Preface

Objectives

The *Cisco VCO/4K Site Preparation Guide* outlines the steps for preparing an installation site before the arrival of a VCO/4K Open Programmable Switch. It also includes technical specifications for equipment sizing, power and environmental requirements, and specifications for the Main Distribution Frame (MDF), and peripheral equipment cabling. Installation of the VCO/4K system also requires the fabrication or purchase of EIA/TIA-232 cables and/or Ethernet transceiver cards and cables for host communication links.

Note This document represents the most current information about VCO/4K mechanical assemblies. If you need information pertaining to VCO/4K assemblies, circuit cards, or other components that are not included in this document, see the following URL on Cisco's web site for legacy VCO/4K information:

http://www.cisco.com/univercd/cc/td/doc/product/tel_pswt/index.htm

Audience

This manual is intended for VCO/4K system users and third-party support personnel. If you are unfamiliar with the VCO/4K system, refer to the "Related Documentation" section on page viii.

This manual assumes that the host application (if it is a hosted system) is written to conform to the *VCO API Programming Reference Manual*. However, that does not preclude problems occurring between the application and the VCO/4K system.

Each release of the VCO/4K Generic is described in the *Cisco VCO/4K Release Notes* that contain detailed information on changes from one release to the next. If your VCO/4K system includes the SS7 subsystem, refer to the *SS7 Release Notes*.

Document Organization

The *Cisco VCO/4K Site Preparation Guide* is organized as follows:

- Chapter 1, “General Information,” provides an overview of the site preparation process.
- Chapter 2, “Installation Planning,” describes the factors for consideration when planning a VCO/4K installation site.
- Chapter 3, “Peripheral Equipment,” describes installation requirements for these peripheral devices.
- Chapter 4, “Host Communication Cabling,” provides equipment requirements for creating Ethernet links.

Appendix A, “System Component Weights,” lists the weights of various system components.

Document Conventions

Notes

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Cautions

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

Warnings

Warning **Means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translated versions of the warning, refer to the *Regulatory Compliance and Safety* document that accompanied the device.**

Related Documentation

The following documents are referenced from this guide or contain information that is directly related to system performance and configuration.

VCO/4K System

- *Cisco VCO/4K System Software Release Note*
- Cisco *VCO/4K SS7 ISUP Release Notes*
- *Cisco VCO/4K TCAP Release Notes*
- *Cisco VCO/4K Product Overview*
- *Cisco VCO/4K Hardware Planning Guide*
- *Cisco VCO/4K System Maintenance Manual*
- *Cisco VCO/4K Standard Programming Reference*
- *Cisco VCO/4K Extended Programming Reference*
- *Cisco VCO/4K System Administrator's Guide*
- *Cisco VCO/4K Ethernet Guide*
- *Cisco VCO/4K Mechanical Assemblies*
- *CiscoVCO/4K Hardware Installation Guide*
- *Cisco VCO/4K Card Technical Descriptions*
- *Cisco VCO/4K Troubleshooting Guide*
- *Ring Generator Instruction Sheet* (included with the ring generator kit)

Third-party Documents

The following third-party documents are recommended by Cisco:

- Theodore Frankel's *ABC Of the Telephone: Traffic Series – Tables For Traffic Management And Design*
- International Telecommunications Union ITU-T Q.931 ISDN documentation
- ANSI T1.113-1992, SS7 ISUP documentation
- OEM manuals supplied with peripheral equipment installed as part of the system configuration
- The documentation set produced for the host computer system
- Documentation for the application software package developed to run on the host

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, for your convenience many documents contain a response card behind the front cover. Otherwise, you can mail your comments to the following address:

Cisco Systems, Inc.
Document Resource Connection
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

General Information

The site preparation checklist at the end of this chapter helps ensure that all site preparations are completed before the delivery and installation of a VCO/4K system.

Installation Planning

Installation planning includes:

- Location
- Environment
- Power
- Alarms
- Operating limits for cards and peripherals

Review Chapter 2, “Installation Planning,”and complete all modifications to the installation site before the arrival of the VCO/4K. For additional information on installation planning, refer to Appendix A, “System Component Weights.”

Cabling Preparations

Cabling preparation includes:

- Digital interconnections
- Cabling to a VCO/4K system

This guide does not describe how to construct and wire cables. Review the “Digital Interconnections” section on page 2-8 before prewiring the installation site.

Regulatory Considerations

Refer to the “Federal Communication Commission (FCC) Information” section on page 2-9.

Peripheral Equipment

Every VCO/4K system requires connection to a video display terminal (VDT) and dot matrix printer for system administration purposes. A remote maintenance modem is also an option. Topics discussed include:

- Types of peripheral equipment
- Installation planning for peripheral equipment
- Peripheral cabling
- Routing peripheral equipment through transfer switches

Host Communication Links

VCO systems communicate with a host computer system over Ethernet links. This is discussed in Chapter 4, “Host Communication Cabling.” For detailed information on using the optional Ethernet communications package for the VCO/4K, refer to the *Cisco VCO/4K Ethernet Guide*.

Site Preparation Checklist

If you request Cisco to perform the VCO/4K installation and system certification, you must complete the following checklist before Cisco personnel arrive:

1. ____ Verify the space requirements, including access and passageways to the equipment room for the VCO/4K system and the associated peripheral equipment (Chapter 2, “Installation Planning”).
2. ____ Complete all modifications to the installation site, including electrical service and HVAC modifications (Chapter 2, “Installation Planning”).
3. ____ Construct, label, and properly route cables to the VCO/4K location (Chapter 2, “Installation Planning”).
4. ____ Order telco facilities (subscriber loops, trunks, T-spans, and so forth); coordinate their installation, and test all facilities following installation (*Cisco VCO/4K Hardware Planning Guide)*.
5. ____ Install the DC Power Plant (if required) and terminate the feeder circuits near the VCO/4K (Chapter 2, “Installation Planning”).
6. ____ Install the earth ground so you can terminate it at the power entry module on the VCO/4K (Chapter 2, “Installation Planning”).
7. ____ Connect the EIA/TIA-232 and parallel cables from the VCO/4K to the peripheral equipment (console, printer, modem, and switches). (See Chapter 3, “Peripheral Equipment.”)
8. ____ Install the business line for the remote maintenance modem. Terminate the line near the installation location for the modem (optional). (See Chapter 3, “Peripheral Equipment.”)
9. ____ Connect the Ethernet transceiver and cables for use as the host communication links between the host computer and the VCO/4K (Ethernet Communications Package). (See Chapter 4, “Host Communication Cabling.”)
10. ____ Install and test the host computer system.
11. ____ Install an AC branch circuit, either 120V, 50/60 Hz, 3A or 240V, 50/60 Hz, 15A, (if required) near the VCO/4K location for connection to the power supply (Chapter 2, “Installation Planning”).

