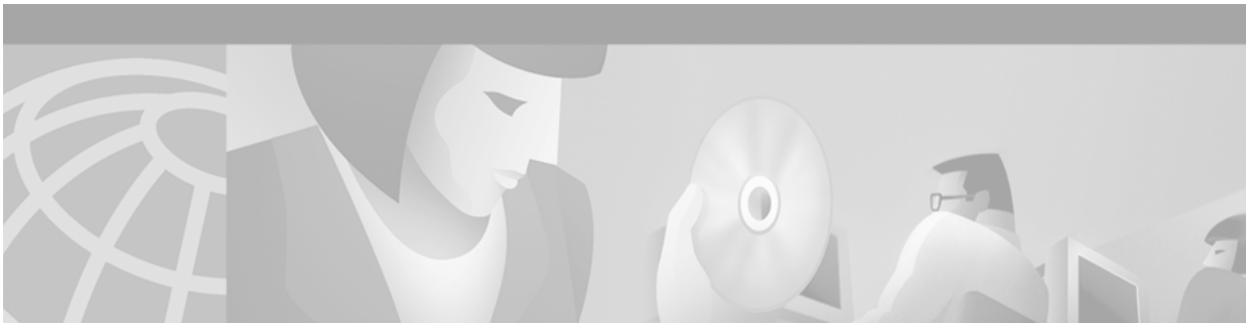


Preface

Objective

The *Cisco VCO/4K Troubleshooting Guide* provides information that will enable you to properly diagnose and resolve many of the problems that you may encounter with the VCO/4K system. Problems that cannot be resolved with the information in this guide must be elevated to a Cisco TAC (Cisco Technical Assistance Center). Procedures to ensure accuracy and timeliness of your input are also contained in this guide.

The guide provides users and technicians with information on performing corrective maintenance routines for peripheral equipment, power subsystem, interface circuits, service and control circuits, and host communication links. It also serves as a reference guide on the diagnostic tools incorporated in the system.

This guide concentrates on fault isolation and refers to descriptions, procedures, and tools used to remedy a problem within a specific system component. It contains first-level troubleshooting information for the VCO/4K system and associated components. Procedures reference additional information contained in various other documents in the VCO/4K documentation set. Corrective maintenance procedures for individual VCO/4K system components may be called upon from more than one source within this guide (that is, a troubleshooting procedure may apply to several symptoms). These internal cross-references tie sections of this guide together.

Original equipment manufacturer (OEM) documents contain details on maintaining the peripheral equipment (console, printer, and modems) connected to a VCO/4K system. Specialized OEM telecommunications equipment (such as voice response units, voice store-forward subsystems, telsets, etc.) are also available with similar documentation. Refer to these OEM documents when performing preventive and corrective maintenance.

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 one or more of the related documents listed in the “Related Documentation” section on page xiii.

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

This document is organized as follows:

- Chapter 1, “How to Use This Guide,” explains how to use this guide as an aid in resolving system problems.
- Chapter 2, “Problem Scenarios,” lists by category (system, VCO, SS7, etc.) failure descriptions and corresponding resolutions.
- Chapter 3, “System Troubleshooting,” addresses fault isolation from a top-down approach starting with the larger environment in which the switch exists. The goal is to as quickly as possible isolate the problem to either the VCO/4K subsystem (switch) and/or the SS7 subsystem or to a problem external to the switch/SS7 subsystems.
- Chapter 4, “VCO Subsystem Troubleshooting,” addresses fault isolation within the VCO subsystem and associated software and peripheral equipment that exists to support the subsystem.
- Chapter 5, “SS7 Subsystem Troubleshooting,” addresses fault isolation within the SS7 subsystem and associated software.
- Chapter 6, “Host Communications Troubleshooting,” describes the host communications interface to the VCO/4K System from a troubleshooting perspective.
- Chapter 7, “Peripheral Equipment Troubleshooting,” addresses fault isolation for each peripheral that may be associated with a VCO/4K system.
- Appendix A, “Diagnostic Tools,” describes the diagnostics that Cisco Systems provides to facilitate troubleshooting the VCO/4K system.
- Appendix B, “Checklists,” contains detailed checklists that enable you to record the information a TAC engineer will need to resolve an issue that you could not resolve at your site.
- Appendix C, “System Reconfiguration Procedures,” contains procedures for reconfiguration of your system. These procedures are referenced as appropriate from elsewhere in the guide.
- Appendix D, “Expected Outputs,” contains examples of system outputs from a system known to be operating normally. These are an aid to be compared to suspected erroneous output.

