
- The downstream frequency is known at the time of installation
- The absolute downstream signal level can be measured where it enters the cable voice adapter

# Required Tools and Equipment

Assemble the tools and equipment needed to install the Cisco CVA122/CVA122E Cable Voice Adapter at subscriber sites. Table 2-2 lists the recommended items that Cisco does not provide.

*Table 2-2    Recommended Tools, Cabling, and Equipment List*

| Checked Off | Item |
|---|---|
| **Normal Installation Tools** | |
| | Installation toolkit including a flathead screwdriver (small to medium size); Phillips screwdriver (small to medium size); 7/16-inch open-end wrench; ESD-preventive wrist strap |
| | High-quality, shielded RF coaxial cable (with at least 80% braid) to connect the cable voice adapter to the cable system |
| | Coaxial cable splitter and high pass filter, as appropriate. |
| | Host-to-device (type "A" to type "B") USB cable, maximum length 5 meters, if using USB connectivity. |
| | One straight-through category 5 UTP (10Base T) Ethernet cable to connect one computer is provided with the cable voice adapter. |
| | If using an Ethernet hub to connect multiple PCs to the cable voice adapter, the following additional cabling is required: |
| | • Crossover category 5 UTP (10Base T) Ethernet cable to connect the Ethernet hub to the cable voice adapter |
| | • Additional straight-through category 5 UTP (10Base T) Ethernet cables for each PC connecting to the hub |
| | Voice cables and appropriate items to connect the cable voice adapter to the telephone, modem, or FAX device at the site. Each telephone, modem, or FAX device requires a two-wire or four-wire cable with an RJ-11 connector on at least one end; the connector on the other end is usually also an RJ-11 connector, but this depends on the telephone or FAX device being connected. |
| | Connector assemblies/adapters and wiring items for subscriber sites that support multiple telephones or fax devices on a VoIP telephone line; items and wiring must be in accordance with regulations in the country of operation. |
| **Optional Troubleshooting Tools** | |
| | Signal level meter capable of reading a 64 QAM signal or a spectrum analyzer (HP8594Q or equivalent) as appropriate. An alternative is a clear understanding of the digital-to-analog channel amplitude offset and a calibrated analog signal level meter to measure a nearby adjacent analog carrier. |
| | 10BaseT Ethernet cable tester |

The Cisco CVA122/CVA122E Cable Voice Adapter is available in differing bulk box and single packages:

• Bulk box packages include: ten Cisco CVA122/CVA122E Cable Voice Adapters, ten support stands, ten power supplies, ten power cords based on the country of operation, one USB driver software installation CD, the release notes for the included version of Cisco IOS software, safety

and warranty information, one copy of the *Cisco CVA122/CVA122E Cable Voice Adapter User Guide*, and ten copies of the *Quick Start, Cisco CVA122/CVA122E Cable Voice Adapter Subscriber Setup* card.

- Single packages include: one Cisco CVA122/CVA122E Cable Voice Adapter, one power supply, one support stand, one power cord appropriate for the country of operation, one 10BaseT Ethernet straight-through cable, one USB driver software installation CD, one copy of the *Cisco CVA122/CVA122E Cable Voice Adapter User Guide*, and one copy of the *Quick Start, Cisco CVA122/CVA122E Cable Voice Adapter Subscriber Setup* card.

⚠️

**Caution**    Use only the Cisco-provided power supply. Using any other vendor's power supply can cause loss of data or permanent damage. Ensure the power cord is suitable for your country of operation.

The subscriber in-box documentation set includes:

- *Quick Start, Cisco CVA122/CVA122E Cable Voice Adapter Subscriber Setup* card
- *Cisco CVA122/CVA122E Cable Voice Adapter User Guide*

The service provider in-box documentation set includes:

- Warranty card
- Licensing information
- Release notes for the shipping Cisco IOS Release image

The following additional documents are available via CCO:

- *Cisco CVA122/CVA122E Cable Voice Adapter Hardware Installation Guide*—this document
- *Cisco CVA122 Cable Voice Adapter Features* guide
- *Cisco CVA122E Cable Voice Adapter Features* guide
- Release notes are available for all Cisco IOS Release images

Based on the number of subscriber sites you are scheduled to install, ensure that you have sufficient Cisco-provided bulk box packages. After you have completed installation, give each subscriber a copy of the *Quick Start, Cisco CVA122/CVA122E Cable Voice Adapter Subscriber Setup* card, along with any documentation your company provides.

# Installing the Cisco CVA122/CVA122E Cable Voice Adapter

This chapter contains the following sections that provide instructions on installing the Cisco CVA122/CVA122E Cable Voice Adapter, initial power-on, and verifying the installation:

- Cisco CVA122/CVA122E Cable Voice Adapter Installation Checklist
- Physical Placement
- Verifying Power Requirements
- Connecting to the Cable System
- Connecting to Telephones or Fax Devices
- Connecting to the Computer (Ethernet)
- Connecting to the Computer (USB)
- Power-On and Initialization Sequence
- Verifying Installation

⚠️

**Caution**    Before proceeding with the installation, verify that you have fulfilled all of the requirements listed in Chapter 2, "Preparing for Installation." Also read and follow the safety guidelines in the "Safety" section on page 2-1, as well as those contained in this chapter.

# Cisco CVA122/CVA122E Cable Voice Adapter Installation Checklist

Table 3-1 presents a checklist, identifying the installation tasks to complete at each subscriber site. Use this table as a guide while installing the cable voice adapter.

*Table 3-1    Installation Checklist*

| Checked Off | Task | For More Information, See... |
|---|---|---|
|  | Verify that the PC to be connected to the cable voice adapter has either a USB port or an Ethernet NIC. Ensure that all other PC prerequisites are met. | "Site Requirements" section on page 2-3 |
|  | Ensure the selected location to install the cable voice adapter is free of dust and meets all requirements. | "Environmental" section on page 2-5 |
|  | Install the Cisco CVA122/CVA122E Cable Voice Adapter:<br><br>• Close to the cable drop connection.<br>• If using USB connectivity, the Cisco CVA122/CVA122E Cable Voice Adapter must be within 5 meters of the connected PC (or USB hub).<br>• Close to the power source.<br>• If wall-mounting, on a cement, wood, or drywall, near the cable drop connection and power source. Otherwise, place the unit on a stable, flat surface such as a desktop, close to the devices to be connected such that your cables reach all devices, but in a location where the top, sides, and rear of the chassis are clear of obstructions and away from the exhaust of other equipment.<br><br>**Note** If placed on a desktop, the Cisco CVA122/CVA122E Cable Voice Adapter can be placed flat or it can be placed vertically in its support stand, as desired. | "Physical Placement" section on page 3-4 |
|  | Check the power at the subscriber site before and after installation to ensure that you are receiving clean power. | "Verifying Power Requirements" section on page 3-9 |
|  | Attach the 8-pin end of the supplied power supply cord into the cable voice adapter's Power connector. Push the plug into the connector until it locks. Connect the power cord to the power supply, and plug the cable voice adapter's power supply into the wall outlet.<br><br>**Note** For information on connecting the Cisco CVA122/CVA122E Cable Voice Adapter to the Cisco CVA120 Series Universal Power Supply (UPS), see the instructions that accompany the UPS. | "Connecting Power" section on page 3-10 |
|  | Connect the cable voice adapter's F-connector to the cable TV coaxial drop cable. (If the subscriber also subscribes to cable TV services, install a cable splitter/directional coupler and high-pass filter as appropriate.) | "Connecting to the Cable System" section on page 3-11 |

***Table 3-1    Installation Checklist (continued)***

| Checked Off | Task | For More Information, See... |
|---|---|---|
| | Connect the cable voice adapter's phone RJ-11 connectors directly to individual analog telephones, modems, or FAX devices. If supported by your phone system, you can also use adapter(s) that allow multiple telephones or fax devices to be connected to the telephone lines. At subscriber sites supporting multiple voice devices on a single VoIP telephone line, ensure you have all certified connector assemblies/adapters and wiring items needed to support the configuration.<br><br>**Note**    Cisco does not provide these connector assemblies and adapters. | "Connecting to Telephones or Fax Devices" section on page 3-12 |
| | If using Ethernet connectivity, connect the Cisco CVA122/CVA122E Cable Voice Adapter to either a PC with an Ethernet NIC or to an Ethernet hub:<br><br>• To directly connect one PC to the Cisco CVA122/CVA122E Cable Voice Adapter, connect the unit's Ethernet port directly to the PC's Ethernet adapter, using a straight-through 10BaseT Ethernet cable.<br><br>• To connect additional PCs and other CPE devices at the site, use a crossover Ethernet 10Base T Ethernet cable to connect the cable voice adapter to an Ethernet hub. Then connect each computer/device to the hub, using straight-through 10BaseT Ethernet cables. | "Connecting to the Computer (Ethernet)" section on page 3-14 |
| | If using USB connectivity, connect the Cisco CVA122/CVA122E Cable Voice Adapter to the PC with a host-to-device (type "A" to type "B") USB cable.<br><br>**Note**    The USB specification requires that the USB cable not exceed 5 meters in length. You can, however, use up to 5 USB hubs, each with a maximum 5 meter cable, for a maximum distance of 25 meters. | "Connecting to the Computer (USB)" section on page 3-15 |
| | Power on all other devices at the subscriber site: PCs, Ethernet hub and all other equipment as applicable. | "Power-On and Initialization Sequence" section on page 3-16 |
| | If using USB connectivity, install the USB driver software that is on the Cisco CVA120 series USB software driver CD included with the Cisco CVA122/CVA122E Cable Voice Adapter. | See the documentation accompanying the software CD for details. |

*Table 3-1    Installation Checklist (continued)*

| Checked Off | Task | For More Information, See... |
|---|---|---|
| | (Optional) Ensure the data channel frequency has a sufficient RF signal level to meet your cable plant specifications and verify the RF input levels relative to a nearby analog video level:<br><br>• Check the RF signal with an RF power meter at the Type F coax connector to verify the DOCSIS system signal.<br><br>• Verify the nearby analog video signal is within the correct range—0 to +15 dBmV for most CATV systems. | |
| | Test the installation:<br><br>• Establish an Internet connection and request data from a PC connected to the cable voice adapter.<br><br>• Make a VoIP telephone call. | "Verifying Installation" section on page 3-17 |

# Physical Placement

The Cisco CVA122/CVA122E Cable Voice Adapter can be placed flat on a desktop, placed on its side using the supplied support stand, or mounted on a wall. See the following sections for more information.

## Placing the Cisco CVA122/CVA122E Cable Voice Adapter on a Desktop

The Cisco CVA122/CVA122E Cable Voice Adapter can be placed flat on a hard, stable surface such as a desktop or table top. When doing so, use the following guidelines:

• Place the cable voice adapter close to the cable TV drop connection and all devices to be connected at the subscriber site.

• Install the cable voice adapter in compliance with all national and local electrical codes such as:

  – US NFPA 70

  – Canadian Electrical Code, part I, CC22.1

  – IEC 364, part 1 through part 7

• The bottom and sides of the cable voice adapter must remain unobstructed to ensure adequate airflow and to prevent the unit from overheating.

• The cable voice adapter should have at least 3 inches of clearance at the rear to allow sufficient space for the connected cables without crimping.

⚠

**Caution**    Do not install the cable voice adapter on the floor or an uneven or soft surface.

# Side Mounting the Cisco CVA122/CVA122E Cable Voice Adapter

The Cisco CVA122/CVA122E Cable Voice Adapter can be placed on its side on a desktop or other stable, flat surface, using the support stand that is shipped with the unit. To mount the cable voice adapter on its side, use the following procedure:

**Step 1**   Decide which side should be placed on the stand. The cable voice adapter can be mounted on either side, according to whichever position is most convenient for cabling.

**Note**   Although the cable voice adapter can be mounted on either side, Cisco recommends that it be placed with its coaxial cable connector on the bottom. This provides the most stable placement when the coaxial cable (and other cables) are connected to the unit.

**Step 2**   Position the cable voice adapter over the support stand, aligning the two pegs on the stand with the large holes in the front and middle of the cable voice adapter's side panel. The side rails on the support stand must be supporting the rear half of the cable voice adapter. See Figure 3-1:

*Figure 3-1    Side Mounting the Cisco CVA122/CVA122E Cable Voice Adapter*
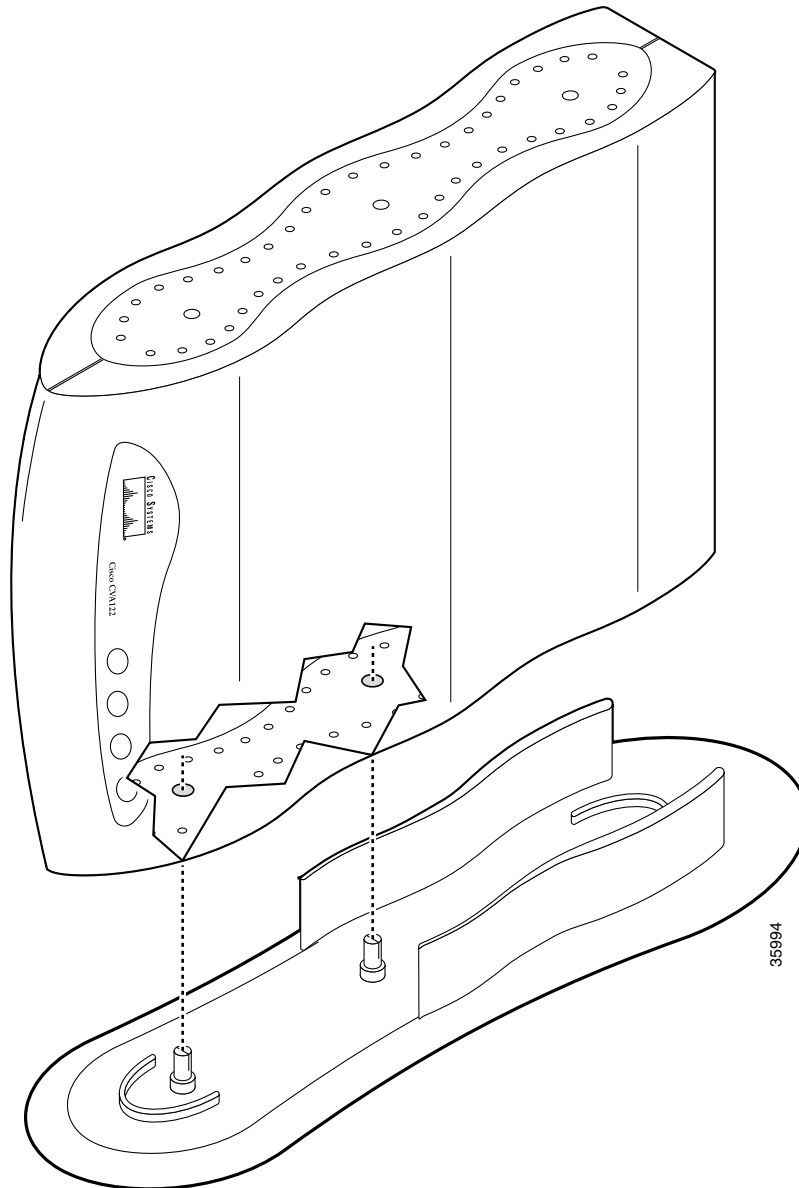


**Note**    For stability, Cisco recommends that the Cisco CVA122/CVA122E Cable Voice Adapter be placed as shown in Figure 3-1, so that the coaxial cable connector and its attached cable are at the bottom.