12. ____ Install the 120V, 50/60 Hz, 20A AC branch circuit (if required) to power the peripheral equipment (may require more than one outlet). (See Chapter 3, “Peripheral Equipment.”)

CHAPTER 2

Installation Planning

Use the information in this chapter to evaluate the suitability of a site for a VCO/4K Open Programmable Switch, and to begin preparations for installation. Topics covered include:

- Location
- Environment
- Power
- Alarm contacts
- Operating limits for cards and peripherals

For specific installation procedures and requirements, refer to the *Cisco VCO/4K Hardware Installation Guide*.

Location

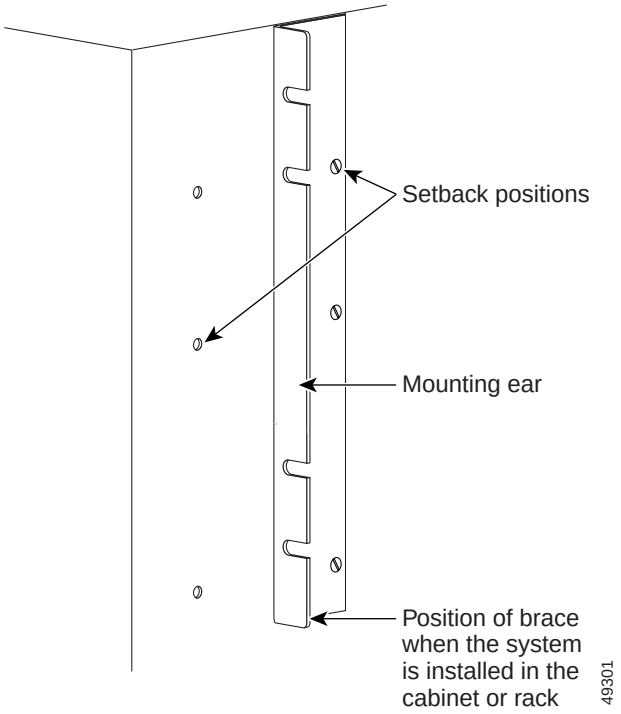
You can locate VCO/4K systems in areas such as central office (CO) equipment bays or separate equipment rooms. You can install a VCO/4K system in any of the following ways:

- Floor
- Table or desktop
- Cabinet (customer supplied) or rack

VCO/4K systems are designed for use in a wide range of environments, including computer rooms, as carrier network equipment, and as customer premise equipment (CPE). These systems meet the enclosure requirements of *UL 1950 Standard for Information Technology Equipment*, *Network Equipment-Building System (NEBS) GR-63-CORE* with *Zone 4 Earthquake*, and *Bellcore's GR-1089-CORE Safety* and *Physical Protection* for customer premises installation.

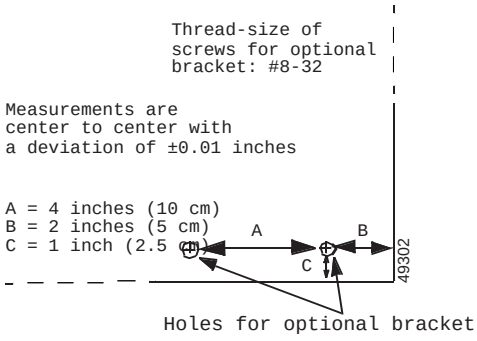
The mounting scheme complies with the EIA mounting scheme for 19-inch and 24-inch cabinets. A pair of braces comes with the system that you fasten to the VCO/4K system if you are mounting it in a cabinet or rack. Then you position the system into the cabinet or rack and secure it in place. Refer to the *Cisco VCO/4K Hardware Installation Guide* for more information about the brace. Figure 2-1 shows the mounting brace.

Figure 2-1 Mounting Ear Setback Options and Optional Bracket Specifications



There are two holes on each side of the system in the rear for attaching an optional bracket (customer supplied) for additional support. Figure 2-2 shows the specifications.

Figure 2-2 Specifications for Optional Bracket



Selecting a Location

Consider the following when selecting a location for the VCO/4K:

- Proximity to peripheral devices
- Interference from other equipment
- Size of the VCO/4K

Proximity to Peripheral Devices

Allow adequate space for peripheral devices (system console or printer), so you can keep them in the same area as the VCO/4K. Cisco recommends that the system console be close to the system so the operator can see the front of the VCO/4K. It is easier for the operator to check the status of front panel indicators while performing maintenance and diagnostic operations.

Interference from Other Equipment

Install the VCO/4K system at least ten feet (three meters) from EMI and RFI sources such as:

- Equipment with sparking electric motors, such as:
  - Elevators
  - Air conditioners
- Computer equipment not in compliance with FCC Part 15
- Radio frequency transmitters (two-way radios)

Size of the VCO/4K

Table 2-1 lists the dimensions and weight of the system for both redundant and nonredundant configurations.

Table 2-1 VCO/4K Dimensions and Weights

	Dimensions			Weight	
	Width	**Depth**	**Height**	**Redundant**	**Nonredundant**
VCO/4K (system only)	17.5 in. (45.33 cm)	22.5 in. (58.57 cm)	26.13 in. (67.73 cm)	100–157 lb. (45–70.65 kg)	85–100 lb. (38.25–45 kg)
VCO/4K in shipping container	23.5 in. (58.75 cm)	32 in. (80 cm)	32.75 in. (83.19 cm)	118–175 lb. (53.1–78.75 kg)	103–118 lb. (46.35–53.1 kg)

It is necessary to have more than one person position the system during installation. The Occupational Safety and Hazards Act (OSHA) weight limitations presently recommend a limit of 40 pounds for an individual female lifting an object and 75 pounds for an individual male. Observe local, regional, and national safety codes, as well as your own company's safety rules and regulations.

For easier positioning and to reduce the system weight, remove the power supplies. Refer to Appendix A, "System Component Weights," for the weights of various cards and components. Follow ESD grounding rules when removing system components.

The VCO/4K has a removable front door with a lock. Allow approximately 36 inches (90 cm) of clearance to remove the door. In the back of the system, allow about 6 inches (15 cm) for cable access.

Caution Operating the system with the door off is in violation of local EMI/EMC regulations and ESD susceptibility specifications.

Environment

Operate the VCO/4K in an environment with 20 to 80 percent relative humidity (noncondensing). Maintaining the relative humidity above 50 percent reduces the chance that static charges will build up.