Documentation Conventions

This document uses the following conventions:

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

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.**

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

Related Documentation

The following third-party documents are recommended by Cisco:

- 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

You should also have knowledge of PSTN communication protocols.

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

How to Use this Guide

This guide focuses on the resolution of commonly seen system problems and how to isolate these problems to a specific component replacement, parameter selection, a work around, or problem escalation.

This chapter describes how to approach problem isolation in conjunction with this guide. Different troubleshooting methods are appropriate in different circumstances within the context of a particular set of symptoms. These symptoms will, in general, determine the starting point for the isolation process.

Troubleshooting Overview

The knowledge gained by individuals familiar with troubleshooting the VCO/4K system and the tools provided with the system form the basis of this guide. This information is organized into chapters that address different aspects of this knowledge, different aspects of the system, and the troubleshooting capabilities built into the system.

There are fundamentally three avenues of approach in VCO/4K troubleshooting. This guide is the starting point for all three.

- Cisco customer support engineering experience. Chapter 2, “Problem Scenarios” presents a number of frequently encountered problem scenarios and corresponding resolution.
- System messages generated by the VCO subsystem and the SS7 subsystem. These messages are described in the *Cisco VCO/4K System Messages*.
- The third approach is through the hierarchy of the system starting at the highest level, the system level, and successively follows a path that is intended to isolate the cause of the problem. This process is described in:
  - Chapter 3, “System Troubleshooting”
  - Chapter 4, “VCO Subsystem Troubleshooting”
  - Chapter 5, “SS7 Subsystem Troubleshooting”
  - Chapter 6, “Host Communications Troubleshooting”
  - Chapter 7, “Peripheral Equipment Troubleshooting”

Some problems will remain unresolved despite the above efforts. Appendix B, “Checklists” provides a series of forms that will enable the Cisco Systems TAC to resolve the problem as quickly as possible.

Repair-by-replacement

The Cisco Systems repair-by-replacement policy provides maximum system availability with minimum downtime. The technician removes and replaces field-replaceable units (FRUs) to bring the system back to normal operation as quickly as possible, and then returns the original components to the factory for quick repair.

Spares Inventory

The Cisco *VCO/4K Hardware Planning Guide* lists the spare components that can be replaced in the field by trained technicians. It also lists the recommended spares for the VCO/4K system. Field-replaceable units (FRUs) not in the list can only be serviced or replaced by the factory or by Cisco Systems field engineers.

To maintain maximum system availability, Cisco Systems encourages the customer to purchase the recommended spares.

Obtain spare parts and maintenance kits for peripheral equipment from OEM suppliers.

Peripheral and host link cables are available from Cisco Systems and computer supply sources.

Troubleshooting Procedures

No troubleshooting procedure or set of procedures can be followed by rote. When you try to resolve a problem, you must always be aware of information that may be particular to a system and you must constantly be open to information that may not be explicitly identified or expected.

Despite the need for openness when you are troubleshooting, you must also adhere to a given process. Skipped steps, seemingly logical assumptions, and shortcuts leading to unproven data can easily invalidate the entire process.

Where to Begin

Always begin by checking basic requirements for a system and ensure that such obvious problems as a lack of power or disconnected cables are not the cause.

There are two classes of problems:

- Problems that can be reproduced. A problem that can be reproduced at will makes troubleshooting much easier and the fix can be easily verified.
- Problems that cannot be reproduced. Unfortunately problems are often not easily reproducible. This is generally due do to an intermittently failing component, a poor connection, a timing or protocol mismatch, or a software coding problem. Careful record keeping can help with these kinds of problems.

You have two choices when you are faced with a system that is not functioning properly. The approach you take depends on the symptoms.