**Step 3**    Press the cable voice adapter into the stand until each peg snaps securely in place. See Figure 3-2:

*Figure 3-2    Cisco CVA122/CVA122E Cable Voice Adapter (Side Mounted)*
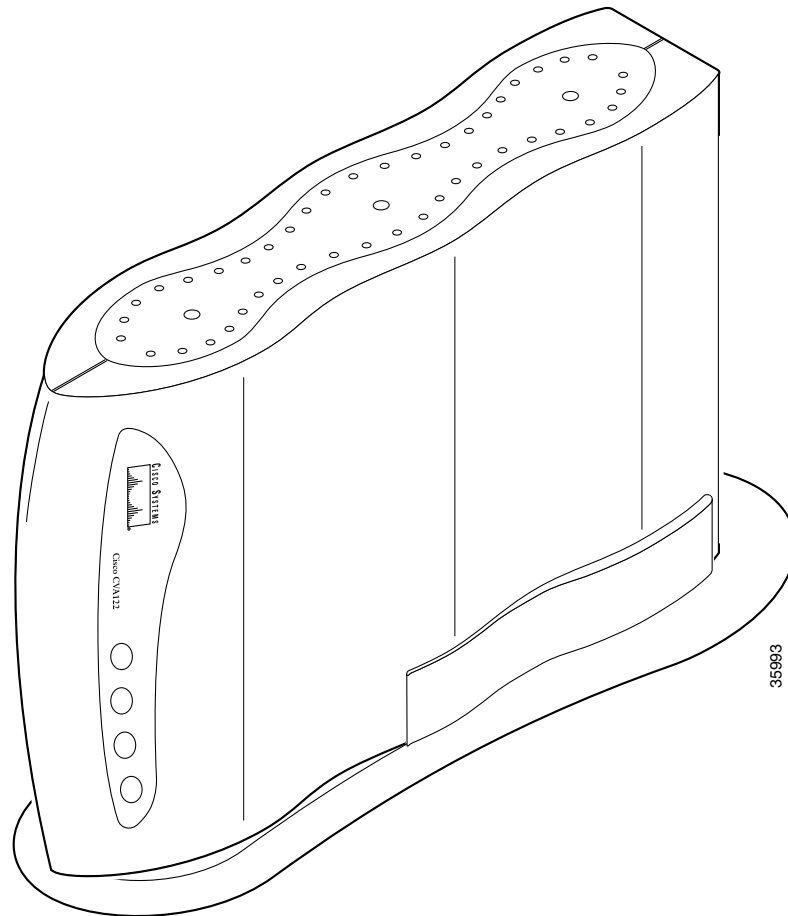


**Step 4**    Place the cable voice adapter and stand on any stable, hard surface, using the following guidelines:

- Close to the cable TV drop connection and all devices to be connected at the subscriber site.

- Install the cable voice adapter in compliance with all national and local electrical codes such as:

    - US NFPA 70

    - Canadian Electrical Code, part I, CC22.1

    - IEC 364, part 1 through part 7

- The top and sides of the cable voice adapter must remain unobstructed to ensure adequate airflow and to prevent the unit from overheating.

- The cable voice adapter should have at least 3 inches of clearance at the rear to allow sufficient space for the connected cables without crimping.

# Wall Mounting the Cisco CVA122/CVA122E Cable Voice Adapter

To mount the Cisco CVA122/CVA122E Cable Voice Adapter on a cement, wood, or drywall, do the following:

**Step 1**   Choose a location on a suitable wall (wood, cement, or drywall) that is close to the cable TV drop connection and all devices to be connected at the subscriber site.

**Step 2**   If also mounting the Uninterruptible Power Supply (UPS) for the Cisco CVA122/CVA122E Cable Voice Adapter, mount it first, using the instructions that accompany the UPS, to ensure that the wall and location are suitable for both the UPS and Cisco CVA122/CVA122E Cable Voice Adapter.

**Step 3**   Drill two holes 4-1/8 inch (105 mm) apart, using Figure 3-3 as a guideline.

*Figure 3-3     Wall Mounting the Cisco CVA122/CVA122E Cable Voice Adapter (not to scale)*
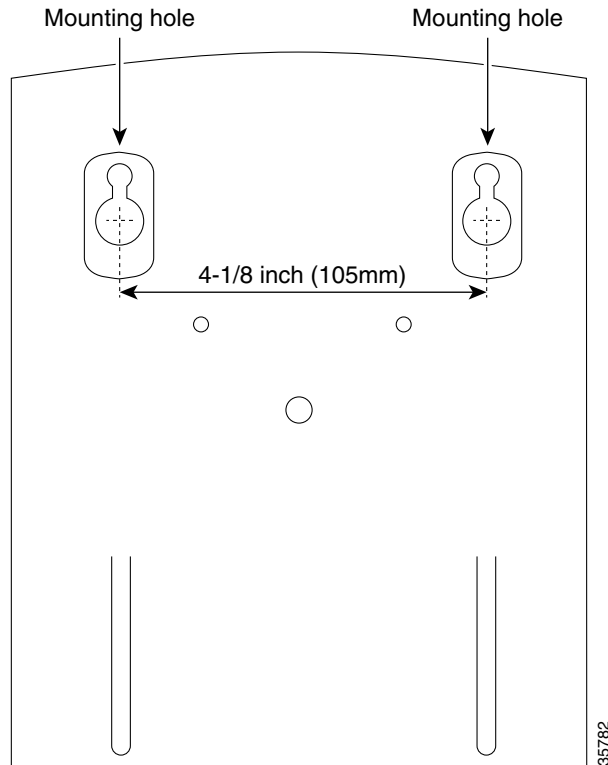


**Step 4**   Install two 1/4 inch (6 mm) anchors or mounting screws in the holes, extending about 1/4 inch (6mm) from the wall. (The anchors or mounting screws should be appropriate for the type of wall being used.)

**Step 5**   Hang the Cisco CVA122/CVA122E Cable Voice Adapter on the two screws, with the rear panel facing down toward the ground. (See Figure 3-4.)

*Figure 3-4    Wall Mounting the Cisco CVA122/CVA122E Cable Voice Adapter*
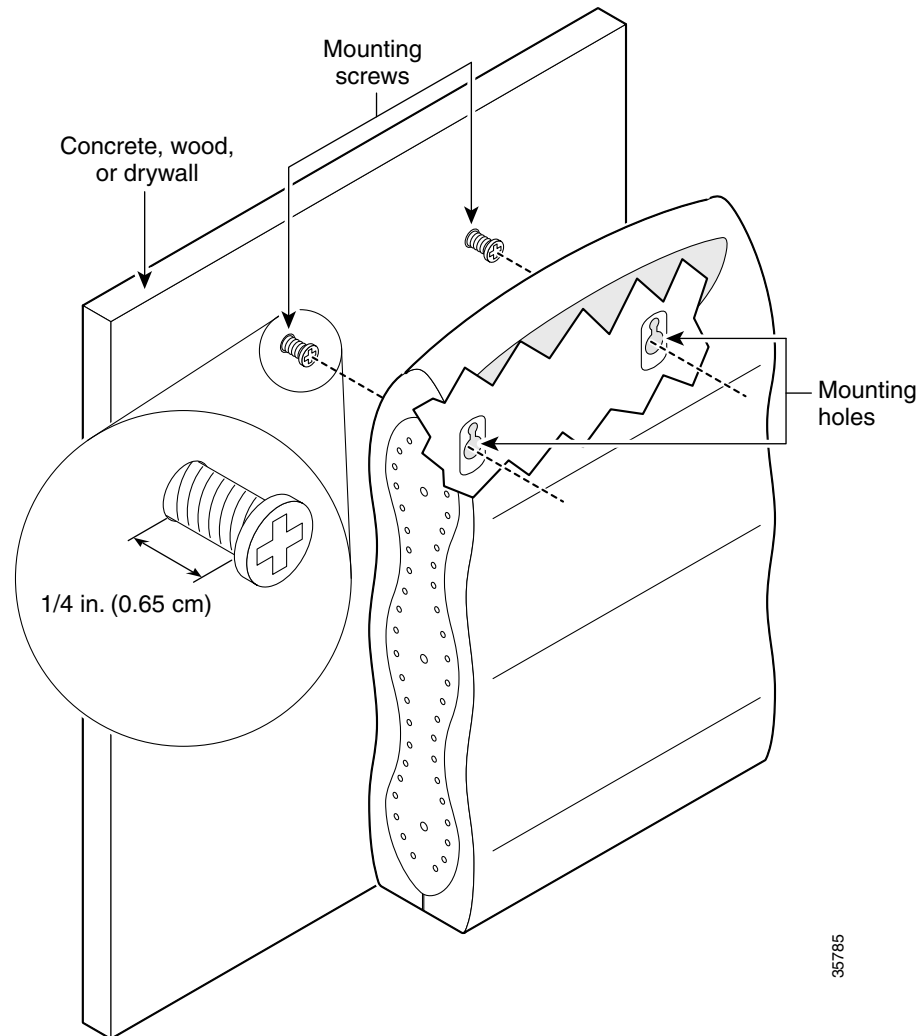


# Verifying Power Requirements

The cable voice adapter uses one external AC-input power supply. The Cable Status LED on the front of the unit indicates that the power supply is supplying power to the unit when it is connected and operational.

The AC-input power supply uses a power factor corrector that allows the Cisco CVA122/CVA122E Cable Voice Adapter to operate in any country where the input voltage is between 100 and 240 VAC, and 50 or 60 Hz. Different power cords are available to suit the country of operation.

**Note**    For information on the Cisco CVA120 Series Universal Power Supply (UPS), see the instructions that accompany the UPS.

See Table A-1 on page A-1 for AC-input power supply specifications, including input voltage and operating frequency ranges. Cisco recommends that you follow these precautions:

- Check the power at the subscriber site before and after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.

- If plugging the cable voice adapter into any Uninterruptible Power Supply (UPS) other than the CVA120 Series UPS, verify that the total power and current requirements used by all devices plugged into the UPS are within the maximum limits of the UPS.

- Do not work on the system or connect or disconnect any cables (Ethernet, USB, cable, or power) during periods of lightning activity—the possibility of serious physical injury exists if lightning should strike and travel through those cables. In addition, the equipment could be damaged by the higher levels of static electricity present in the atmosphere.

Note    Adhere to the safety guidelines presented in the "Safety" section on page 2-1 before following procedures in the remainder of this chapter. Be sure all equipment to be connected to the cable voice adapter is powered off.

# Connecting Power

This section describes how to connect the Cisco CVA122/CVA122E Cable Voice Adapter to power using the AC-input power supply. For information about using the CVA120 Series UPS, see the documentation that accompanies the UPS.

Step 1    See "Verifying Power Requirements" section on page 3-9 to verify that the external power source is adequate for the cable voice adapter.

Step 2    Turn on power to all other devices that will be connected to the Cisco CVA122/CVA122E Cable Voice Adapter (such as a PC, Ethernet hub, or USB hub).

Step 3    Plug the 8-pin end of the power supply output cord into the power connector at the rear of the cable voice adapter. Push the plug into the connector until it locks. (See Figure 3-5.)

***Figure 3-5    Connecting the Power***
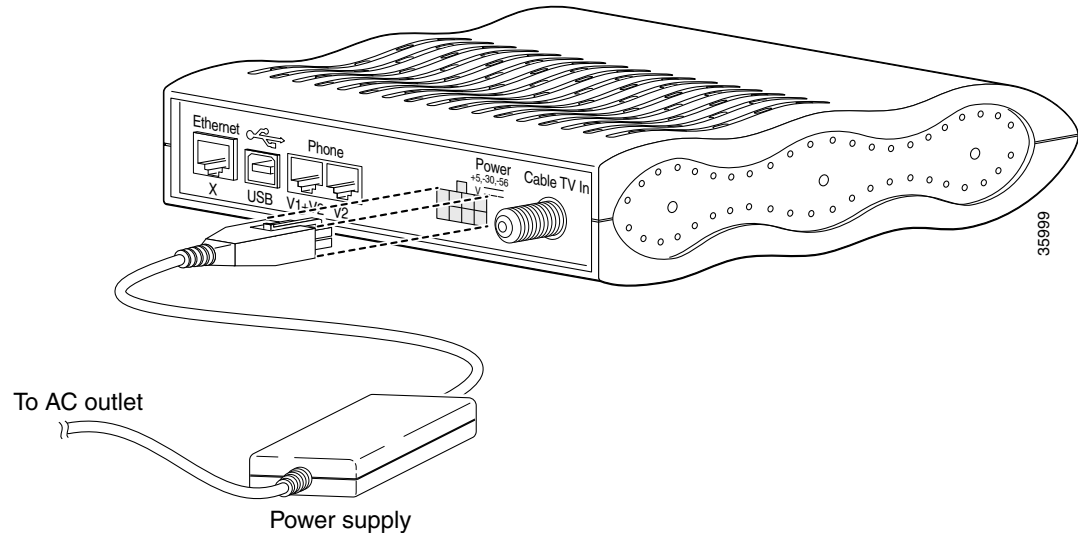


**Step 4**   If not already done, plug the two-plug end of the power cord into the receptacle on the power supply.

**Step 5**   Plug the prong end of the power cord into a standard electrical power outlet at the site. Power is immediately supplied to the cable voice adapter. The cable voice adapter is meant to be left on at all times, and therefore, has no power switch.

**Step 6**   Continue with the following sections to connect the remaining cables to the Cisco CVA122/CVA122E Cable Voice Adapter.