There is a direct correlation between humidity and static electricity. The sudden discharge of built-up static electricity can damage the integrated circuits used in VCO/4K assemblies. Electrostatic discharge (ESD) can also cause random error generation in magnetic media and memory circuits.

Caution Always follow standard ESD precautions whenever handling VCO/4K circuit cards by attaching a grounding wrist strap to the VCO/4K equipment.

Operating Environment

Operate the VCO/4K in an environment where the ambient temperature is 40 to 100 F (10 to 40 C) and does not exceed a 15 F (10 C) rise or fall per hour.

If you need an environmental control system to maintain proper operating conditions, install the control system, test it, and set it for 24 hours of operation before the delivery of the VCO/4K system.

Air Flow

The maximum amount of heat generated by the VCO/4K is 2930 BTUs per hour. A fan unit installed in the system draws air in through the perforated front door, pulls it through the system, and blows it out through the rear of the cabinet.

The equipment room should provide sufficient air flow to minimize heat buildup. This may require installing vents or blowers in the equipment room.

Earthquake Protection

It is the customer's responsibility to install the VCO/4K system in an earthquake-hardened cabinet or rack in areas where earthquakes are likely, or where local regulation requires earthquake protection. See the *Cisco VCO/4K Product Overview* for more details. The VCO/4K system complies with the EIA (Electronic Industries Association) mounting scheme for 19-inch and 24-inch cabinets.

Power Subsystem

The power subsystem operates on either AC or DC at the specified voltages and currents. The AC power entry module supports both 120 VAC and 240 VAC. Table 2-2 provides the input power for the VCO/4K with either AC or DC sources.

Table 2-2 VCO/4K Input Power

Source	Current	Frequency
–48 VDC	20 amps	DC
120 VAC	10 amps	50/60 Hz
240 VAC	5 amps	50/60 Hz

The amount of input power required depends on the configuration of the system—the number of cards in it and whether it is redundant or nonredundant. For more information on the power subsystem, refer to the *Cisco VCO/4K Mechanical Assemblies*.

Power Source

Connect a circuit breaker or fuse at the power panel for the AC or DC feed. To avoid induced noise problems, Cisco recommends the use of a dedicated branch circuit to which no other high current or motor-driven device is connected.

The cable length from the power panel to the VCO/4K determines the size of the conductor.

Note For detailed recommendations on electrical installation, refer to your local, regional, and national electrical code.

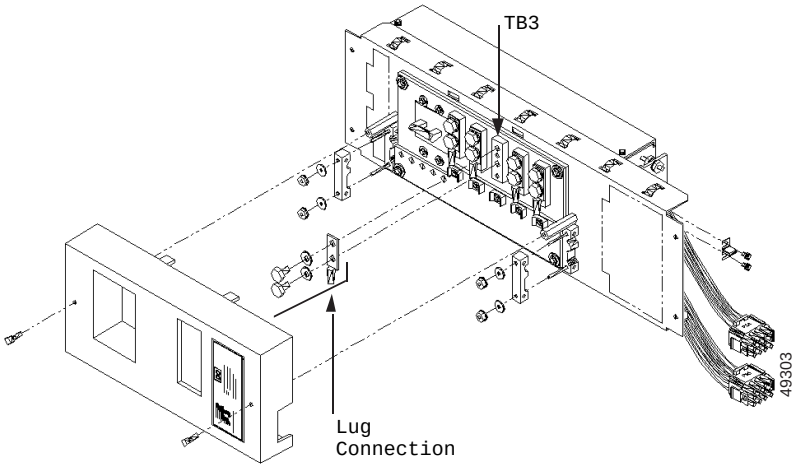
In AC systems, the VCO/4K power subsystem receives electrical power from a 3-conductor cable; in DC systems, from a 3-conductor (ground optional) cable; and in dual DC systems, from a 5-conductor cable. Refer to local or national electrical codes for wire sizes. Use a wall outlet or drop cord connection for the source of AC power.

The VCO/4K power entry module (AC, DC, or dual DC) has five lugs (ring terminals) to which the cable is connected (refer to Figure 2-3). For complete wiring information, consult your local, regional, and national electrical code. For specific installation procedures and requirements, refer to the *Cisco VCO/4K Hardware Installation Guide*.

Grounding

The VCO/4K provides a separate ground connection between itself and earth ground. Electrical ground is within the TB3 lug connection in the power entry module (refer to Figure 2-3, which also shows the TB3 location in the power entry module).

Figure 2-3 Power Entry Module



Caution Do not connect the earth ground through an electrical distribution circuit, such as the neutral or safety ground in an AC panel.

Voltages for AC Systems

A VCO/4K system with AC input receives power sources with voltages from 85 to 264 volts. A 120-volt source requires 10 amps. A 240-volt source requires 5 amps.

Alarm Contacts

The Alarm Arbiter Card (AAC), supplied with the system, provides four sets of alarm contacts—Major Alarm, Minor Alarm, AUX 1, and AUX 2.

The DB-15 female connector for remote alarms on the left lower rear of the VCO/4K system allows you to monitor alarms remotely on the system (connector is labeled). Use the information in Figure 2-4 to build a cable and a male connector for whatever device you will be using at the other end.

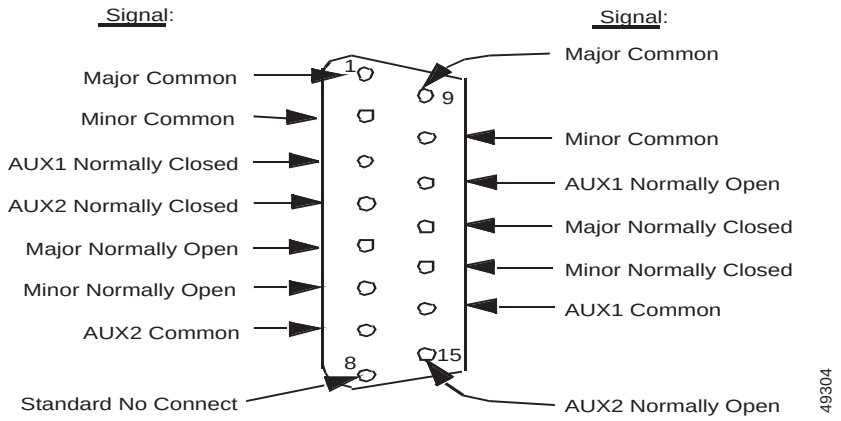
Select an appropriate gauge based on your local codes for the cable connecting the terminal block to the alarm signaling device. Maximum ratings for the relay contacts are as follows:

- @ 24 VDC for 0.5 amp
- @ 120 VAC for 0.25 amp

Note AAC alarm contacts are not intended for direct connection to high current alarm devices, such as bells or sirens. Use the relay contacts to signal an external alarm controller that powers such alarm devices.