- With systemic problems, you can’t immediately identify where the failure is. All you know is that some function that was once working is no longer working. Generally this suggests a top-down approach. Starting at the highest level, attempt to isolate the problem to as small a component of the system (hardware or software) that you can. Chapter 3, “System Troubleshooting”addresses this approach.

- An identifiable symptom such as a screen or log file message typically leads you to a procedure (or set of procedures) that you can follow to isolate the problem. This is a bottom-up approach and is typified in Chapter 2, “Problem Scenarios”.

System Administrative Details

Keep a complete and accurate record of your system’s configuration. You would typically do this when the system is installed, but you can do it later. It is very important that changes to the system (and when these changes were implemented) be recorded. Often the introduction of a new feature or hardware precedes the emergence of a problem.

Note When you are working with a Cisco Systems TAC Customer Support Engineer (CSE), always have this administrative information available or be prepared to log in to the system to obtain the information.

Third-Party Support

If you have a contract for third-party support, contact them. They will be operating with this same guide as a reference and any work you may already have done should be passed on to them.

What Cisco Will Do

Some problems cannot be isolated or resolved by using this guide and need to be escalated to a Cisco Systems TAC who will apply more exhaustive tests and procedures. You must be aware, however, that TAC involvement also places requirements on you. A TAC representative operates at a disadvantage without accurate and solid information about your problem (see the “System Administrative Details” section on page 1-3). Appendix B contains several forms for you to provide the needed accurate and complete data.

CHAPTER 2

Problem Scenarios

This chapter describes some typical VCO/4K system problems.

Cisco Connection Online

Scenarios in this chapter may be referenced to a Cisco DDTS issue. These issues can be viewed via the Cisco Connection Online (CCO). Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

You can access CCO in the following ways:

- WWW: http://www.cisco.com
- WWW: http://www-europe.cisco.com
- WWW: http://www-china.cisco.com
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Problems with the VCO Subsystem

API

Reporting to Host

$EA

Generic will report to the Host a flipped Call Reference Flag bit in the Call Reference Number byte of the $EA report.

For details, see DDTS issue CSCdp41872 on CCO.

If the VCO receives an ISDN RELEASE COMPLETE message with Call Reference Number from the network, then the Generic will report to the Host a dummy Call Reference Number byte of “FF FE” in the $EA report.

For details, see DDTS issue CSCdp41872 on CCO.

Receiving Commands from Host

$49

The Generic will reject a $49 command if the $49 command is used to connect two clear-channel ports that are in “CP_SETUP” state. A network status byte (NSB) error code of $20 will be returned. The associated port will have a DTMF receiver attached.

For details, see DDTS issue CSCdp72822 on CCO.

Boot

Failure to Complete Boot Cycle

“WARNING: unreliable read/write to NVRAM” message upon boot up

The VCO CPU will not finish its boot-up cycle. This indicates that the NVRAM battery on the CPU is defective or has been drained.

Replace the CPU.

Multiple Re-boots/Continual Re-boots

VCO Reboots Periodically Throughout a 24-hour Period

This usually means that a circuit card (typically other than the AAC) is failing in such a way that it functions for awhile, then fails and causes the system to switch sides and reboot. Isolate the faulty circuit card as follows:

Step 1 Unseat all circuit cards, except the NBC3 in slot 1, the A-side Combined Controller (with CPU) in slots 3 and 4, and the AAC card.

Step 2 Hard-select the A-side by moving the selector switch on the AAC card to A.

Step 3 Reset the A-side by pressing the A-reset button on the AAC card, then isolate for possible faults in A-side control hardware.

- **a.** If the system boots properly, go to Step 4. Otherwise, go to b.
- **b.** If the system does not boot properly, then replace the NBC3 card. If the system still does not boot properly, then replace the A-side Combined Controller and keep the existing NBC3 and CPU. If the system still does not boot properly, then replace the A-side CPU and keep the existing NBC3 and Combined Controller. The system should boot properly in one of these scenarios, which will then isolate the cause of the periodic rebooting to one of the three faulty A-side control circuit cards.