⚠

**Caution**   To turn off the cable voice adapter, disconnect the power cord from the wall outlet.

# Connecting to the Cable System

To connect the Cisco CVA122/CVA122E Cable Voice Adapter to the cable TV (CATV) system:

**Step 1**   Locate the CATV wall outlet to be used for the Cisco CVA122/CVA122E Cable Voice Adapter.

**Step 2**   If you want to use the same CATV wall outlet for both the Cisco CVA122/CVA122E Cable Voice Adapter and cable TV, contact your service provider for instructions on installing a cable splitter/directional coupler to the cable outlet. Also, if required by the service provider, install a high-pass filter between the TV and the Cisco CVA122/CVA122E Cable Voice Adapter to prevent interference between the TV and networking signals.

**Step 3**   Connect one end of the coaxial cable to the CATV wall outlet (or to the cable splitter). Hand-tighten the connector so that it is finger tight; then give it a 1/6 turn with a wrench.

**Step 4**   Connect the coaxial cable to the cable voice adapter's F-connector. Hand-tighten the connector so that it is finger tight; then give it a 1/6 turn with a wrench. (See Figure 3-6.)

*Figure 3-6    Connecting the CATV Coaxial Cable to the Cisco CVA122/CVA122E Cable Voice Adapter*
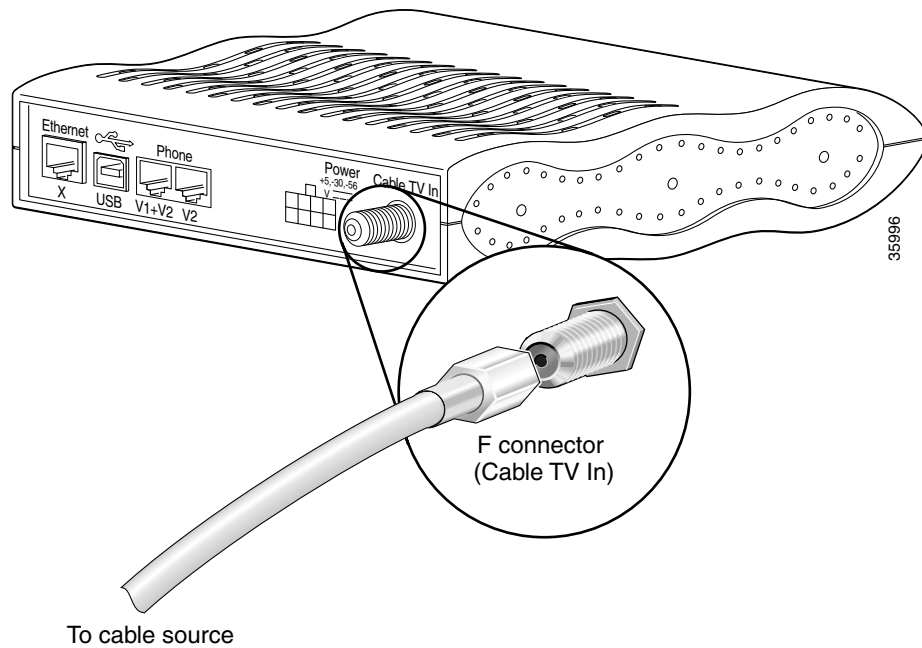


⚠
**Caution**    Do not overtighten because this can break off the connector. Using a torque wrench is not recommended because of the danger of tightening the connector more than the recommended 1/6 turn after it is finger tight.

**Step 5**    Make sure all other coaxial cable connectors—all intermediate splitters, couplers, or ground blocks—are securely tightened from the distribution tap to the Cisco CVA122/CVA122E Cable Voice Adapter.

✎
**Note**    Loose connectors inside the residence can cause intermittent network operation.

⚠
**Caution**    To ensure compliance with FCC limits, connection to the cable system must be made with a high-quality, shielded cable. If the quality or general condition of the coaxial cable at the subscriber site is in question, Cisco recommends that you replace the coaxial cable. For more information on the effects of substandard cabling on the cable voice adapter installation, see the "Cabling" section on page 2-5.

# Connecting to Telephones or Fax Devices

If you have purchased voice services from your service provider, use the following procedure to connect the Cisco CVA122/CVA122E Cable Voice Adapter to telephone, modem, or FAX devices at the site.

**Step 1**    Obtain the telephone number assignments for each voice port from your service provider, and label each telephone, modem, or FAX device with its assigned number.

**Step 2**    Obtain a proper cable for each device to be connected. This cable should be either a two-wire or a four-wire cable wired straight-through, with an RJ-11 connector on at least one end; the other end typically has an RJ-11 connector as well, but this depends on the type of device being connected.

> **Note**    When connecting a single-line telephone, you can use either a two-wire or a four-wire cable. When connecting a dual-line telephone to the "V1+V2" voice port, you must use a four-wire cable.

**Step 3**    Connect the RJ-11 end of this cable to the appropriate voice port (labeled "V1+V2" or "V2") on the rear panel of the Cisco CVA122/CVA122E Cable Voice Adapter. Press the cable firmly into the receptacle.

**Step 4**    Connect the other end of the cable to the telephone, modem, or FAX device that has been given the number assigned for that voice port. Press the cable firmly into the receptacle.

> **Caution**    Do not connect the voice ports to telephone wires that exit the building under any circumstances—this is a safety hazard. The Cisco CVA122/CVA122E Cable Voice Adapter is not designed to connect to the Public Telephone Switched Network (PTSN).

See Figure 3-7 illustrates a possible configuration. The exact configuration depends on the phone numbers that are assigned by the service provider.

*Figure 3-7    Connecting the Voice Ports*
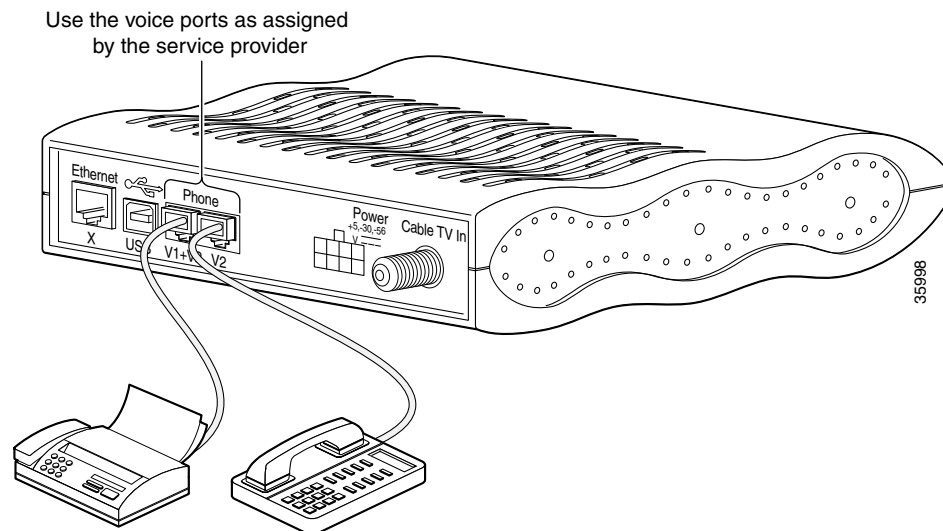


> **Note**    The "V1+V2" connector supports either a single-line analog telephone or a two-line analog telephone. When using a two-line telephone, line 2 of the telephone behaves as if a single-line telephone is plugged into the V2 voice port. In this configuration, a device plugged into the V2 port act as extensions to the line 2 telephone.

**Cisco CVA122/CVA122E Hardware Installation Guide**

**Step 5**    Repeat steps 3 and 4 to connect another telephone, modem, or FAX device to the other voice port.

---

⚠

**Caution**    When connecting multiple telephones or fax devices to a telephone line, be sure the sum of the RENs of all devices on any one line does not exceed the ratings given in Appendix A, "Technical Specifications."

---

⚠

**Warning**    **This equipment contains a ring signal generator (ringer), which is a source of hazardous voltage. Do not touch the RJ-11 (phone) port wires (conductors), the conductors of a cable connected to the RJ-11 port, or the associated circuit board when the ringer is active. The ringer is activated by an incoming call.**

---

# Connecting to the Computer (Ethernet)

This section describes how to connect Cisco CVA122/CVA122E Cable Voice Adapter to a computer using the Ethernet interface. If supported by the service provider, you can also connect an Ethernet hub to the cable voice adapter, and then connect multiple computers to the Ethernet hub.

If you are not using the Ethernet interface, proceed to "Connecting to the Computer (USB)" section on page 3-15.

✎

**Note**    If supported by your service provider, you can connect two separate computers using both the Ethernet and USB interfaces.

---

**Step 1**    Obtain the required Ethernet cables:

- Use a straight-through Ethernet cable (10Base T with RJ-45 connectors) to directly connect a computer to the Cisco CVA122/CVA122E Cable Voice Adapter's Ethernet port (one cable is supplied with the cable voice adapter).

- Use a crossover Ethernet cable (10Base T with RJ-45 connectors) to connect the Cisco CVA122/CVA122E Cable Voice Adapter to an Ethernet hub. (If your hub has an uplink port, you might be able to use a straight-through cable to connect the hub to the Cisco CVA122/CVA122E Cable Voice Adapter.)

- Connect additional Ethernet devices to the hub using straight-through Ethernet cables.

**Step 2**    Connect one end of the Ethernet cable to the cable voice adapter's Ethernet port at the rear of the unit. Press the cable firmly into the receptacle. (See Figure 3-8.)

*Figure 3-8    Connecting the Ethernet Cable to the Cisco CVA122/CVA122E Cable Voice Adapter*
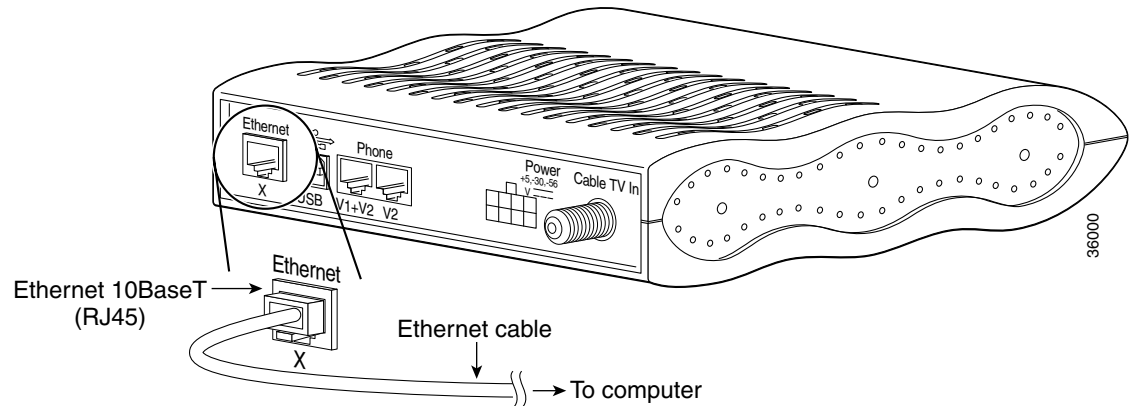


**Step 3**  Connect the other end of the cable to the Ethernet port on the PC or hub. Press the cable firmly into the receptacle.

**Step 4**  Verify that the Ethernet LED on the front panel of the Cisco CVA122/CVA122E Cable Voice Adapter turns on. If this LED does not light, check that the Ethernet cable is plugged in to the correct RJ-45 connector on your computer and that the computer is turned on. Also verify that the other end of the cable is completely plugged into the Ethernet port on the cable voice adapter.

# Connecting to the Computer (USB)

This section describes how to connect Cisco CVA122/CVA122E Cable Voice Adapter to a computer using the Universal Serial Bus (USB) interface. (If you are not using the USB interface, complete the "Connecting to the Computer (Ethernet)" section on page 3-14 before proceeding.)

**Step 1**  Verify that your computer is turned on and meets the requirements in Table 2-1 on page 2-4. In particular, your computer must be running Windows 98, Windows 98 Second Edition, Windows 2000, or Windows Millennium.

✎
**Note**    Computers running Windows 95 or Windows NT do not support USB networking connectivity.

**Step 2**  If using a USB hub, verify that it is already installed and working before connecting the Cisco CVA122/CVA122E Cable Voice Adapter.

**Step 3**  Plug the broad, flat plug (the type "A" or host end) of the USB cable into the USB port on your computer (or USB hub).

**Step 4**  Plug the other rectangular box plug (the type "B" or device end) of the USB cable into the USB port on the rear panel of the Cisco CVA122/CVA122E Cable Voice Adapter. (See Figure 3-9.)

*Figure 3-9    Connecting the USB Cable to the Cisco CVA122/CVA122E Cable Voice Adapter*
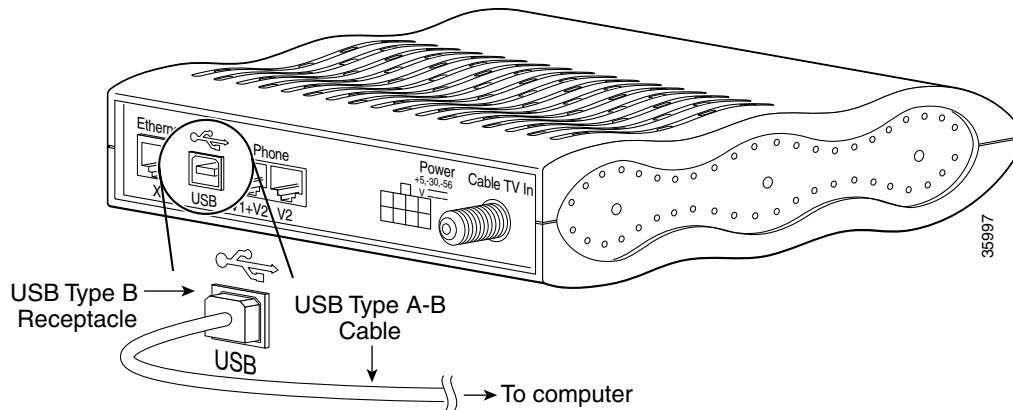


**Step 5**  Verify that the USB LED on the front panel of the Cisco CVA122/CVA122E Cable Voice Adapter turns on. If this LED does not light, check that each connector on the USB cable is fully inserted into the USB port on the computer (or the hub) and the USB port on the cable voice adapter. If using a hub, try disconnecting it from the computer and connecting the Cisco CVA122/CVA122E Cable Voice Adapter directly to the computer; if the USB LED then turns on, check that the USB hub is properly installed and powered.

**Step 6**  Install the required USB driver software—the Windows software will detect the installation of a new USB device and automatically begin the software installation procedure. For information on installing the software device drivers required for USB connectivity, see the instructions that accompany the USB driver software CD that is shipped with the cable voice adapter.

# Power-On and Initialization Sequence

When the Cisco CVA122/CVA122E Cable Voice Adapter is connected and powered on, it executes automatic self-diagnostic and installation procedures. The following procedure describes what you should see during this process.