For alarm wiring information, refer to the *Cisco VCO/4K Hardware Installation Guide*.

Figure 2-4 Signals for 15-Pin Male Connector for Remote Alarming



When building cables, terminate all cable shields 360 degrees around each connector at each end by feathering the shields before attaching them to the connector.

Operating Limits

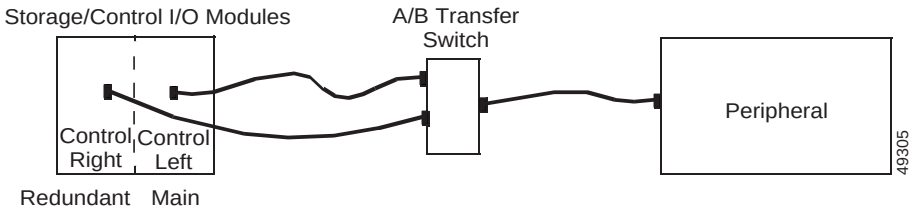
The operating limits for cards and peripheral devices that you can connect to the VCO/4K system are as follows:

- *T1 Card Spans:* Each T1 Interface Card incorporates an equalization circuit that you can set to optimize electrical circuit characteristics for span lengths up to 655 feet (196.5 m); lengths beyond 655 feet require repeaters.
- *Video Display Terminals:* You can put Administrative/maintenance terminals connected to serial ports up to 50 feet (45 m) from the VCO/4K with shielded EIA/TIA-232 cables.
- *Printers:* You can put system printers connected to a dedicated port up to 50 feet (15 m) from the VCO/4K with standard shielded parallel cables.
- *Remote Maintenance Modems:* You can put modems connected to the serial asynchronous port up to 50 feet (15 m) from the VCO/4K with shielded EIA/TIA-232 cables terminated with DB-25 male connectors.
- Terminate a switched network line on an RJ-11 or RJ-45 jack, as close to the modem mounting location as possible. The type of jack used depends on the telco modem requirements. Cisco recommends that you not route unconditioned business lines through a PBX for modem applications.

Terminals, printers, and modems connect to ports located on the Storage/Control I/O Module.

You can route the system console, printer, and remote maintenance modems through A/B transfer switches for convenient connection to the Storage/Control I/O Module in redundant configurations. Refer to Figure 2-5.

Figure 2-5 Use of A/B Transfer Switches in Redundant Systems



Refer to the *Cisco VCO/4K Hardware Installation Guide* for the A/B transfer switch pinouts and signaling information.

Digital Interconnections

You can connect a VCO/4K system directly to digital carrier systems. For example, you can connect a VCO/4K to a T1 digital carrier system operating at a DSX-1 (patch panel) level. Each T1 span supports twenty-four 56 Kbps voice channels and complies with Bell System DS-1 specifications for transmission at 1.544 Mbps. Transmission over T1 circuits is bidirectional, involving both transmit (Tx) and receive (Rx) data streams.

For more information, refer to:

- AT&T PUB 62411 *ACCUNET® T1.5 Service Description and Interface Specifications*
- AMERICAN NATIONAL STANDARD for Telecommunication: *Standards for DS1, DS1C, DS2, and DS3 Levels of the Digital Hierarchy*

VCO/4K systems can also be equipped with Primary Rate Interface (PRI) cards for Integrated Services Digital Network (ISDN) PRI services. These cards use the same I/O module as the T1 card. PRI cards must be used with the ISDN PRI Package available from Cisco. Refer to the *Cisco VCO/4K ISDN Supplement* and the *Cisco VCO/4K Card Technical Descriptions* for more information about this option.

T1 Cabling

The T1-span line requirement is 4-wire separately twisted pairs, 22 AWG, ABAM cable with a maximum length of 655 feet (200m). This cable must meet DS-1 electrical specifications for the interface. The span line is connected to each T1 interface card through a T1 I/O module.

Be sure that the receive and transmit pairs from the connecting equipment are terminated on a matching plug connector in accordance with the pinouts specified in the *Cisco VCO/4K Card Technical Descriptions*. The plug connector must be an Amphenol 17-10150-1 or an equivalent, with hood and cable clamp accessory.

Note It is good practice to label the T1 connectors on the VCO/4K end with information specific to your installation. Use an indelible ink pen to write the identifying information on the connector housing, or use machine-made labels to tag the end of each cable. Use the same identifying information when filling out the forms provided in the *Cisco VCO/4K Card Technical Descriptions.*

RJ-45 I/O Module

Both ICC E1 I/O and ICC T1 I/O modules require RJ-45 connections. Refer to the *Cisco VCO/4K Card Technical Descriptions* for complete wiring information.

Federal Communication Commission (FCC) Information

The FCC provides specifications and codes for customers to order facilities (DS0) and services from telecommunications companies in North America.

Table 2-3 lists general FCC information for the VCO/4K system.

Table 2-3 FCC Specifications

FCC Specification	Description
Part 68 registration number	BHRUSA-23298-PF-E
Ringer equivalence (UTC-2)	0.8B

Table 2-4 lists the Facility Interface Codes (FIC) for the VCO/4K system. FICs are tariff references which are used by customers to order the correct facilities from telcos.

Table 2-4 Facility Interface Codes

Card Type	FIC	Description
T1	04DU9-B	1.544 Mbps D4 framing format
PRI	None	1.544 Mbps 23B+D Primary Rate

Table 2-5 lists the service order codes.

Table 2-5 FCC Service Order Codes

Service Type	Value[1]	Description
Digital services (T1 only)		Provides billing and encoded analog content protection.

1. Service Order Code values are not available until testing on a released system is complete.

Cabling to a VCO/4K System

Cables to telecommunications facilities and to peripherals are routed out the back of the VCO/4K system enclosure. If you have to route cables along a floor and upward to the connector panel(s), you should protect the cables from physical damage with conduit, raised flooring, or some type of wood or metal housing.

Temporarily secure cables to ceiling supports (not suspended ceiling rails), or drop them from cable raceways until you permanently fasten the connectors to I/O modules.