Step 4 Isolate for possible faults in B-side control hardware by selecting the B-side on the AAC card:

- **a.** Insert the B-side NBC3 and Combined Controller (with CPU).

b. Reset the B-side by pressing the B-reset button on the AAC card.

c. If the system boots properly, then go to Step 5, otherwise go to d.

d. If the system does not boot properly, then replace the NBC3 card. If the system still does not boot properly, then replace the B-side Combined Controller and keep the existing NBC3 and CPU. If the system still does not boot properly, then replace the B-side CPU and keep the existing NBC3 and Combined Controller. The system should boot properly in one of these scenarios, which will then isolate the cause of the periodic rebooting to one of the three faulty B-side control circuit cards.

Step 5 Insert each card, present in slots 7 to 21, into the system, one at a time.

a. Insert one card and ensure that it properly downloads. If it does not properly download and come back into service, then permanently remove it (this could be the culprit card). Proceed to the next circuit card.

Note If a card properly downloads and comes back into service, then wait two minutes after it comes back active before proceeding to insert the next card.

b. Repeat the process until the card that you insert causes the system to reboot. This will isolate the cause of the periodic rebooting to one of service circuit or network circuit cards.

Step 6 To restore the system redundant operation, hard-select the AAC card to AUTO by moving the selector switch on the AAC card to AUTO.

Installation Diskette

Booting off the Generic Diskette #1, or Optional Diskette, and the Boot does Not Complete

The boot cycle stops at "`Reading boot file from disk device A:/boot/boot.sds`" as follows:

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved
MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz
FPC  passed test
MMU  passed test
COLD Start
Onboard  RAM start = $00000000,  stop = $00FFFFFF
147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C

SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
```

This means that no diskette volume label was entered on the diskette. Do the following:

Step 1 Enter the volume label INSTALL on this diskette from a PC.

Step 2 Reinsert the diskette into the system and press the reset button on the AAC card.

The boot cycle may stop at "`Please insert disk volume INSTALL... Press ENTER key when ready...`": as follows:

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test

COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot
147-Bug>G FFA0002C
Effective address: FFA0002C

SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
Please insert disk volume INSTALL...

Press ENTER key when ready...
```

This means either of the following two possibilities:

- The label in Generic diskette #1 does not contain a volume label that is exactly INSTALL. This also applies to the optional diskette, e.g., ETHERNET (for V5.1(2) or lower) or OPTIONAL SOFTWARE. If this is the case, then do the following:

Step 1 Enter the volume label INSTALL on this diskette.

Step 2 Reinsert the diskette into the system and press the Return key and the boot cycle will continue as follows:

```
Loading file A:/boot/install.exe
Hard disk mounted successfully
Hard disk dismounted successfully

           I N S T A L L A T I O N   U T I L I T I E S


      1) Install/Configure Basic System Software
      2) Incremental Install of Basic System Software
      3) Disk Utilities
      4) Install Another Software Option
      5) Database Conversion
      6) License Configuration
      7) Set Extended Operational Mode
      8) Enable C-Bus Mode
      X) Terminate Installation


      Enter Selection:
```

Note Line "(1) Install/Configure Basic System Software" will vary according to the type of installation diskette installed. The system can also be booted from the ETHERNET diskette, the TELEROUTER diskette, or one of the ISDN diskettes (for V5.1(2) or lower) or the OPTIONAL SOFTWARE diskette.

Line "(4) Install Another Software Option" appears as "Install Optional Software Package" for Generic V5.1(3) and higher.

- The diskette you inserted in the system is one of the following:

  Generic diskette 2

  Generic diskette 3

  Generic diskette 4

  Generic diskette 5

  Generic diskette 6

These diskettes cannot be used to boot the system. Insert Generic diskette #1 into the system and press the Return key and the boot cycle will continue:

```
Loading file A:/boot/install.exe
Hard disk mounted successfully
Hard disk dismounted successfully


            I N S T A L L A T I O N   U T I L I T I E S


        1) Install/Configure Basic System Software
        2) Incremental Install of Basic System Software
        3) Disk Utilities
        4) Install Another Software Option
        5) Database Conversion
        6) License Configuration
        7) Set Extended Operational Mode
        8) Enable C-Bus Mode
        X) Terminate Installation


        Enter Selection:
```

Loading a Generic Diskette Other than Diskette #1

If you attempt to boot the system from a diskette other than diskette #1, you will receive an error of "check_vol: error 0x769 Check Floppy Disk" or an error of "Wrong Volume in Floppy." You might also encounter errors due to missing volume labels or inaccurate volume labels.