**Step 1**  Watch the LEDs on the front of the Cisco CVA122/CVA122E Cable Voice Adapter. When the unit first powers on, the LEDs briefly light and then turn off. As self-test is executed, various LEDs light to reveal the progress of the unit's self-tests.

**Step 2**  The Message LED then blinks as the cable voice adapter completes its self-tests and boots a Cisco IOS image.

> **Note**    The LEDs on the front panel display the power-on self-test progress and status. Should the self-test fail, these LEDs display error codes. See the "Initialization and Self-Test Problems" section on page 4-2 for a description of self-test LED error patterns.

**Step 3**  During the cable voice adapter's initialization and download, the Message LED blinks. After completing the download procedure (which could take up to 10 minutes if downloading a new Cisco IOS image as well as a configuration file), the Message LED turns off and the Cable Status LED turns on solid.

**Step 4** Check the LEDs for proper operation:

- The Cable Activity LED blinks to indicate activity on the cable interface and remains on otherwise.

- The Ethernet LED goes on solid when the Ethernet interface is properly connected to an Ethernet network interface card on a PC. The Ethernet LED also blinks to indicate activity on the Ethernet interface.

- The USB LED goes on solid when the USB port is properly connected to a USB port on a PC. The USB LED also blinks to indicate activity on the USB interface.

- The service provider controls the Message LED, which can be used to notify the user of special events, such as waiting voicemail or email. Contact your service provider for details on this LED.

**Step 5** If all LEDs appear normal, proceed to the "Verifying Installation" section on page 3-17 to test the cable voice adapter and its connection to each part of the network. If any problems occur, proceed to Chapter 4, "Troubleshooting," to troubleshoot and solve the problem.

**Step 6** After verifying operations, acquaint the subscriber with the cable voice adapter recommended ambient temperature requirement of 23° to 113°F (-5° to 45°C). Remind the subscriber to keep the area around the cable voice adapter as free from dust as is practical and review general safety standards.

**Step 7** Give the subscriber the Cisco-provided subscriber publications, along with any literature your company provides, including instructions on how to contact your customer service department.

# Verifying Installation

Use the following procedures to verify the cable voice adapter's installation and operation; see Chapter 4, "Troubleshooting," if any problems occur.

- Internet Connection
- VoIP Telephone Connection

## Internet Connection

Use the following procedure to verify Internet connectivity between the PC connected to the cable voice adapter's Ethernet or USB port and the service provider's network.

**Step 1** From a computer connected to the Cisco CVA122/CVA122E Cable Voice Adapter, start an Internet browser such as Microsoft Internet Explorer or Netscape Communicator.

**Step 2** Enter a URL of your choice in your web browser. If a URL is not known, use **http://www.cisco.com** to connect to the Cisco Connection Online (CCO) web site.

**Step 3** Watch the Ethernet or USB LED on the front of the cable voice adapter blink as data is transmitted on the link. If the Internet browser displays the selected web page, the network connection is successfully established.

**Step 4** If using both Ethernet and USB connectivity, repeat steps 1 through 3 for each computer connected to the Cisco CVA122/CVA122E Cable Voice Adapter.

**Step 5** Disconnect the cable system input by unscrewing the cable F-connector at the back of the cable voice adapter.

**Step 6** Using an in-line attenuator, add 3 to 6 dB of attenuation between the cable voice adapter and the CATV cable input.

> ✎
> **Note** The addition of 3 to 6 dB of attenuation simulates the variation found in a cable network over time and in relation to temperature. If you install a cable voice adapter at a time of year when the temperature is cooler, this step might not be necessary.
>
> If you install a cable voice adapter at a time of year when the temperature is warmer, this step might assist you in determining how the cable voice adapter will function over time. If the cable voice adapter does not function properly with the addition of attenuation, you should replace and reconfigure the coaxial cables at the subscriber site.

**Step 7** Reconnect the cable system to the cable voice adapter and recheck the network connection at one of the PCs. Reload the previous web page or another URL to verify that you can still access the Internet.

**Step 8** Disconnect the cable system again by unscrewing the cable connector at the back of the cable voice adapter.

**Step 9** Remove the in-line attenuator from the back of the cable voice adapter.

**Step 10** Reconnect the cable system to the cable voice adapter and recheck the network connection at the PC as in step 7.

# VoIP Telephone Connection

If the subscriber has purchased Voice over IP (VoIP) services, use the following procedure to test the VoIP network by making a telephone call over the cable and IP network:

**Step 1** Pick up a telephone connected to one of the cable voice adapter's voice ports. This signals an off-hook condition. In response, the cable voice adapter's voice software issues a dial tone and waits for a telephone number to be dialed.

If you do not hear a dial tone, the cable voice adapter's voice ports may be not enabled. Contact your service provider for assistance.

**Step 2** Dial a number for another telephone. This telephone could be one of the other telephones plugged in to the cable voice adapter, or it could be a telephone on the public telephone switched network (PTSN). The cable voice adapter turns on the codecs and protocols required to transmit packetized voice and the call proceeds.

Any call-progress indications and other signals that can be carried in-band (for example, remote phone ringing) are cut through the voice path as soon as an end-to-end audio channel is up. You either hear the far end telephone ringing until the caller picks up or you hear a busy signal if the far end telephone is already in use.

**Step 3** When either end hangs up, the call is torn down. The session ends, with each end going idle, waiting for another off-hook condition.

# Troubleshooting

This chapter provides basic installation troubleshooting information. The chapter includes the following sections:

- Troubleshooting Overview
- Initialization and Self-Test Problems
- Troubleshooting Subsystems
- Further Contacts

**Note** This chapter provides only hardware troubleshooting information that does not require access to the cable voice adapter's command-line interface (CLI) or knowledge of CLI commands.

## Troubleshooting Overview

Installation problems with Cisco CVA122/CVA122E Cable Voice Adapter are commonly due to the cable system and its topography. The LEDs on the front panel reveal operational status and help you determine problem areas. See Figure 4-1 for the layout of the LEDs on the Cisco CVA122/CVA122E Cable Voice Adapter's front panel. See Table 1-1 on page 1-13 for a description of these LEDs.

*Figure 4-1    Cisco CVA122/CVA122E Cable Voice Adapter Front Panel LEDs*
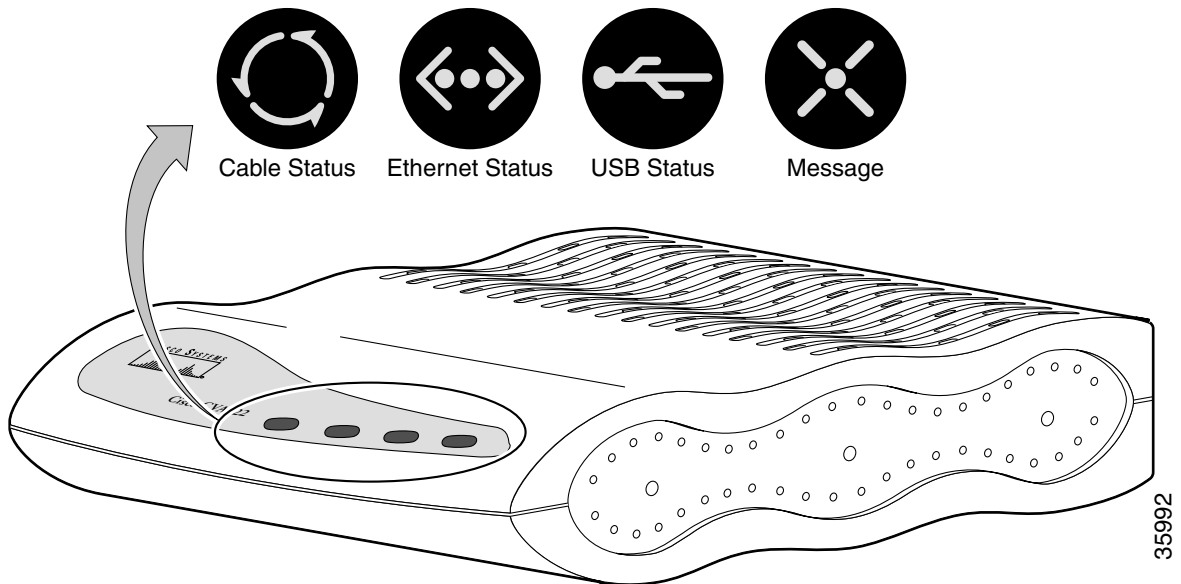


# Initialization and Self-Test Problems

When the Cisco CVA122/CVA122E Cable Voice Adapter first powers on, the following occurs:

1. The cable voice adapter runs its self-test and diagnostic procedures. All LEDs briefly light and then turn off when self-test and diagnostic procedures are successful. The procedures ensure that all components are functioning. To complete all self-test and diagnostic procedures, the Cisco CVA122/CVA122E Cable Voice Adapter must be able to:

   – Perform a system reset trap.

   – Fetch and execute instructions from the ROM Monitor area of the Flash memory chip.

   – Write several internal registers and reset the control processor successfully.

   – Correctly configure the port registers.

   – Perform conditional branches.

   – Verify that the software-controlled LEDs are functional.

   If all diagnostic procedures are successful, the LEDs briefly blink.

2. The next step of the self-test initializes the memory controller and its Dynamic Random Access Memory (DRAM). If this step succeeds,

   – The cable voice adapter first attempts to initialize the memory controller. If this fails, the USB LED lights and remains on to indicate a problem with the memory controller. Otherwise, the console port is initialized and the banner is output to the console port.

   – Next, the cable voice adapter performs a self-test on the low registers of the DRAM. If a problem exists, the Cable Status, Ethernet, and USB LEDs light and remain on to indicate a problem with low memory.

   – The cable voice adapter then attempts to clear the processor's cache memory. If this fails, the Ethernet LED lights and remains on indicate a processor cache failure.

- – The cable voice adapter then attempts to clear the BSS area of the DRAM; if this fails, the Cable Status and Ethernet LEDs light and remain on to indicate a memory or controller problem. If this test succeeds, the Message LED begins blinking.

- – Finally, the cable voice adapter attempts to clear the rest of DRAM. If this fails, the Ethernet and USB LEDs remain on to indicate a possible memory or controller problem.

Table 4-1 summarizes the self-test failure codes displayed by the LEDs; these patterns appear when the Cisco CVA122/CVA122E Cable Voice Adapter has failed to complete a self-test and enters its diagnostics mode.

*Table 4-1    LED Self-Test Failure Codes*

| Cable Status | Ethernet | USB | Error Description |
|---|---|---|---|
|  |  | ON | Initialization of the memory controller failed. |
| ON | ON | ON | The self-test of the low registers of the DRAM failed. This indicates a problem with low memory. |
|  | ON |  | The self-test of the processor cache memory failed. This indicates a processor cache failure. |
| ON | ON |  | A memory or controller problem was detected while clearing the BSS area of the DRAM. |
|  | ON | ON | A memory or controller problem was detected while clearing the remaining DRAM. |

If the main memory initialization routine successfully completes, all LEDs turn off.

3. If all self-tests passed, the cable voice adapter boots the Cisco IOS image stored in its Flash memory. The Message LED blinks during the boot process and continues blinking until it finishes booting the Cisco IOS image; after loading the image, the Message LED turns off. If the Message LED *does not* start to blink, or if it continues to blink for more than ten minutes, proceed to the "Troubleshooting Subsystems" section.

4. The cable voice adapter starts normal operations after it starts up the Cisco IOS image. At this point, the LEDs indicate the status of the cable voice adapter:

- – The Cable Activity LED blinks to indicate activity on the cable interface and remains on otherwise.

- – The Ethernet LED goes on solid when the Ethernet interface is properly connected to an Ethernet network interface card on a PC. The Ethernet LED also blinks to indicate activity on the Ethernet interface.

- – The USB LED goes on solid when the USB port is properly connected to a USB port on a PC. The USB LED also blinks to indicate activity on the USB interface.

- – The service provider controls the Message LED, which can be used to notify the user of special events, such as waiting voicemail or email. Contact your service provider for details on this LED.

5. When the cable voice adapter and computer have booted successfully, you should be able to access an Internet web site, which will confirm that the cable voice adapter is configured correctly. If you cannot access a web site, proceed to the "PC Subsystem" section on page 4-10.

# Troubleshooting Subsystems

The key to troubleshooting is to isolate a problem to a specific subsystem:

- Coaxial Cable Subsystem
- RF and Digital Subsystem
- Ethernet Subsystem
- USB Subsystem
- PC Subsystem
- VoIP Subsystem

Figure 4-2 on the next page provides a general troubleshooting flowchart. Table 4-2 can help you correlate LED behavior with possible problems, and suggested courses of actions.