CHAPTER 3

Peripheral Equipment

This chapter describes how to prepare for the installing of peripheral equipment. Peripheral equipment includes a video display terminal, a system printer, and a remote maintenance modem. The peripheral interface connections are on the back of the system. Preparations involve:

- Allocating space
- Providing AC service circuits
- Considering the use of an uninterruptible power supply (UPS)
- Providing cabling for peripheral equipment

In addition, customers with redundant systems need to determine how to connect peripheral equipment to the two Storage/Control I/O Modules. There are three options, as follows:

- Manually switch cable connections from one Storage/Control I/O Module to the other following switchover between the two combined controllers.
- Purchase two sets of peripheral equipment and connect one set to each Storage/Control I/O Module.
- Interconnect one set of peripheral equipment to both Storage/Control I/O Modules through either a manual or automatic A/B transfer switch.

Transfer switches are described later in this chapter.

Peripheral Equipment

Refer to the *Cisco VCO/4K Hardware Planning Guide* for information on ordering peripheral equipment.

Video Display Terminal

A video display terminal (VDT), from which you perform administrative and maintenance tasks on the VCO/4K, functions as the system console. Position it within a maximum distance of 50 feet of the VCO/4K system.

A local VDT capable of operating with VT220 emulation is connected directly to a serial port on the Storage/Control I/O Module to perform routine administrative tasks. Cisco Systems supports the following terminal models for administrative applications: VT220 and 320, and WYSE Technology WY-185 and WY-185ES.

Connect the terminal with a shielded EIA/TIA-232 cable terminated with DB-25 male connectors to a dedicated serial port (Serial Port 1/Console) on the storage/control I/O module (refer to the "Recommendations for Peripheral Cabling" section on page 3-3).

Define system console operating parameters in the system database with the system administration Peripheral Configuration screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information. These operating parameters must match the VT220/320 setup parameters defined for the console itself. Refer to the *Cisco VCO/4K Hardware Installation Guide* for instructions on establishing VT220/320 setup parameters.

System Printer

Connect a system printer with a Centronics-type parallel interface to the Storage/Control I/O Module. You can request a hardcopy of VCO/4K system reports and database entries through the system print utilities. Cisco recommends using a dot-matrix printer with a pin or tractor feed option that accepts continuous feed paper. Reports are generated within an 8-1/2 inch by 11 inch (21.6 cm by 27.9 cm) printing area.

A parallel printer cable connects the printer to the printer port on the Storage/Control I/O Module (see the "Recommendations for Peripheral Cabling" section on page 3-3).

Note A Centronics-to-Centronics cable is available from Cisco to connect the parallel printer interface on the Storage/Control I/O Module to the Centronics connector on the printer. Refer to the *Cisco VCO/4K Hardware Planning Guide* for more information. Do not use this cable to connect a serial printer to the system.

Define the end-of-line (EOL) terminator for the printer interface in the system database and match the printer setup configuration before use. Then define the EOL terminator in the system administration Peripheral Configuration screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for instructions. Refer to the documentation supplied with the printer to configure the EOL for the printer.

Remote Maintenance Modem

You may use an asynchronous modem for remote maintenance of a VCO/4K. Cisco Systems Technical Support can use this modem to dial up the system through the switched public network to perform diagnostic inquiries about system operation, when requested.

Connect the asynchronous modem with an EIA/TIA-232 cable to a serial port on the Storage/Control I/O Module (refer to the "Recommendations for Peripheral Cabling" section on page 3-3). Then define modem operating parameters in the system database with the system administration Peripheral Configuration screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information. These operating parameters must match the setup parameters defined in the manufacturer's instructions supplied with the modem.

Connect the modem to the switched public network through a business line, to the local central office (CO). Terminate the CO line on an RJ-11 or RJ-45 modular jack near the modem. Cisco does not recommend routing the modem through a PBX circuit.

Installation Planning for Peripheral Equipment

Use the guidelines in this section to plan for peripheral equipment.

Space Allocation

Cisco recommends locating the system console close to the system so that the operator can see the front of the VCO/4K cabinet. This arrangement makes it easier for the operator to check the status of front panel indicators while performing maintenance and diagnostic operations.

Provide sufficient floor space for the host computer and its associated peripherals if the host is located with the VCO/4K system.

When determining the location of the system printer, ensure that the printout does not obstruct air flow into or out of the VCO/4K system enclosure.

General-Purpose AC Service Circuits

Whether your VCO/4K is an AC or a DC system, provide AC receptacles for the system console, system printer, and modems when they are located in the same room as the VCO/4K. One single-phase, 115 VAC, 60 Hz, 20A circuit with multiple receptacles is sufficient. Locate this circuit close to the console, printer, optional modems, and automatic transfer switches. To minimize problems associated with line surges and sags caused by heavy equipment, motors, and so forth, use a dedicated circuit for this AC service.

Note Many VDTs, printers, and modems can be set for 220 VAC operation, as required, to meet site limitations. Be sure that peripheral devices are selected for, and set to operate with, the voltage supplied to the receptacles.

Uninterruptible Power Supply for Console, Printer, and Modem

Uninterruptible power supplies (UPS) are available from OEM suppliers. A UPS ensures the operation of the console, printer, and the remote maintenance modem during a power outage.

Recommendations for Peripheral Cabling

The Electric Industries Association (EIA) recommends a maximum distance of 50 feet (15 m) for cable length. Cable lengths in excess of 50 feet are susceptible to noise induced by ground loops and stray electromagnetic radiation. Observe the following recommendations for peripheral cabling:

- Use shielded EIA/TIA-232 cable and shielded parallel cable.
- Use cable with the minimum number of pairs required.
- Use protective line drivers in areas susceptible to high induced voltages.
- Connect only one end of the shield to frame ground.
- Connect only one end of unused wires to frame ground.
- Ground the frame of each unit locally, not to each other.

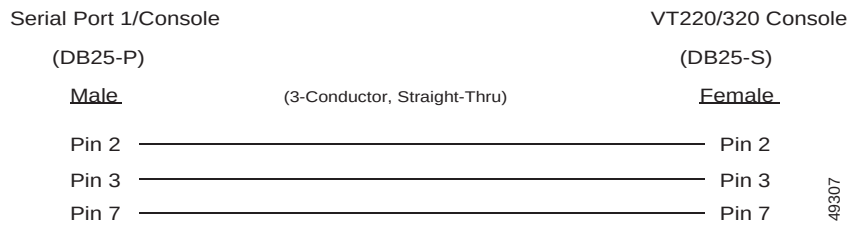
- Install short-haul modems in high noise environments or where cable runs become excessive.

Cisco provides the cables referred to in this section. Refer to the *Cisco VCO/4K Hardware Planning Guide* for ordering information.

Nonredundant Cabling

Figure 3-1, Figure 3-2, and Table 3-1 show the types of cables used to connect peripheral equipment when you operate a nonredundant VCO/4K. Figure 3-1 shows the EIA/TIA-232 cable diagram for a system console.