- The output could look something like this:

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test

COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C

SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
Loading file A:/boot/install.exe
Hard disk mounted successfully
Hard disk dismounted successfully

I N S T A L L A T I O N  U T I L I T I E S


       1) Install/Configure Basic System Software
       2) Incremental Install of Basic System Software
       3) Disk Utilities
       4) Install Another Software Option
       5) Database Conversion
       6) License Configuration
       7) Set Extended Operational Mode
       8) Enable C-Bus Mode
       X) Terminate Installation


       Enter Selection: 1

Device C: Will Be Reformatted. All Information Will Be Erased.
Do You Wish To Back-Up The System Data Base (Y/N) =N?n

This Installation Process Reformats The Device C:
All Information Will Be Erased
Press Return to Continue

Formatting Device C:
Format of Device C: complete
Creating Directory Structure on Device C:
Directory Structure on Device C: Complete
Creating System Configuration File ..... Done
Copying A:/BOOT/SOFTWARE.CFG ...
1 file[s] copied


Insert disk 2 of Installation Set
Press return to continue

Copying Files
Copying A:/* ...
```

```
0 file[s] copied
Copying A:/BOOT/* ...
3 file[s] copied
Copying A:/DBASE/* ...
19 file[s] copied
Copying A:/LOG/* ...
0 file[s] copied
Copying A:/TRACE/* ...
0 file[s] copied


Insert disk 3 of Installation Set
Press return to continue

Copying Files
Copying A:/* ...
0 file[s] copied
Copying A:/BOOT/* ...
6 file[s] copied


Insert disk 4 of Installation Set
Press return to continue

Copying Files
Copying A:/* ...
0 file[s] copied
Copying A:/BOOT/* ...
3 file[s] copied


Insert disk 5 of Installation Set
Press return to continue

check_vol: error 0x769
Check Floppy Disk
```

This means that no diskette volume label was entered onto diskette #5. Do the following:

Step 1 Enter the volume label SUMMA4D on this diskette using a PC.

Step 2 Re insert the diskette into the system and press Return for the installation to resume.

- If a volume label was entered but is not correct, you might see the following output:

  ```
  Wrong Volume in Floppy
  ```

  Make sure the volume label is correct. Insert the correct diskette into the system and/or correct the volume label and reinsert the diskette and press Return for the installation to resume. See Table 2-1 for correct volume labels.

Table 2-1 Diskette Labels

Diskette	Label	Version
Generic diskette #1	INSTALL	
Generic diskette #2	SUMMA4	
Generic diskette #3	SUMMA4B	

Table 2-1 Diskette Labels (continued)

Diskette	Label	Version
Generic diskette #4	SUMMA4C	
Generic diskette #5	SUMMA4D	
Generic diskette #6	SUMMA4E	
EHTERNET	INSTALL	V5.1(2) or lower
TELEROUTER	INSTALL	V5.1(2) or lower
Any ISDN diskette	INSTALL	V5.1(2) or lower
OPTIONAL SOFTWARE diskette #1	INSTALL	V5.1(3) or higher

Booting off Generic Diskette #1, or Optional Diskette, and an Error Occurs

The output will likely be an error "`NonBootable Floppy Exists in A: Drive Replace it to Boot from A:`".

The following message sequence means that Generic diskette #1, or an Optional diskette, does not have the "/boot" directory on the diskette (but does have the correct volume label):

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test

COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C


SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
NonBootable Floppy Exists in A: Drive Replace it to Boot from A:
Trying C drive
Reading boot file from disk device C:/boot/boot.sds
Loading file C:/boot/globals.exe
Loading file C:/boot/syswd.exe
Loading file C:/boot/hostmgr.exe
Loading file C:/boot/redmgr.exe
Loading file C:/boot/netmgr.exe
Loading file C:/boot/permgr.exe
Loading file C:/boot/snmp.exe
SW version loaded - Ver.Rev FSR : 5.1 002
Hard disk mounted successfully
Hard disk dismounted successfully

Loading File < syscnfg.TBL > ...
Loading File < card.TBL > ...
Loading File < port.TBL > ...
Loading File < hostcnfg.TBL > ...
Loading File < resgroup.TBL > ...
Loading File < supvtmpl.TBL > ...
Loading File < iprule.TBL > ...
Loading File < oprule.TBL > ...
Loading File < isdnsupv.TBL > ...
Loading File < isdnmsg.TBL > ...
Loading File < routesum.TBL > ...
Loading File < routetbl.TBL > ...
Loading File < exroute.TBL > ...
Loading File < nfascnfg.TBL > ...
Loading File < promptlb.TBL > ...
Loading File < subrate.TBL > ...
Loading File < motomap.TBL > ...
Loading File < license.TBL > ...
```