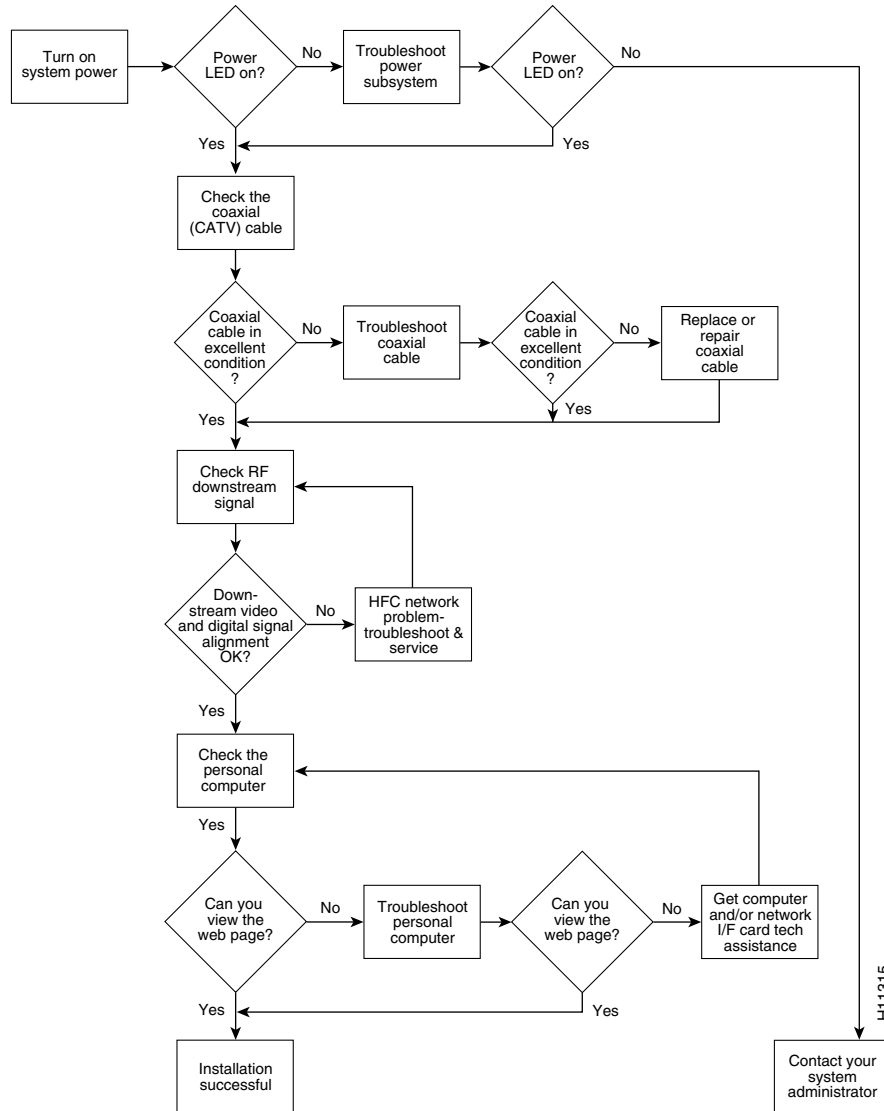*Figure 4-2    Basic Troubleshooting Strategy for Startup Problems*

```
┌──────────┐      ╱╲          No   ┌──────────┐      ╱╲          No
│ Turn on  │     ╱Power╲  ─────────│Troubleshoot│   ╱Power╲  ──────────────────────┐
│ system   │────╲ LED on?╱         │  power    │──╲ LED on?╱                        │
│ power    │     ╲    ╱            │ subsystem │    ╲    ╱                          │
└──────────┘      ╲╱               └──────────┘     ╲╱                             │
                   │ Yes                              │ Yes                        │
                   │◄─────────────────────────────────┘                           │
                   ▼                                                               │
           ┌──────────┐                                                           │
           │ Check the│                                                           │
           │ coaxial  │                                                           │
           │(CATV)cable│                                                          │
           └──────────┘                                                           │
                   │                                                              │
                   ▼                                                              │
                 ╱╲          No   ┌──────────┐     ╱╲          No  ┌──────────┐  │
            ╱Coaxial╲ ────────────│Troubleshoot│  ╱Coaxial╲──────────│Replace or│  │
           ╱ cable in ╲          │  coaxial  │──╱ cable in ╲        │  repair  │  │
           ╲excellent ╱          │   cable   │  ╲excellent ╱        │ coaxial  │  │
            ╲condition╱          └──────────┘   ╲condition╱         │  cable   │  │
             ╲  ?  ╱                             ╲  ?  ╱            └──────────┘  │
              ╲╱                                  ╲╱                      │      │
               │ Yes                               │ Yes                 │      │
               │◄──────────────────────────────────┴─────────────────────┘      │
               ▼                                                                 │
        ┌──────────┐                                                            │
        │ Check RF │◄───────────────┐                                           │
        │downstream│                │                                           │
        │  signal  │                │                                           │
        └──────────┘                │                                           │
               │                    │                                           │
               ▼                    │                                           │
             ╱╲          No   ┌──────────┐                                      │
         ╱ Down- ╲ ───────────│HFC network│                                     │
        ╱ stream  ╲          │ problem-  │                                      │
        ╲video and╱          │troubleshoot&│                                    │
         ╲digital ╱          │  service  │                                      │
          ╲signal╱           └──────────┘                                       │
          alignment                                                             │
           ╲OK?╱                                                                │
            ╲╱                                                                  │
             │ Yes                                                             │
             ▼                                                                 │
      ┌──────────┐                                                             │
      │ Check the│◄──────────────────────────────┐                            │
      │ personal │                               │                            │
      │ computer │                               │                            │
      └──────────┘                               │                            │
             │ Yes                               │                            │
             ▼                                   │                            │
           ╱╲          No   ┌──────────┐    ╱╲      No  ┌──────────┐          │
       ╱Can you╲ ───────────│Troubleshoot│ ╱Can you╲──────│Get computer│       │
      ╱ view the╲          │ personal  │─╱ view the╲      │and/or network│     │
      ╲web page?╱          │ computer  │ ╲web page?╱      │I/F card tech│     │
       ╲    ╱              └──────────┘  ╲    ╱          │ assistance  │     │
        ╲╱                                ╲╱             └──────────┘        │
         │ Yes                             │ Yes                            │
         │◄───────────────────────────────┘                                 │
         ▼                                                                   ▼
  ┌──────────┐                                                       ┌──────────┐
  │Installation│                                                     │Contact your│
  │ successful │                                                     │  system   │
  └──────────┘                                                       │administrator│
                                                                     └──────────┘
```

H11315

*Table 4-2    LED Troubleshooting Tips[1]*

| Icon | LED | Status | Possible Problem | Suggested Action |
|---|---|---|---|---|
|  | Cable and Power Status | Cable Status LED is blinking. | System is locking on to downstream and upstream channels. | Wait until the cable voice adapter finishes its power-up sequence. If the blinking is continuous, contact your service provider. |
| | | Cable Status LED remains off. | Power cord not connected. | Check power connections. |
| | | | Power outlet not operating. | Check the outlet or try another one. |
| | | | Power supply has failed. | Replace the power supply. |
|  | Ethernet | Ethernet LED remains off. | Ethernet interface is not in use. | This is normal behavior when the Ethernet interface is not used. |
| | | | PC not powered on. | Verify the PC is powered on. |
| | | | Bad Ethernet connection. | Reseat the Ethernet cable at both ends. |
| | | | Incorrect cable between the cable voice adapter, hub (if one is being used), and the PC. | Verify that the Ethernet cable is the correct type (straight-through or cross-connect) for the equipment used. If using an Ethernet hub, try connecting a PC directly to the cable voice adapter using a straight-through cable. |
| | | | Ethernet driver and TCP/IP software not installed. | Install the proper driver and TCP/IP software for the Ethernet card and verify that DHCP is enabled on the PC. |
| | | | Faulty Ethernet card. | Replace the Ethernet card. |
|  | USB | USB LED is off. | USB interface is not in use. | This is normal behavior when the USB interface is not used. |
| | | | USB cable is not connected to cable voice adapter and PC. | Verify that the correct cable (host-device cable with type "A" and type "B" connectors, maximum length 5 meters) is being used and is firmly inserted in both connectors. |
| | | | USB software drivers are not installed on the PC. | Install the USB software according to the instructions in the booklet that accompanies the USB driver CD. |
| | | | PC is running Windows 95 or Windows NT. | Windows 95 and Windows NT do not contain support for USB networking. Install Windows 98, Windows 2000, or Windows Millennium. |
|  | Message | This LED is defined by the service provider. Contact your service provider for details on its use and meaning. | | |

1. If using the CVA120 Series Universal Power Supply (UPS), the UPS contains two LEDs that give additional information about the power supply to the Cisco CVA122/CVA122E Cable Voice Adapter. See the documentation accompanying the UPS for details.

# Coaxial Cable Subsystem

For proper operation the Cisco CVA122/CVA122E Cable Voice Adapter must be able to establish a connection with the service provider's CMTS. There are many conditions inherent to coaxial cable that can inhibit this connection:

**Step 1** Verify the cable connection from the cable voice adapter to the HFC plant and headend by checking the video reception. You should test the same coaxial cable that the cable voice adapter is connected to—if necessary, disconnect the cable voice adapter from the coaxial cable and connect a cable-ready TV in its place.

If the TV does not receive any cable channels, contact the service provider to re-establish service to the site. If the TV does receive cable channels, it indicates that the basic infrastructure between the site and the HFC plant and headend is working; however, because data connections are much more sensitive to signal interference than cable TV service, it is still possible that a problem exists that prevents reception of the data signals.

**Step 2** If you are using a splitter or couple to share the coaxial cable between a TV and the cable voice adapter, remove the splitter/coupler, TV, and any other devices connected to the cable (such as video or DVD players) so that the cable voice adapter connects directly to the coaxial cable coming out of the CATV wall outlet. Make sure the cable voice adapter is the only device on this segment of cable.

If the cable voice adapter functions in this configuration, inspect the splitter and any other devices that were installed on this cable segment. If necessary, upgrade them and their interconnecting cables with ones that have higher-quality connectors—see "Coaxial Connector and Cable Specifications" in Appendix B, "Connector and Cable Specifications" for the recommended cable and connector quality. A high-pass filter might be necessary between the modem and TV to prevent signal interference. If this does not help, you might need to install a separate cable for TV reception.

**Step 3** Disconnect the coaxial cable from the back of the cable voice adapter and inspect the cable and its connector. Is the center conductor on the coaxial cable end straight and of the correct length to ensure a good connection?

If the center conductor is not straight or appears to be too long or too short, cut the coaxial cable behind the connector end, and strip the insulation back. Make sure that the newly exposed center conductor is straight. Before replacing the new cable connector end, check the general condition of the cable. Make sure the new conductor end is securely crimped to the cable.

**Note** The center connector should extend 1/8 inch (3.2 mm) beyond the end of the connector.

**Step 4** Is the coaxial cable running to the cable voice adapter in excellent condition?

The coaxial cable between the cable voice adapter and the cable tap must be very high quality. The cable insulation must be at least 80% braid with foil. If the existing cable appears to be of lesser quality or in poor condition, replace the cable from the ground block or tap to the cable end.

**Step 5** Is the coaxial cable connection to the back of the cable voice adapter secure?

Check that the coaxial cable end is securely screwed onto the F-connector at the back of the cable voice adapter. Hand-tighten the connector, making sure it is finger tight; then give it a 1/6 turn.

> **Note**  If you are unable to resolve the problem, contact your internal service organization for instructions and assistance.

# RF and Digital Subsystem

The use of RF and digital signals on the same cable can lead to interference if the HFC network is not correctly configured.

**Step 1**  Is the downstream video signal being received at the ground block or at the tap?

Connect a premium services cable converter to the ground block or at the tap and contact field service dispatch. Ask the CMTS system administrator to check if they can locate the box on the network by sending an impulse, or on-demand, video signal to the converter.

If field service can locate the converter at the ground block or at the tap, repeat the test with the cable voice adapter connected to the cable end near the computer.

If field service cannot locate the converter at the cable end, but can locate the converter at the ground block or tap, replace the cable from the ground block or tap to the cable end.

**Step 2**  Check the adjacent video channel. The digital data signal should be approximately in the range of -2 to +15 dBmV on a nearby analog channel. Confirm this value using a portable field strength meter, or power meter, to measure the adjacent analog video signal.

# Ethernet Subsystem

Use the following procedure if you cannot communicate with the Internet from a PC that connects to the Cisco CVA122/CVA122E Cable Voice Adapter using an Ethernet connection.

**Step 1**  Is the Ethernet LED on the front panel of the Cisco CVA122/CVA122E Cable Voice Adapter turned on?

If the Ethernet LED does not light, do the following until the LED begins to light:

**a.**  Verify that the Cisco CVA122/CVA122E Cable Voice Adapter and computer are both powered on.

**b.**  Disconnect the Ethernet cable between the cable voice adapter and computer and reconnect it, making sure it is firmly seated in each connector.

**c.**  Verify that the Ethernet cable is connected to the proper RJ-45 connector on the computer. If the computer has multiple RJ-45 connectors, verify that the one you are using is the connector for the Ethernet card configured for use with the cable voice adapter.

**d.**  Verify that the Ethernet cable is the proper type for the equipment used. A straight-through cable should be used when connecting the cable voice adapter to a computer. A crossover cable should be used when connecting to an Ethernet hub (although if the Ethernet hub has an uplink port, you might be able to use a straight-through cable).

**e.**  If using an Ethernet hub, verify that the correct Ethernet cables are connecting the computers to the hub. (See the hub's documentation for details on the correct cables that should be used.)

**f.**  If using an Ethernet hub, try connecting a computer directly to the cable voice adapter using a straight-through cable.

**Step 2** Does the Ethernet LED blink when you attempt to access a site on the Internet?

If the Ethernet LED does not blink, check that the software drivers for the computer's Ethernet card are installed.

a. Choose **Start:Settings>Control Panel** to display the Control Panel.

b. Double-click the **Network** icon.

c. Click the **Configuration** tab.

d. Scroll through the network components list and verify that the list contains both a driver for the Ethernet card and a driver for the TCP/IP software for the Ethernet card.

If either driver does not appear, install the proper drivers for your Ethernet card and its TCP/IP software.

**Step 3** Is the computer's TCP/IP software configured for dynamic IP addressing (DHCP)?

a. Display the Network Configuration window, as described above.

b. Click on the component for the TCP/IP software for the Ethernet card.

c. Click the **Properties** button and verify that the IP address is set for **Obtain an IP address automatically**.

d. Choose **Start>Run** and enter **winipcfg** in the dialog box (Windows 95/98/Millennium) or **ipconfig** (Windows NT/2000).

e. In the IP configuration dialog box, select the Ethernet adapter from the pull-down menu and click the **Renew All** button to force the computer to obtain an IP address from the DHCP server at the headend.

**Step 4** Did the computer obtain an IP address from the headend?

If the computer could not obtain an IP address from the headend, try removing and reinstalling the Ethernet card, following the directions given in its documentation. In particular, verify that the card does not conflict with any other devices:

a. Choose **Start:Settings>Control Panel** to display the Control Panel.

b. Double-click the **System** icon.

c. Click the **Devices** tab and then click on the plus sign next to **Network adapters**.

d. Verify that the display for the Ethernet card does not contain either a red "X" or a yellow exclamation point. If it does, then the Ethernet card has a conflict with some other device in the computer. This conflict must be resolved before proceeding; to identify the conflict, select the Ethernet card, click on **Properties**, and then click on the **Resources** tab.

e. If the above fails, replace the Ethernet card.

## USB Subsystem

Use the following procedure if you cannot communicate with the Internet from a PC that connects to the Cisco CVA122/CVA122E Cable Voice Adapter using a USB connection.

**Step 1** Is the computer running Windows 98, Windows Millennium, or Windows 2000?

If not, install Windows 98, Windows Millennium, or Windows 2000 on this computer. Windows 95 and Windows NT do not support networking through the USB interface.

**Step 2** Is the USB LED on the front panel of the Cisco CVA122/CVA122E Cable Voice Adapter on?

If the USB LED does not light, do the following until the LED begins to light:

**a.** Verify that the Cisco CVA122/CVA122E Cable Voice Adapter and computer are both powered on.

**b.** Verify that the correct cable (host-device cable with type "A" and type "B" connectors, maximum length 5 meters) is being used and is firmly connected to both the cable voice adapter and PC.

**c.** Disconnect the USB cable between the cable voice adapter and computer and reconnect it, making sure it is firmly seated in each connector.