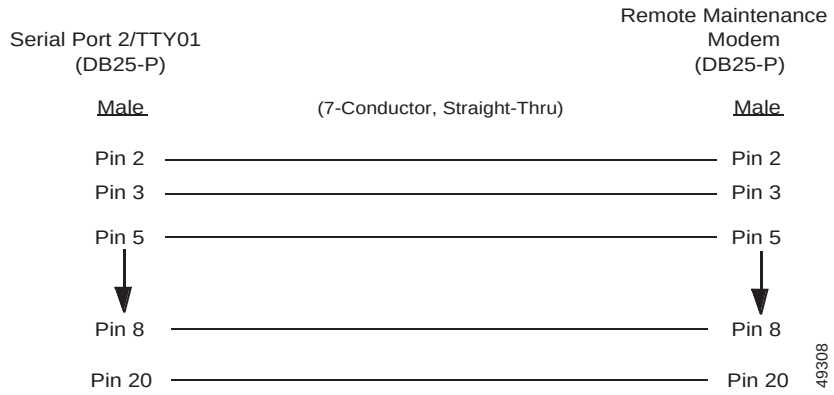
Figure 3-1 System Console EIA/TIA-232 Cable Diagram



Use a 25-conductor, straight-through cable to connect a system console to the Storage/Control I/O Module. However, use only the conductors shown in Figure 3-1.

Figure 3-2 shows the EIA/TIA-232 cable diagram for a remote maintenance modem.

Figure 3-2 Remote Maintenance Modem EIA/TIA-232 Cable Diagram



Use a 25-conductor, straight-through cable to connect a remote maintenance modem to the Storage/Control I/O Module. However, use only the conductors shown in Figure 3-2.

Cabling for a System Printer

Use a Centronics 36-conductor, straight-through parallel cable with male-to-male connectors to connect a printer to the Storage/Control I/O Module.

Table 3-1 summarizes the types of cables to use with nonredundant systems.

Table 3-1 Nonredundant Cabling for Peripheral Equipment

Peripheral Equipment	Straight-Through Cable	Comments
System console	3-conductor, or 25-conductor serial cable	Only pins 2, 3, 7 are used
Modem	7-conductor, or 25-conductor serial cable	Only pins 2, 3, 5–8, 20 are used
Printer	36-conductor parallel cable	Standard Centronics-type cable

Routing Peripheral Equipment Through Transfer Switches

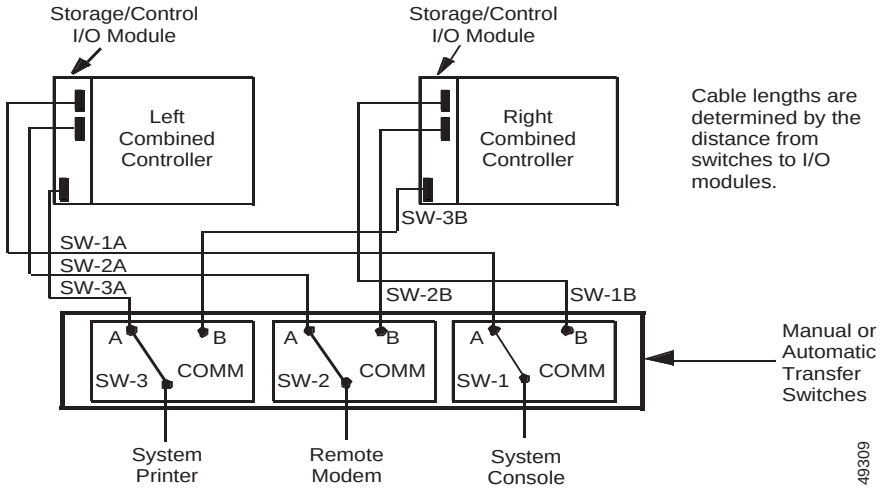
Using a transfer switch to route one set of peripheral equipment to two Storage/Control I/O Modules has the following advantages:

- Eliminates the need to manually switch cables from one Storage/Control I/O Module to the other.
- Spares the expense of purchasing a second set of peripheral equipment.

You can route a system console, printer, and remote maintenance modem through manual or automatic transfer switches to primary and redundant combined controllers. Refer to Figure 3-3.

In addition to transfer switches, the installer requires six cables (see Table 3-2) to connect the six outputs from the transfer switches directly to redundant combined controllers in the VCO/4K system. The distance from the transfer switches to the control subrack determines the length of the six cables.

Figure 3-3 EIA/TIA-232 Transfer Switches



Note A Centronics to DB-25 cable is available from Cisco to connect the parallel printer interface on the Storage/Control I/O Module to a DB-25 connection, such as the DB-25 ports on both manual and automatic transfer switches. Refer to the *Cisco VCO/4K Hardware Planning Guide* for more information. Do not use this cable to connect a serial printer to the system.

Redundant Cabling

Route the system console, printer, and remote maintenance modems through A/B transfer switches for convenient connection to the Storage/Control I/O Module in redundant configurations. Table 3-2 lists the types of cables to use with the A/B transfer switches.

Table 3-2 Redundant Cabling with A/B Transfer Switches

Peripheral Equipment	From VCO/4K to A/B Transfer Switch, Use . . .	From A/B Transfer Switch to Peripheral, Use . . .
System console	DB-25 male-to-male connectors; 25-conductor straight-through serial cable	DB-25 male-to-female connectors; 3-conductor or 25-conductor straight-through serial cable (See Figure 3-1)
Modem	DB-25 male-to-male connectors; 25-conductor straight-through serial cable	DB-25 male-to-male connectors; 9-conductor straight-through serial cable
Printer	36-Pin Centronics male-to-DB-25 male connectors	DB-25 male-to-36-Pin Centronics male connectors
Remote equipment	DB-9 female-to-male connectors; 2-conductor straight-through serial cable	DB-25 male-to-36-Pin Centronics male connectors

Manual Transfer Switch

A manual, two-way, serial port transfer switch allows one EIA/TIA-232 input to be switched to either of two EIA outputs. For VCO/4K applications, three A/B transfer switches, capable of switching all 25 EIA/TIA-232 pins, are required between the peripheral equipment (system console, system printer, and remote maintenance modem) and the redundant combined controllers. You can purchase the transfer switches from several supply houses.

Automatic Transfer Switch

Note Cisco offers an external A/B switch and A/B switch drive cable for this application. Cisco provides all the cables referred to in this section except the cable for the remote switch A/B. Refer to the *Cisco VCO/4K Hardware Planning Guide* for ordering information.