The files on the given diskette in question are probably located in the root directory. No files for any installation diskette (volume label = INSTALL), including Generic diskettes 2 through 6, should be in the root directory. All files should be in the /boot directory except as noted in Table 2-2.

Table 2-2 Diskette Files

Diskette	Volume Label	/	/boot	/dbase	/log	/trace
Generic 1	INSTALL	none	all files for the diskette	*	*	*
Generic 2	SUMMA4	none	all files except .tbl files	.tbl	none	none
Generic 3	SUMMA4B	none	all files for the diskette	*	*	*
Generic 4	SUMMA4C	none	all files for the diskette	*	*	*
Generic 5	SUMMA4D	none	all files for the diskette	*	*	*
Generic 6	SUMMA4E	none	all files for the diskette	*	*	*
ETHERNET, TELEROUTER, ISDN	INSTALL	none	all files for the diskette	*	*	*
OPTIONAL SOFTWARE	INSTALL	none	all files for the diskette	*	*	*

* No such directory for this diskette.Resolution: Take the diskette in question to a PC. Create the required boot directory and move the files on the diskette into the boot directory.

Note If you received ftp-downloaded Generic software as a WinZip V7.0 self-extracting file, then use WinZip V7.0 to unzip the file. WinZip creates the required directory structure automatically. Customers using PKUnZip have reported that PKUnZip will not create the required directories. If you use PKUnZip, you will have to manually create the directories indicated in Table 2-1.

Ethernet LAN (TCP/IP)

No Connection

VCO-Host Socket Connection Lost

The following error message generally indicates that this problem has occurred:

```
HST013: Host < host-name > Socket Write Error $A23:Operation Would Block
```

The VCO has closed the VCO-Host socket connection because the VCO's TCP/IP transmit (tx) queue has completely filled up. There is no more free space in the VCO's TCP/IP transmit (tx) queue for the application residing on the VCO to write data to.

Here is an example VCO log file (A-MMMDD.LOG in C:/log/) foot print:

```
<snip>
  #DF Fri Jan 21, 2000 14:48:46 A-ACT
HST013: Host < HOST2 > Socket Write Error $A23:Operation Would Block
  #DF Fri Jan 21, 2000 14:48:46 A-ACT
HST002: Host < HOST2 > Has Failed Due To: Socket Write Error
  #DF Fri Jan 21, 2000 14:48:46 A-ACT
FRM504: Major Alarm Set For - ALM011: No Hosts Available (SA)
  #DF Fri Jan 21, 2000 14:49:38 A-ACT
HST012: Host < HOST1 > Login Attempt From-10.10.25.156 33322
  #DF Fri Jan 21, 2000 14:49:38 A-ACT
HST003: Host < HOST1 > Restored
  #DF Fri Jan 21, 2000 14:49:38 A-ACT
FRM511: Major Alarm Clear For - ALM011: No Hosts Available
<snip>
```

There are two causes of HST013.

Cause 1:

The Host's TCP/IP receive (rx) queue is filling up faster than the Host can empty it (read it). You can easily determine this by monitoring the VCO-Host socket connection with a LAN protocol analyzer (sniffer).