**d.** If using a USB hub, try disconnecting all devices and connecting the Cisco CVA122/CVA122E Cable Voice Adapter directly to the computer using a host-to-device (type "A" to type "B")

**Step 3**    Does the USB LED blink when you attempt to access a site on the Internet?

If the USB LED does not blink, check that the USB software drivers are installed.

**a.** Choose **Start:Settings>Control Panel** to display the Control Panel.

**b.** Double-click the **Network** icon.

**c.** Click the **Configuration** tab.

**d.** Scroll through the network components list and verify that the list contains both a driver for the Cisco CVA122/CVA122E Cable Voice Adapter and a driver for TCP/IP software for the Cisco CVA122/CVA122E Cable Voice Adapter.

**e.** If either driver does not appear, install the USB software according to the instructions in the booklet that accompanies the Cisco CVA120 series USB driver software CD.

# PC Subsystem

To isolate a problem with a PC that is connected to the Cisco CVA122/CVA122E Cable Voice Adapter:

**Step 1**    Can you access a web page using the web browser installed on the computer?

If you cannot access a web page, verify that the computer network protocol is configured for TCP/IP and that DHCP services are enabled using the following Windows options:

**a.** Turn on your PC and enter your network username and password.

**b.** Choose **Start:Settings>Control Panel** to display the Control Panel.

**c.** Double-click the **Network** icon. The Network window appears with the Configuration tab in the foreground. If the Configuration tab is not in the foreground, click this tab.

**d.** Scroll the network components list box until the Ethernet adapter TCP/IP option displays for your network adapter or USB port and double-click the selection. The TCP/IP Properties window appears with the IP Address tab in the foreground. If the IP Address tab is not in the foreground, click this tab.

**Note**    If there is no TCP/IP entry for the installed network adapter or USB port, the Windows software is not configured for IP operation. See the computer and network interface card user guides on how to configure these settings.

**e.** Make sure that the button next to **Obtain an IP address automatically** is selected. If this button is not selected, the computer is not configured for DHCP. Select the **Obtain an IP address automatically** radio button now and save the configuration settings.

**f.** Close all networking windows and close the Control Panel.

**g.** Follow the onscreen instructions and reboot your PC.

**Step 2** Is the network interface (Ethernet or USB) operational?

See the steps given in "Ethernet Subsystem" section on page 4-8 and "USB Subsystem" section on page 4-9 to troubleshoot the network interface connection on the computer.

**Step 3** Is the computer already configured to work with special software such as America Online? Some computers come with dialup adapters preconfigured to work with special software. To ensure the setup is correct, follow the procedures below.

**Setting the Internet Properties**

**a.** Turn on your PC and enter your network username and password.

**b.** Choose **Start:Settings:Control Panel** to display the Control Panel.

**c.** Double-click the **Internet** icon. The Internet Properties window appears with the General tab in the foreground.

**d.** Click the **Connection** tab. The Internet Properties Connection tab displays. The Connect to the Internet: as needed check box is checked and the name of the dialup adapter appears in the Dial-Up Networking connection list box.

**e.** Click the **Connect to the Internet: as needed** check box to deselect the option.

> **Note** The check box must not be checked. If the checkbox is checked, the computer attempts to open a dialup adapter connection each time a network application is started.

**f.** Click **OK**.

**g.** From the Control Panel, double-click the **System** icon. The System Properties window displays with the General tab in the foreground.

**h.** Click the **Device Manager** tab.

**i.** Click the **Network adapter** selection. Make sure the display does not contain either a red "X" or a yellow exclamation point.

**j.** Click **OK**.

**Setting Network Components**

**a.** Turn on your PC and enter your network user name and password.

**b.** Choose **Start:Settings:Control Panel** to display the Control Panel.

**c.** Double-click the **Network** icon. The Network window appears with the Configuration tab in the foreground.

**d.** Scroll the list box until the particular dialup adapter selection appears. If the computer has America Online installed, two network components will be displayed: **AOL Dialup Adapter** and **TCP/IP:AOL Dialup Adapter**.

> **Note** The computer might have more than one dialup adapter. Be sure to select the right dialup adapter.

**e.** If the subscriber does not intend to use America Online, remove both these components from the Network components list box:

- Click **AOL Dialup Adapter** to highlight it. Click **Remove**.

- Click **TCP/IP:AOL Dialup Adapter** to highlight it. Click **Remove**.

**f.** If the subscriber intends to use America Online, double-click the TCP/IP component associated with the dialup adapter. The TCP/IP Properties window appears with the IP Address tab in the foreground.

**g.** Click the **Obtain an IP address automatically** button. The IP address for the dialup connection will only be assigned when the connection is made. By default, the computer will be assigned an IP address by the Cisco CVA122/CVA122E Cable Voice Adapter via DHCP.

> ✎
>
> **Note**    When set up correctly, the Cisco CVA122/CVA122E Cable Voice Adapter is the default Internet connection device. The subscriber might select the dialup adapter as an alternative connection path.

**h.** Click **OK**. A dialog box appears, informing you for the change to become effective, the computer must be rebooted.

**i.** Click **Yes** to reboot the computer.

# VoIP Subsystem

If you do not have dial tone when picking up a telephone or fax device connected to the Cisco CVA122/CVA122E Cable Voice Adapter's voice ports, verify the following:

**Step 1**    Has the subscriber has purchased voice services from the service provider?

Voice services must be enabled and configured by the service provider before they can be used. Verify that the subscriber's service contract provides voice services.

**Step 2**    Have voice services been enabled in the configuration file that is downloaded to the Cisco CVA122/CVA122E Cable Voice Adapter at system startup?

If necessary, contact your provisioning or billing administrator or customer service department. If the provisioning or billing system is designed to support automatic feature upgrades, and the cable voice adapter's UID (cable MAC address) is already in the billing system and configured for use with voice, ask to have the cable voice adapter refreshed with the correct voice configuration.

**Step 3**    Does the Cisco IOS image being used on the Cisco CVA122/CVA122E Cable Voice Adapter support the required number of voice ports?

The version of Cisco IOS image software determines whether the Cisco CVA122/CVA122E Cable Voice Adapter supports 0, 1, or 2 voice ports. Verify that the image being used supports the number of voice ports being used by the subscriber.

**Step 4**    Are the telephone, modem, and FAX devices plugged into the proper voice port connectors on the rear panel of the cable voice adapter?

Verify that the telephone, modem, and FAX devices are plugged in to the "V1+V2" or "V2" voice port assigned to them by the service provider.

**Step 5**    Is the proper cable connecting the telephone, modem, or FAX device to the Cisco CVA122/CVA122E Cable Voice Adapter?

If connecting a single-line telephone, the cable can be either a two-wire or four-wire cable; when connecting a two-line telephone, the cable must be a four-wire cable. In all cases, the cable must have an RJ-11 connector on at least one end; the other connector depends on the device being connected. Disconnect the cable at both ends and reconnect it, making sure the cable makes a firm and secure fit at both ends. If this doesn't help, replace the cable with a known good cable.

**Step 6**   Is the telephone, modem, or FAX device a dual-line telephone?

A dual-line telephone must be plugged into the "V1+V2" voice port. Single-line telephones can be plugged into either voice port.

**Step 7**   Is the telephone, modem, or FAX device an analog (FXS) device that uses a tone pushbutton dial set?

The Cisco CVA122/CVA122E Cable Voice Adapter supports only analog devices that use tone dialing.

**Step 8**   Is the sum of the RENs of all devices on any one telephone line less than five?

If you have plugged multiple telephone, modem, or FAX devices into the same telephone line to use as extensions, the sum of their Ringer Equivalence Numbers (REN) cannot exceed five. If this happens, the phones might not ring properly or at all. See the documentation for each phone for its REN value.

# Further Contacts

If you experience trouble with the startup that is not resolved with the procedures and tips in this chapter, contact field service dispatch for further assistance and instructions. Also see the documentation available in the Broadband Cable section on CCO and the Documentation CD-ROM.

**Note**   Cisco recommends that a CMTS systems engineer or network administrator be available, or on-call, to assist field service technicians or installers in troubleshooting a Cisco CVA122/CVA122E Cable Voice Adapter.

If you are a network administrator or systems engineer with a Cisco product covered under warranty or a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com.

APPENDIX **A**

# Technical Specifications

This appendix contains the following technical specifications for the Cisco CVA122/CVA122E Cable Voice Adapter:

- Physical, Power, and Environmental Specifications
- Data Specifications
- Voice Specifications

# Physical, Power, and Environmental Specifications

Table A-1 lists the Cisco CVA122/CVA122E Cable Voice Adapter physical specifications and power requirements.

*Table A-1    Cisco CVA122/CVA122E Cable Voice Adapter Physical Specifications*

| Description | Specification |
|---|---|
| Dimensions (H x W x D) | 1.6 x 6.75 x 8.25 in. (4.1 x 17.1 x 21.0 cm) |
| Weight | 1.5 lb (0.6 kg)<br>0.75 lb (0.3 kg) for the AC-input external power supply<br>8 lb (3.5 kg) for the Cisco CVA120 Series Uninterruptible Power Supply (UPS) |
| AC-input voltage | 120 to 240 VAC[1] input with power factor correction |
| AC-input current rating | 1.0 A[2] maximum |
| AC-input cable | 18 AWG[3] two-wire cable, with a two-lead receptacle on the power supply end. The power source end contains a North American (NEMA 1-15P) plug or other country-specific cords and plug as ordered. |
| DC-output voltage and current rating | +5.0 VDC at 2.65A maximum<br>-30VDC at 0.130 A maximum<br>-56VDC at 0.08A maximum |
| Frequency | 50 to 60 Hz[4] |
| Temperature, ambient | 32° to 104°F (0 to 40°C) operating; -22° to 149°F (-30° to 65°C) nonoperating/storage |
| Humidity, ambient | 5 to 95% noncondensing, operating and nonoperating/storage |
| Noise level | 38 dBa[5] maximum at desktop, 43 dBa maximum in an office |
| Altitude, operating and nonoperating | Sea level to 10,000 ft (3,050 m) |

*Table A-1    Cisco CVA122/CVA122E Cable Voice Adapter Physical Specifications (continued)*

| Description | Specification |
|---|---|
| Vibration, operating | 10 to 200 Hz, 0.0005 g (1 oct./min.) |
| Vibration, nonoperating | 10 to 100 Hz, 0.0065 g (1 oct./min.) |
| Software requirement | Cisco CVA122/CVA122E Cable Voice Adapter software—Cisco IOS Release 12.2(1)XA or higher |
| Agency approvals | Safety: CSA 950-95 (Third Edition), IEC 950 (Second Edition with Amendments 1, 2, 3, and 4), EN60950:1922 (with Amendments 1, 2, 3, 4, and 11), AS/NZS 3260:1966 (with Amendments 1, 2, 3, and 4), TS001:1997.<br>Emissions: CFR 47 Part 15 Class B, EN55022 Class B, VCCI Class B, AS/NRZ 3548:1992 Class B, ICES-003 (Issue 2, Class B, April 1997)<br><br>See also Appendix C, "Regulatory Compliance and Safety Information." |

1.  VAC = volts alternating current.

2.  A = ampere.

3.  AWG = American Wire Gauge.

4.  Hz = hertz.

5.  dBa = adjusted decibels.

# Data Specifications

Table A-2 lists the specifications for the data transmitted on the Cisco CVA122/CVA122E Cable Voice Adapter's cable interface.

*Table A-2    Cisco CVA122/CVA122E Cable Voice Adapter Data Specifications*

| Description | Downstream Values | Upstream Values |
|---|---|---|
| Frequency Range | 88 to 860 MHz (CVA122, DOCSIS) | 5 to 42 MHz (CVA122, DOCSIS) |
| | 88 to 860 MHz (CVA122E, EuroDOCSIS) | 5 to 65 MHz (CVA122E, EuroDOCSIS) |
| Modulation | 64 QAM | QPSK |
| | 256 QAM | 16 QAM |
| Data Rate | 30 Mbps/64 QAM (27 Mbit/sec after FEC overhead) | QPSK—320 Kbit/sec to 5 Mbit/sec |
| | 42.8 Mbps/256 QAM (36 Mbit/sec after FEC overhead) | 16 QAM—640 Kbit/sec to 10 Mbit/sec |
| Bandwidth | 6 MHz | 200K, 400K, 800K, 1.6M, 3.2 MHz |
| FEC | RS (122, 128) Trellis | |
| Signal-to-Noise Ratio (SNR) | 64 QAM: >23.5 dB @ BER<10^8<br><br>256 QAM*: >30 dB @ BER <10^-8 (For input level between +15 and -8 dBmV, SNR must be greater than 30 dB. For input level between -8 and -15 dBmV, SNR must be greater than 33 dB.)<br><br>**Note** These performance numbers are in laboratory-controlled conditions, against statistically pure noise sources (AWGN). Since such conditions do not exist in practise, a 6 or more dB SNR margin is required for reliable operation. Check with your local system guidelines. | QPSK: >15 dB @ BER<10^-8 (QPSK will work at 98% successful ping rate for SNR>13 dB. An SNR of 15 dB will be needed to get almost optimal packets per minute transition.)<br><br>16 QAM: >22 dB @ BER <10^-8 (For 16 QAM, an SNR>22 dB results in 98% ping efficiency. To get a quality packet rate, you need SNR>25 dB)<br><br>**Note** These measurements were done for 0 and -10 dBmV input to the CMTS, 1280 ksym/sec and 64 bytes packet size under laboratory-controlled conditions. |

*Table A-2    Cisco CVA122/CVA122E Cable Voice Adapter Data Specifications  (continued)*

| Description | Downstream Values | Upstream Values |
|---|---|---|
| One Channel | Receive level of digital signal -15 to +15 dBmV | QPSK— +8 to +58 dBmV |
| | **Note**    Most field measurements are of nearby or adjacent analog signal which is normally +6 to +10 dB (system specific) above the digital signal level | 16 QAM— +8 to +55 dBmV |
| Security | DES decryption: DOCSIS Baseline Privacy (BPI), 40-bit and 56-bit DES encryption, as controlled by the headend and configuration files. | |
| | **Note**    Cisco IOS images must contain encryption software at both the CMTS and the Cisco CVA120 Series Cable Voice Adapter. Both units must be enabled and properly configured to support encryption. | |

# Voice Specifications

Table A-3 lists the specifications for the voice ports on the Cisco CVA122/CVA122E Cable Voice Adapter.