The automatic external A/B switch unit switches pins 2 through 25 between port A and port B on signal from the Alarm Arbiter Card. One A/B switch unit is required for each peripheral device to be switched. The system console, printer, or remote maintenance modem is cabled to the common port of the switch unit. Port A is cabled to the appropriate serial port on the Storage/Control I/O Module for the left combined controller; port B is cabled to the appropriate serial port on the Storage/Control I/O Module for the right combined controller. (See Figure 3-3.)

Refer to the *Cisco VCO/4K Hardware Installation Guide* for details on connecting the automatic external A/B switch unit to the VCO/4K.

CHAPTER 4

Host Communication Cabling

This chapter describes how to cable Ethernet communication links between a host computer and a VCO/4K system.

VCO/4K systems provide Ethernet socket connections to use as host links. You must provide cables, transceivers, and other link components to implement Ethernet links. The optional Ethernet Communications Package is available from Cisco Systems. The *Cisco VCO/4K Ethernet Guide* explains Ethernet implementation strategies.

General Wiring Practices

The following general practices apply to host communication link cables:

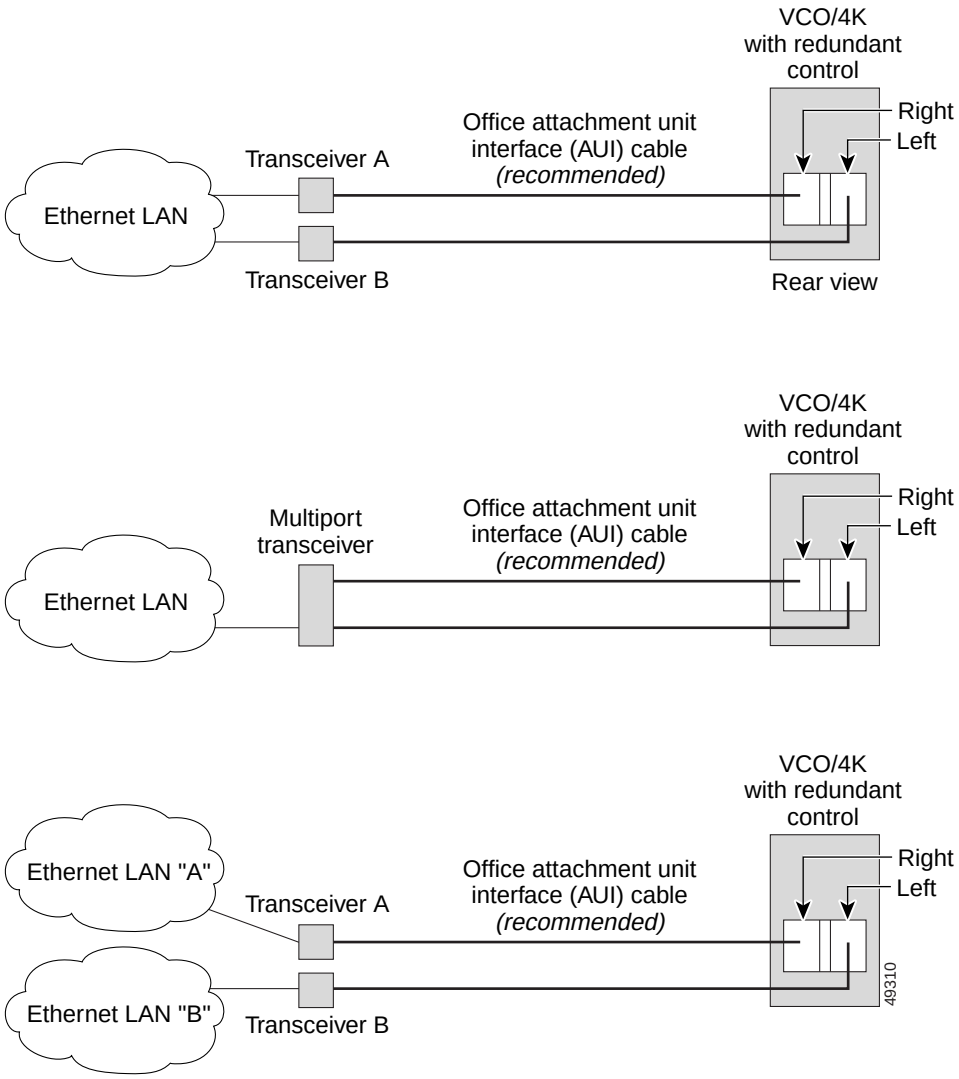
- Prepare a cabling diagram for the host computer-to-VCO/4K communication configuration. This diagram determines the number and length of cables required for the installation.
- Use shielded cabling and connectors for all cabling between the host computer and the VCO/4K.
- Route cables away from EMI and RFI sources and secure the cables to prevent damage caused by passersby or other equipment.
- Connections on the VCO/4K end of the cable require DB-15 male connectors for Ethernet links. Connector requirements on the opposite end are dictated by the I/O connections on the host and the network on which it operates.

Figure 4-1 shows two Storage/Control I/O Modules on the back of a redundant VCO/4K system. If your host requires an Ethernet communication link, connect it to the Ethernet port on the Storage/Control I/O Module.

Figure 4-1 Storage/Control I/O Modules

Figure 4-2 shows some possible Ethernet cabling configurations for communication links using the recommended cables and transceivers.

Figure 4-2 General Ethernet Host Communication Link Cabling Diagrams



Wiring Practices for Serial Connections

Table 4-1 shows the pinouts of each serial EIA/TIA-232 DB-25 connector on the Storage/Control I/O Module.

Table 4-1 EIA/TIA-232 DB-25 Serial Connector Pinouts

Pin	Signal	Description
2	TxD	Transmit Data
3	RxD	Receive Data
4	RTS[1]	Not used
5	CTS[1]	Clear To Send

Table 4-1 EIA/TIA-232 DB-25 Serial Connector Pinouts (continued)

Pin	Signal	Description
6	DSR[1]	Data Set Ready
7	SGR	Signal Ground
8	DCD[1]	Data Carrier Detect
15	TxC[2]	Transmit Clock
17	RxC[2]	Receive Clock
20	DTR[1]	Data Terminal Ready
24	TxC[2]	Transmit Clock

1. Modem support only.
2. Supported on serial port 4 only.

Jumpers on the Storage/Control I/O Module allow you to configure these ports as modem (DCE) terminations for connection to a terminal, or as DTE terminations for connection to a modem.

The factory settings for the Storage/Control I/O Module support the following configurations:

- Straight-through cables connecting the VCO/4K to a modem (DTE to DCE)
- Crossover (null modem) cables connecting the VCO/4K to a terminal (DTE to DTE)

If other cable types or terminations are required, modify the jumper settings on the Storage/Control I/O Module. Refer to the *Cisco VCO/4K Card Technical Descriptions* for more information on jumper settings.