*Table A-3    Cisco CVA122/CVA122E Cable Voice Adapter Voice Specifications*

| Metric | Value |
|---|---|
| Loss (between DCS and BTI gateway) | Nominal:    4 dB ±.5 dB (off hook)<br>Nominal:    9 dB ±.5 dB (on hook) |
| Attenuation distortion:<br>DCS <> BTI (200Hz-3.5kHz)<br>BTI<> DCS (304 Hz-3004Hz)<br>DCS -> BTI (204 Hz-3004 Hz) | Nominal:<br>+1 dB/-3 dB<br>±0.5 dB<br>±0.5 dB0 |
| Idle channel noise | <= 18 dBmC (noise shall not exceed) |
| Signal to C-notched noise | >= 35 dB |
| Inter-modulation distortion:<br>R2<br>R3 | <br>>= 52 dB<br>>= 52 dB |
| Single frequency interference:<br>0 to 12 kHz<br>0 to 4 kHz | <br><= -28 dBmO<br><= -40 dBmO |
| Frequency shift (offset) | <= ±0.2 Hz (max)<br><= ±0.1 Hz (99.5%) |
| Amplitude tracking (input Level, dBmO):<br>-37 to 0 (on-hook)<br>-37 to +3 (off hook)<br>-50 to -37 (off-hook)<br>-55 to -50 (off-hook) | Max Dev.                    Ave. Dev.<br><= ±.5 dB<br><= ±.5 dB            <= ±.25 dB<br><= ±1.0dB            <= ±.5 dB<br><= ± 3.0 dB            <= ±1.5 dB |
| Crosstalk | <= -65 dBmO |
| Codec Support (dependant on software release) | G.711, G.723.1, G.726, G.728, G.729, G.729a |
| Amplitude jitter<br>20-300 Hz<br>4-300 Hz | <br><= 2.5% Peak<br><= 2.9% Peak |
| Phase jitter<br>20 to 300 Hz<br>4 to 300 Hz | <= 1.5 P-P<br><br><= 1.8 P-P |
| Envelope delay distortion:<br>1704 Hz to 604 Hz<br>1704 Hz to 2804 Hz<br>1704 Hz to 204 Hz<br>1704 Hz to 3404 Hz | <= 350 usec<br><= 195 usec<br><= 580 usec<br><= 400 usec |

*Table A-3    Cisco CVA122/CVA122E Cable Voice Adapter Voice Specifications (continued)*

| Metric | Value |
|---|---|
| Hybrid balance: | |
| Echo Return Loss (ERL) | > 26 dB (standard test line) <br> > 14 dB (station off hook) |
| SRL | > 21 dB (standard test line) <br> > 11 dB (station off hook) |
| Clipping: <br> Speech segments <5 ms <br> Speech segments > 5ms | <br> < 0.5% <br> 0.0% |
| Impulse noise: <br> (>= 6 dB below receive signal) | <br> 0 in 93% of all 15 min intervals <br> <= 1 count in all 30 min intervals |
| Phase hits (>= 10 deg) | 0 in 99.75% of all 15 min intervals <br> <= 1 count in all 30 min intervals |
| Gain hits (>= ± 3dB) | 0 in 99.9% of all 15 min intervals <br> <= 1 count in all 30 min intervals |
| Dropouts (>= 12) | 0 in 99.9% of all 15 min intervals <br> <= 1 count in all 60 min intervals |
| **Ringing Characteristics** | |
| Ringing Voltage | 46.5 VRMS (balanced ringing only) |
| Ring Frequency (adjustable) | 20 Hz (default), 25 Hz, 50 Hz |
| **Ring Load (per line)** | **Maximum Distance** |
| 5 REN (Ringer Equivalence Number) <br> 4REN <br> 3REN <br> 2REN <br> 1REN | 2225ft <br> 3125ft <br> 4650ft <br> 7900ft <br> 17500ft |
| **On Hook/Off Hook Characteristics** | |
| On-Hook Voltage (Tip/Ring) | -30V |
| Off-Hook Current | 25mA |
| Port Terminating Impedance | 600 ohms resistive (default) <br> 900 ohms resistive, complex |
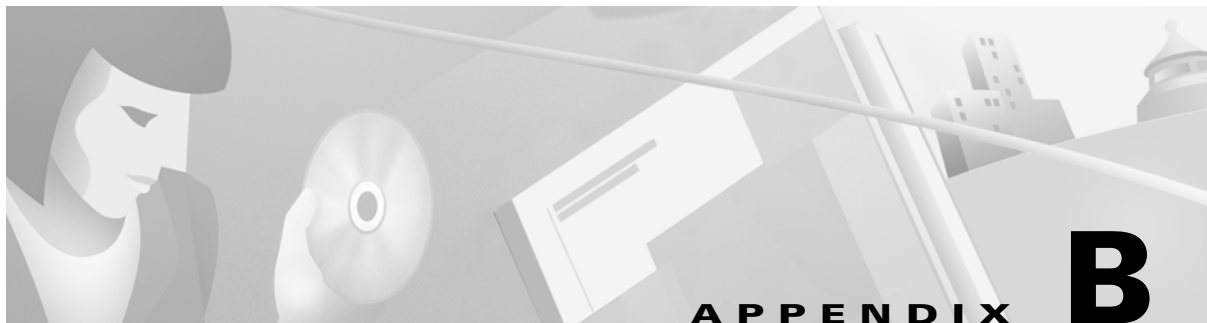
# Connector and Cable Specifications

This appendix describes the pinouts and cabling requirements for the interfaces and cables used on the Cisco CVA122/CVA122E Cable Voice Adapter. All connectors for these interfaces are on the rear-panel, as shown in Figure B-1.

*Figure B-1    Cisco CVA122/CVA122E Cable Voice Adapter Connectors*
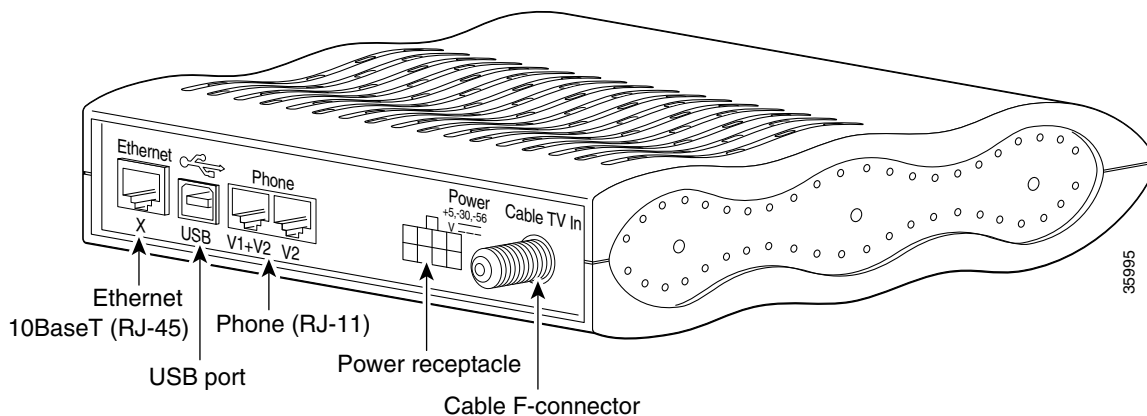


This appendix describes the following connectors and cabling requirements:

- Coaxial Connector and Cable Specifications
- Ethernet Connector and Cabling
- Power Connector
- USB Connector and Cabling
- Voice Port Connectors

Refer to the following sections for more information.

## Coaxial Connector and Cable Specifications

The Cisco CVA122/CVA122E Cable Voice Adapter connects to the HFC cable system with a type-F, right-angle, PCB-mount connector manufactured by Amp (model number 531-40047). The body is die cast out of zinc, with a tin-lead plating. The round, center contact is made of phosphor bronze, with a tin-lead plating. The insulator is polypropylene and will accept a coaxial cable center conductor with a diameter ranging from 0.022 inch (0.056 mm) to 0.042 inch (1.07 mm).

The coaxial cable used should be very high-quality cable because imperfections that do not visibly affect video transmissions can significantly affect digital data transmissions. In particular, poor insulation, improperly installed additional outlets, the condition and length of the cable's center conductor, and the quality of the cable can negatively affect the connectivity and performance of the cable voice adapter for digital data transmission.

For example, a 5 dB reduction in signal quality for analog downstream video might cause a slight degradation of picture clarity, which might or might not be noticeable to a subscriber. However, a reduction of only 1 dB in signal quality for digital data might completely disrupt service to a cable network user.

Cisco recommends that you use a headend-grade coaxial cable or a quad-shield coaxial cable with a minimum of 60% + 40% braid and double foil insulation to connect the cable modem cards to the HFC network. The center conductor must be straight and extend 1/8 inch (3.2 mm) beyond the end of the connector, and the connector should be securely crimped to the cable. The following cables are recommended:

- RG-59—0.034 inch (0.86 mm) center conductor diameter
- RG-59/U—0.0226 inch (0.57 mm) center conductor diameter
- RG-6—0.041 inch (1.05 mm) center conductor diameter

**Note**      All three of the coaxial cables listed can be used to connect a Cisco CVA122/CVA122E Cable Voice Adapter to the HFC network; however, the consistent use of RG-59 cable is preferred.

If you use different types of coaxial cable, the following problems can appear:

- Co-channel interference—If signals at the same frequency are carried on long, parallel runs of coaxial cable, interference can occur between the signals. Higher quality cable helps to prevent this with better shielding. Co-channel interference is seen as hum or patterns in analog video channels and intermittent data loss in digital channels.

- Damage to Cisco CVA122/CVA122E Cable Voice Adapter connector—The coaxial connectors are designed for RG-59 or RG-6 cable and connectors. Larger cables can damage the connectors.

- High signal return loss—High quality cable and correct connectors help to ensure an optimal return loss of 16 dB or higher.

# Ethernet Connector and Cabling

The Cisco CVA122/CVA122E Cable Voice Adapter has a single RJ-45 connector that provides the following Ethernet 10BaseT connectivity:

- A single computer be connected directly to the cable voice adapter through the Ethernet port. Use a straight-through cable for this connection.

- When the cable voice adapter is configured for routing mode, its Ethernet port can be connected to an Ethernet hub, which in turn can be connected to additional computers and other Ethernet devices. Typically, a crossover cable connects the cable voice adapter's port to the 10BaseT Ethernet port on the hub. (However, you may be able to use a straight-through cable if the hub has an uplink port; see the hub's documentation for further details.)

Figure B-2 shows the RJ-45 connector and plug used for the cable voice adapter's Ethernet ports. Table B-1 lists the pinouts and signals for the RJ-45 connector.

**Figure B-2    RJ-45 Connector and Plug**



87654321

RJ-45 connector
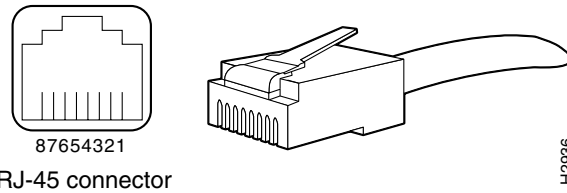
**Table B-1    RJ-45 Receptacle Pinouts**

| Pin | Description |
| --- | --- |
| 1 | Receive Data + (RxD+) |
| 2 | RxD– |
| 3 | Transmit Data + (TxD+) |
| 6 | TxD– |

**Note**    Referring to the RJ-45 pinout in Table B-1, proper common-mode line terminations should be used for the unused cable pairs 4/5 and 7/8. Common-mode termination reduces electromagnetic interference (EMI).

To identify the RJ-45 cable type, hold the two ends of the cable next to each other so you can see the colored wires inside the ends, as shown in Figure B-3.

**Figure B-3    RJ-45 Cable Identification**
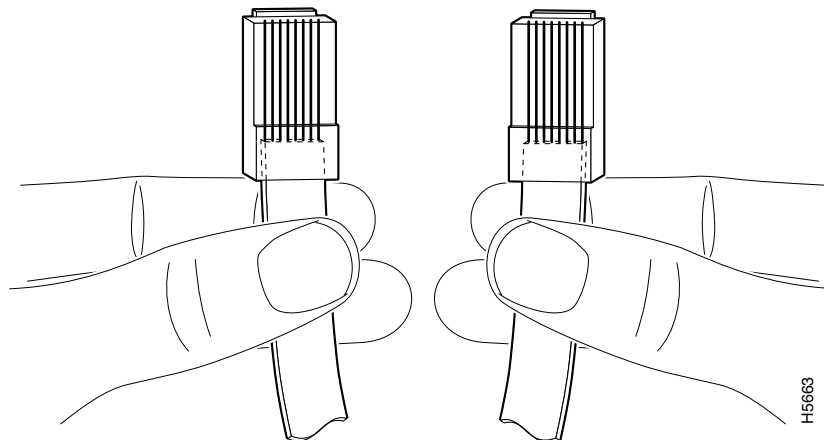


Examine the sequence of colored wires to determine the type of RJ-45 cable:

- Straight-through—The colored wires are in the same sequence at both ends of the cable.

- Crossover—The first (far left) colored wire at one end of the cable is the third colored wire at the other end of the cable.

> **Note**    Both the standard straight-through and crossover Ethernet cables should be Category 5
> UTP (RJ-45) cables. These cables are available commercially.

# Power Connector

Figure B-1 shows the eight-pin power connector on the rear panel of the Cisco CVA122/CVA122E
Cable Voice Adapter, and Table B-2 lists each power signal.

*Figure B-4    Cisco CVA120 Series Power Connector*
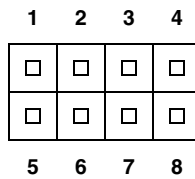


*Table B-2    Power Connector Specifications*

| Pin Number | Power Signal |
|---|---|
| 1 | -56VDC |
| 2 | -30VDC |
| 3 | Return Ground |
| 4 | (not connected) |
| 5 | (not connected) |
| 6 | (not connected) |
| 7 | Return Ground |
| 8 | +5VDC |

# USB Connector and Cabling

The USB port on the Cisco CVA122/CVA122E Cable Voice Adapter uses the standard device (type "B")
receptacle required by the Universal Serial Bus Specification Revision 1.1. Table B-3 lists the signals
used on the USB port.

*Table B-3    USB Connector Specifications*

| Pin Number | Signal Name | Description |
|---|---|---|
| 1 | VBUS | Power (red) |
| 2 | D- | Signal (white) |
| 3 | D+ | Signal (green) |
| 4 | GND | Power Ground (black) |
| Shell | Shield | Shield (drain wire) |

The USB connector requires a cable that meets the USB specification's requirements for a "Full-speed" detachable cable:

- One end of the cable must have a host (type "A") overmolded plug and the other end of the cable must have a device (type "B") overmolded plug.

- The cable cannot exceed 5 meters in length.

- The signal lines (D+ and D-) must be a twisted pair (28 AWG).

- Power and Signal Ground lines are non-twisted (20 to 28 AWG).