Figure 4-3 shows straight-through cables.

Figure 4-3 Straight-Through Cable Wiring Diagram

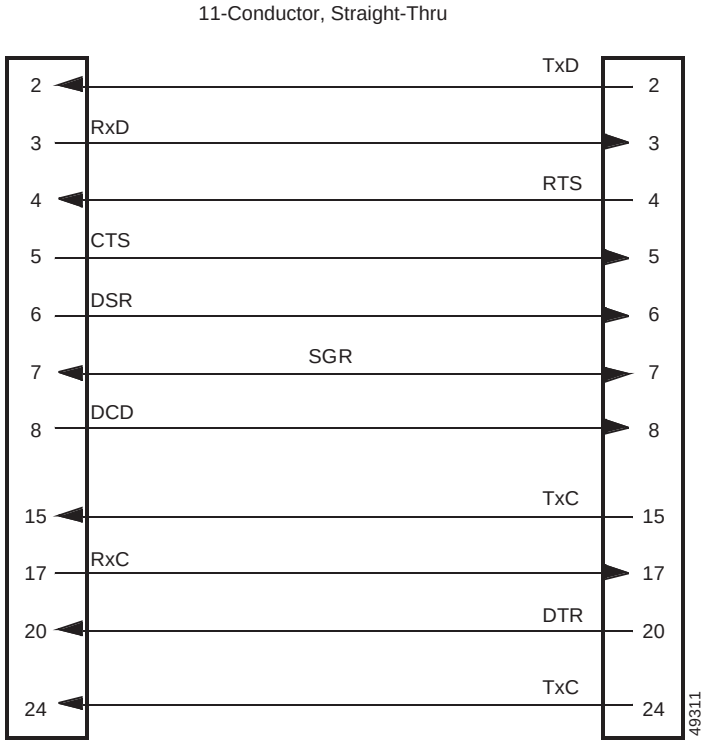
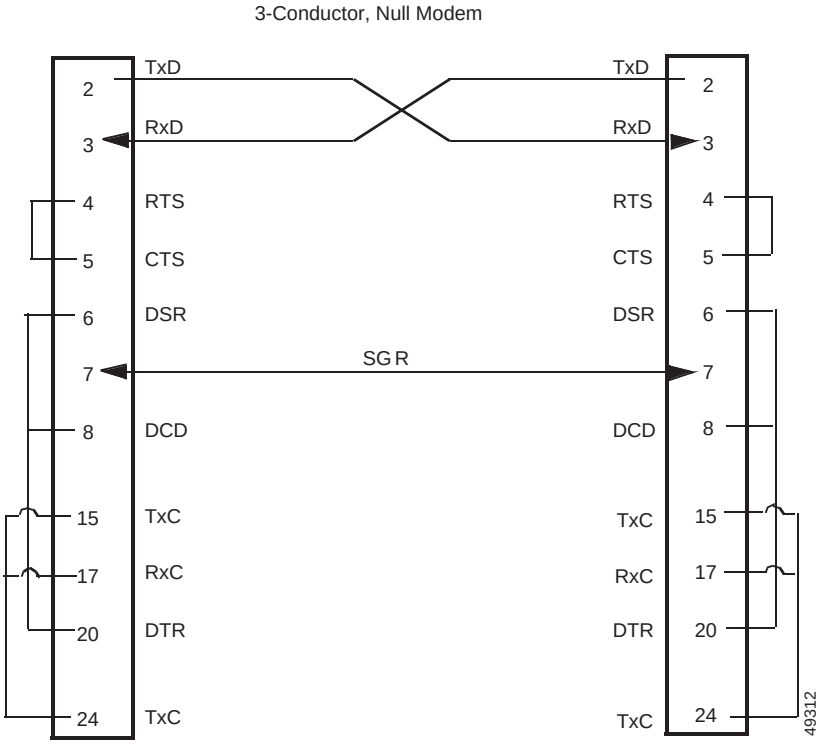


Figure 4-4 shows crossover (null modem) cables.

Figure 4-4 Crossover (Null Modem) Cable Wiring Diagram



Wiring Practices for Ethernet Links

Table 4-2 shows the pinouts of the DB-15 Ethernet interface connector on the Storage/Control I/O Module.

Table 4-2 EIA/TIA-232 DB-15 Serial Connector Pinouts

Pin	Signal	Description
2	C+	Collision + (Input)
3	T+	Transmit + (Output)
5	R+	Receive + (Input)
6	GND	Ground
9	C–	Collision – (Input)
10	T–	Transmit – (Output)
12	R–	Receive – (Input)
13	+12VF	+12 VDC Power

Cisco recommends that you use an office Attachment Unit Interface (AUI) cable between the Storage/Control I/O Module and a transceiver. You can order this cable from Cisco. The requirements of the physical Ethernet network determine the choice of transceiver type. For additional information on Ethernet networks, refer to the *Cisco VCO/4K Ethernet Guide*.

APPENDIX A

System Component Weights

Use this appendix to determine the weight of your system if your floor loading requirements are critical. Table A-1 provides maximum system weights for estimating floor loading requirements.

Table A-1 Maximum System Weights

Configuration	Weight	Floor Loading	Area
Nonredundant	85–100 lb. (38.25–45 kg)	34.69–40.82 lb/ft^2 (173.86–204.55 kg/m^2)	2.45 ft^2 (.22 m^2)
Redundant	100–157 lb. (45–70.65 kg)	40.82–64.08 lb/ft^2 (204.55–321.14 kg/m^2)	2.45 ft^2 (.22 m^2)

Table A-2 lists weights of various VCO/4K components. This table does not include the following OEM-supplied equipment:

- Video display terminals (VDTs)
- Printers
- Modems
- DC power supplies
- EIA/TIA-232 and parallel cables
- Printer/terminal stands
- Transfer switches

Refer to the specifications supplied with this equipment for their weights and dimensions.

Table A-2 Components and Cards

Component	Weight in Pounds	Weight in Kilograms
System enclosure	26.69	12.01
Front door	10.06	4.53
Fan unit	6	2.70
AC power supply module	15.72	7.07
DC power supply module	18.34	8.25
Card Type		
AAC	1.20	0.57
CPA/DRC24	1.80	0.82
Combined Controller without CPU	3.84	1.73
CPU	1	0.45
Storage/Control I/O Module	2.31	1.04
D&I	1.91	0.86
ICC	2.07	0.95
16-Span I/O Module for ICC	1.12	0.51
IPRC	2.21	1.00