- The Shield must contain a 28 AWG tinned copper drain wire.

**Note**    See Chapter 6, "Mechanical," in the Universal Serial Bus Specification Revision 1.1 for complete connector and cable details. The specification is available at the USB Implementers Forum, Inc. web site at http://www.usb.org.

# Voice Port Connectors

This section contains pinout and connection information for the two voice ports on the Cisco CVA122/CVA122E Cable Voice Adapter. The voice ports use standard voice connectors (six pins with RJ-11 connectors) and straight-through four-wire cables.

**Note**    The service provider must enable and configure the Cisco CVA122/CVA122E Cable Voice Adapter for voice services before you can use the voice ports to make Voice over IP (VoIP) calls.

Table B-4 lists the signals used on the voice ports.

*Table B-4    Voice Port Signals*

| Connector | Pin | Signal | Description |
|-----------|-----|--------|-------------|
| V1+V2 | 1 | NC | Not connected. |
| | 2 | TIP 2 | RING connection for second pair of 4-wire voice port V1+V2. This is connected in parallel with voice port V2 RING. |
| | 3 | RING | RING connection for first pair of 4-wire voice port V1+V2. This is the voice port V1 RING connection. |
| | 4 | TIP | TIP connection for first pair of 4-wire voice V1+V2. This is the voice port V1 TIP connection. |
| | 5 | RING 2 | TIP connection for second pair of 4-wire voice port V1+V2. This is connected in parallel with voice port V2 TIP. |
| | 6 | NC | Not connected. |

*Table B-4    Voice Port Signals (continued)*

| Connector | Pin | Signal | Description |
|-----------|-----|--------|-------------|
| V2 | 7 | NC | Not connected. |
| | 8 | NC | Not connected. |
| | 9 | RING | RING connection for voice port V2. Pin 9 on the dual connector maps to pin 3 on a standard 6-pin RJ-11. |
| | 10 | TIP | TIP connection for voice port V2. Pin 9 on the dual connector maps to pin 3 on a standard 6-pin RJ-11. |
| | 11 | NC | Not connected. |
| | 12 | NC | Not connected. |
| | 13, 14 | GND | Ground pins are connected to board ground. |
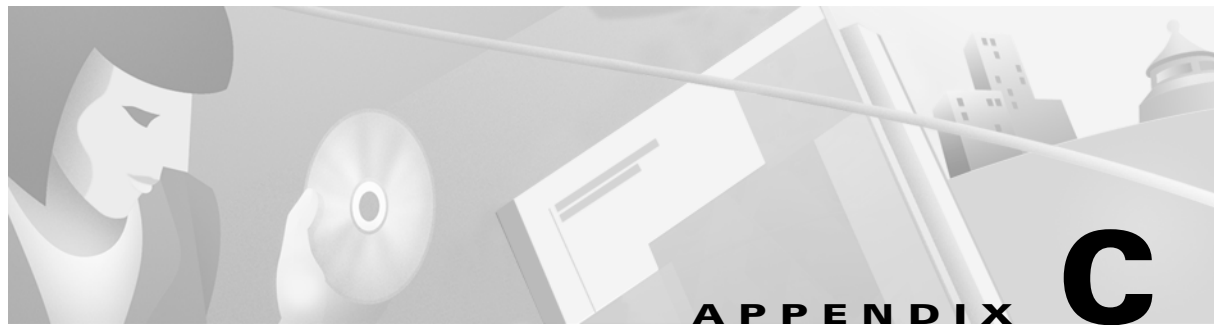
# Regulatory Compliance and Safety Information

This publication provides international agency compliance, safety, and statutory information for the Cisco CVA122/CVA122E Cable Voice Adapter. This publication is intended for service providers and subscribers. The publication presents general safety guidelines to follow and includes translations of safety warnings in this document (*Cisco CVA122/CVA122E Cable Voice Adapter Hardware Installation Guide*).

The following sections are included in this publication:

- Safety Information, page C-1
- Regulatory Statements, page C-2
- Translated Safety Warnings, page C-2

## Safety Information

Following are safety instructions that you must follow when installing a Cisco CVA122/CVA122E Cable Voice Adapter. Failure to install the unit in accordance with these instructions will invalidate the agency approvals for the Cisco CVA122/CVA122E Cable Voice Adapter.

### General Safety

- Do not work on the system or connect and disconnect cables during a lightning storm.
- Do not use this unit near liquids.
- Do not place this unit on an unstable surface or on the floor.

### Subscriber Safety

- Do not remove covers. No operator serviceable parts are inside. Refer servicing to qualified personnel.
- Do not attempt to service or configure the Cisco CVA122/CVA122E Cable Voice Adapter yourself. Only authorized personnel should service or configure the unit. If the unit requires service, contact your service provider.
- Do not insert any objects into the unit.

> ✎
> **Note** In the event of equipment malfunction, contact your service provider. End-users requiring service must report the need for service to their service provider.

# Regulatory Statements

## FCC Requirements

### Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna (as appropriate).
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help (as appropriate).

# Translated Safety Warnings

This section repeats in multiple languages the warnings found in the documentation related to the Cisco CVA122/CVA122E Cable Voice Adapter:

## Warning Definition

> ⚠
> **Warning** **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.**

**Waarschuwing** **Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.**

**Varoitus**    **Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.**

**Attention**    **Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.**

**Warnung**    **Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.**

**Avvertenza**    **Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.**

**Advarsel**    **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.**

**Aviso**    **Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.**

**¡Advertencia!**    **Este símbolo de aviso significa peligro.  Existe riesgo para su integridad física.  Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.**

**Varning!**    **Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.**

# Lightning Activity Warning

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

**Waarschuwing**    **Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.**

| Varoitus | **Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.** |
|---|---|
| Attention | **Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.** |
| Warnung | **Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.** |
| Avvertenza | **Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.** |
| Advarsel | **Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.** |
| Aviso | **Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).** |
| ¡Advertencia! | **No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.** |
| Varning! | **Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.** |

# Installation Warning

| Warning | **Read the installation instructions before you connect the system to its power source.** |
|---|---|
| Waarschuwing | **Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.** |
| Varoitus | **Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.** |
| Attention | **Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.** |
| Warnung | **Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.** |
| Avvertenza | **Consultare le istruzioni di installazione prima di collegare il sistema all'alimentatore.** |
| Advarsel | **Les installasjonsinstruksjonene før systemet kobles til strømkilden.** |
| Aviso | **Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.** |

| ¡Advertencia! | Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación. |
| --- | --- |
| Varning! | Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet. |

# Product Disposal Warning

| ⚠ Warning | Ultimate disposal of this product should be handled according to all national laws and regulations. |
| --- | --- |
| Waarschuwing | Het uiteindelijke wegruimen van dit product dient te geschieden in overeenstemming met alle nationale wetten en reglementen. |
| Varoitus | Tämä tuote on hävitettävä kansallisten lakien ja määräysten mukaisesti. |
| Attention | La mise au rebut ou le recyclage de ce produit sont généralement soumis à des lois et/ou directives de respect de l'environnement. Renseignez-vous auprès de l'organisme compétent. |
| Warnung | Die Entsorgung dieses Produkts sollte gemäß allen Bestimmungen und Gesetzen des Landes erfolgen. |
| Avvertenza | Lo smaltimento di questo prodotto deve essere eseguito secondo le leggi e regolazioni locali. |
| Advarsel | Endelig kassering av dette produktet skal være i henhold til alle relevante nasjonale lover og bestemmelser. |
| Aviso | Deitar fora este produto em conformidade com todas as leis e regulamentos nacionais. |
| ¡Advertencia! | Al deshacerse por completo de este producto debe seguir todas las leyes y reglamentos nacionales. |
| Varning! | Vid deponering hanteras produkten enligt gällande lagar och bestämmelser. |

# Jewelry Removal Warning

**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.

**Waarschuwing**    Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.

**Varoitus**    Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

**Attention**    Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

**Warnung**    Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

**Avvertenza**    Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

**Advarsel**    Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

**Aviso**    Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

| ¡Advertencia! | **Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.** |
|---|---|
| Varning! | **Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.** |

# Incorrect Connection Warning

| Warning | **Incorrect connection of this or connected equipment to a general purpose outlet could result in a hazardous situation.** |
|---|---|
| Waarschuwing | **Incorrecte aansluiting van deze of aangesloten apparatuur op een stopcontact voor algemene doeleinden kan een gevaarlijke situatie tot gevolg hebben.** |
| Varoitus | **Tämän laitteen tai siihen liitettyjen laitteiden virheellinen kytkentä yleispistorasiaan voi aiheuttaa vaaratilanteen.** |
| Attention | **Un branchement incorrect de cet équipement ou de l'équipement branché à une prise d'usage général peut créer une situation dangereuse.** |
| Warnung | **Inkorrektes Anschließen von diesem oder damit verbundenen Geräten an einer Allzwecksteckdose kann eine Gefahrensituation verursachen.** |
| Avvertenza | **Un collegamento errato di questo apparecchio, o dell'apparecchiatura a esso collegato, a una presa di uso generale può causare una situazione pericolosa.** |
| Advarsel | **Feil kobling av dette utstyret eller tilhørende utstyr til et vanlig uttak kan føre til farlige situasjoner.** |
| Aviso | **Uma conexão incorrecta a uma ficha de alimentação eléctrica normal, deste ou de qualquer equipamento a este conectado, poderá resultar numa situação potencialmente perigosa.** |
| Advertencia | **La conexión incorrecta de este equipo, o del equipo conectado, a una toma o receptáculo de tipo general podría resultar en una situación peligrosa.** |
| Varning! | **Felaktig koppling av denna eller ansluten utrustning till ett universaluttag kan orsaka riskfylld situation.** |

# Ring Signal Generator Warning

**Warning**  **This equipment contains a ring signal generator (ringer), which is a source of hazardous voltage. Do not touch the RJ-11 (phone) port wires (conductors), the conductors of a cable connected to the RJ-11 port, or the associated circuit-board when the ringer is active. The ringer is activated by an incoming call.**

**Waarschuwing**  **Deze apparatuur brengt een belsignaal voort wat op spanningsgevaar duidt. Wanneer de bel rinkelt, mogen de RJ-11-draden (telefoon), d.w.z. de geleiders van een aan de RJ-11-poort verbonden kabel, en de bijbehorende circuitplaat, niet aangeraakt worden. De bel wordt geactiveerd door een binnenkomend analoog gesprek.**

**Varoitus**  **Tämä laite on varustettu soittovirran generaattorilla (puhelinkello), jossa on vaarallinen jännite. Älä koske RJ-11 (puhelimen liittymän) liitäntäjohtoihin (johtimet), RJ-11-liittymään yhdistetyn kaapelin johtimiin tai piirilevyyn puhelinkellon ollessa päälle kytkettynä. Saapuva analogisoitto aktivoi puhelinkellon.**

**Attention**  **Cet appareil contient un générateur de sonneries, source de tensions dangereuses. Lorsque la sonnerie est active, ne touchez en aucun cas les fils de port (conducteurs) du connecteur RJ11 (téléphone), les âmes du câble connecté au port RJ11 ou les cartes imprimées correspondantes. La sonnerie est activée par un appel entrant.**

**Warnung**  **Dieses Gerät enthält einen Rufsignalgeber (Rufumsetzer), der unter gefährlicher Spannung steht. Die RJ-11 (Telefon-) Anschlußdrähte (Leiter), die Leiter eines im RJ-11-Anschluß eingesteckten Kabels bzw. die dazugehörige Leiterplatte auf keinen Fall berühren, wenn der Rufumsetzer aktiviert ist. Der Rufumsetzer wird aktiviert, wenn ein Analoganruf eingeht.**

**Avvertenza**  **Questa apparecchiatura contiene un generatore di segnali di chiamata (suoneria) che origina un voltaggio pericoloso. Quando la suoneria è attivata, non toccare l'RJ-11 (telefono), i fili della porta (conduttori), i conduttori di un cavo collegato alla porta RJ-11 o l'associata scheda a circuiti stampati. La suoneria è attivata da un segnale di chiamata analogica in arrivo.**

**Advarsel**  **Dette utstyret inneholder en ringesignalgenerator (ringeklokke) med farlig spenning. Berør ikke RJ-11-utgangens (telefonutgangens) ledninger (lederne), lederne til den kabelen som er koplet til RJ-11-utgangen, eller tilhørende kretskort når ringeklokken er aktivert. Ringeklokken aktiveres av innkommende analoge anrop.**

**Aviso**  **Este equipamento contém um gerador de sinal de campainha que constitui uma fonte de tensão perigosa. Não toque nos fios de porta (condutores) RJ-11 (telefone), nos condutores do cabo conectado à porta RJ-11 ou na placa de circuito associada quando a campainha estiver activa. A campainha é activada pela entrada de uma chamada analógica.**

| | |
|---|---|
| ¡Advertencia! | **Este equipo contiene un generador de señal de llamada (timbre), el cual es una fuente de tensión peligrosa. No toque los alambres de la puerta (conductores) RJ-11 (teléfono), ni los conductores de un cable conectado a la puerta RJ-11, ni la placa del circuito relacionado cuando el timbre está activo. El timbre es activado por medio de una llamada de entrada analógica.** |
| Varning! | **Denna utrustning innehåller en tongenerator (ringklocka) med farlig spänning. Vidrör inte RJ-11-portens (telefonportens) ledningar (ledarna), ledarna hos kabel som är ansluten till porten RJ-11 eller tillhörande kretskort när ringklockan är aktiverad. Ringklockan aktiveras av inkommande analoga anrop.** |

# TN and IT Power Warning

| | |
|---|---|
| Warning | **This equipment has been designed for connection to TN and IT power systems.** |
| Waarschuwing | **Deze apparatuur is ontworpen voor verbindingen met TN en IT energiesystemen.** |
| Varoitus | **Tämä laitteisto on suunniteltu yhdistettäväksi TN- ja IT-sähkövoimajärjestelmiin.** |
| Attention | **Ce matériel a été conçu pour être connecté à des systèmes d'alimentation TN et IT.** |
| Warnung | **Dieses Gerät ist so konstruiert, daß es an TN- und IT-Stromsysteme angeschlossen werden kann.** |
| Avvertenza | **Questa apparecchiatura è stata progettata per collegamenti a sistemi di alimentazione TN e IT.** |
| Advarsel | **Dette utstyret er utformet for å kunne kobles til TN- og IT-strømsystemer.** |
| Aviso | **Este equipamento foi criado para ligações a sistemas de corrente TN e IT.** |
| ¡Advertencia! | **Este equipo se ha diseñado para ser conectado a sistemas de alimentación tipo TN o IT.** |
| Varning! | **Denna utrustning har konstruerats för anslutning till elkraftssystem av TN- och IT-typ.** |

**INDEX**