You will see in the protocol analyzer's trace that the Host is sending to the VCO a "window size = zero (0)" message. When the VCO reads this message, it then instructs itself to "store" the messages in its transmit (tx) buffer and not send them to the Host. If the application residing on the VCO is still continuing to write to its tx queue while the tx queue is in the "store" state, the tx queue will eventually completely fill up. When the tx queue completely fills up, the VCO closes the VCO-Host socket and issues "`HST013: Host < host-name > Socket Write Error $A23:Operation Would Block`" to the VCO log file.

Example LAN protocol analyzer trace:

```
Packet Number 3974
ETH: ====( 60 bytes transmitted on interface en3 )==== 12:15:30.991421683
ETH:    [ 00:06:29:ac:e0:96 -> 08:00:3e:2b:49:73 ]  type 800  (IP)
IP:     < SRC =    10.10.25.156 >
IP:     < DST =     10.10.25.19 >  (sfBA4K)
IP:     ip_v=4, ip_hl=20, ip_tos=0, ip_len=40, ip_id=41667, ip_off=0
IP:     ip_ttl=60, ip_sum=954a, ip_p = 6 (TCP)
TCP:    <source port=33502, destination port=2001(dc) >
TCP:    th_seq=de0adf53, th_ack=4fffce1e
TCP:    th_off=5, flags<ACK>
TCP:    th_win=0, th_sum=2e6, th_urp=0
```

In packet 3974 above, the Host, "10.10.25.156" (SRC = source), is sending to the VCO, "10.10.25.19" (DST = destination), a "window size = 0 bytes" message (th_win=0) implying that the Host is not reading the data out of its rx queue fast enough.

```
Packet Number 3981
ETH: ====( 64 bytes received on interface en3 )==== 12:15:31.863284297
ETH:    [ 08:00:3e:2b:49:73 -> 00:06:29:ac:e0:96 ]  type 800  (IP)
IP:     < SRC =     10.10.25.19 >  (sfBA4K)
IP:     < DST =    10.10.25.156 >
IP:     ip_v=4, ip_hl=20, ip_tos=0, ip_len=40, ip_id=1963, ip_off=0
IP:     ip_ttl=30, ip_sum=4e63, ip_p = 6 (TCP)
TCP:    <source port=2001(dc), destination port=33502 >
TCP:    th_seq=4fffce1e, th_ack=de0adf63
TCP:    th_off=5, flags<ACK>
TCP:    th_win=4096, th_sum=f2d5, th_urp=0
```

In packet 3981 above, just 4 packets later, the VCO, "10.10.25.19" (SRC = source), is sending to the Host, "10.10.25.156" (DST = destination), a "window size = 4096 bytes" message (th_win=4096) implying that the VCO's tx queue is not full.

Further Isolation and Possible Resolution

To improve operation:

- Ensure that the LAN network segment is not being disrupted by excessive amounts of other traffic which could keep the Host from accessing the VCO. Remove the other traffic.
- Increase the Host's rx queue size.
- Look at the task priorities that you run on your Host. Verify that there are no tasks, used to communicate with the VCO, that are running at a priority lower than other tasks that provide similar functionality. Your Host runs at "0% CPU idle", the effected task would not get enough CPU time and would start to fall behind (when your Host CPU runs at less than 0% idle, this task would get enough time to run and you would see no problem). To address this issue, try raising the priority of the task in question.

Cause 2:

The application residing on the VCO is filling up its tx queue faster than it can empty it (transmit it). You will see nothing abnormal in the LAN protocol analyzer trace, and the HST013 message will be generated in the log file.

The application residing on the VCO (generic) writes its output directly to the tx queue, which is the low-level network device driver that resides on the "vrtx ethernet controller" on the CPU, and, in this case, it is filling up its tx queue faster than it can send the data out to the Host. The "vrtx ethernet controller" will eventually close the socket and not report an error on the wire.

Further Isolation and Possible Resolution

The VCO is trying to send report messages to the host as fast as it can in response to the rate at which the host is sending command messages to the VCO.

To improve operation:

- Try reducing the rate at which the host sends call processing commands (e.g., $49 commands) to the VCO.
- If you are using the $83, $82, or $90 commands, see if you can reduce their frequency of use.

Note One $83, $82, or $90 command (each a "non-callprocessing" command) has the potential to generate up to 30 VCO acknowledgement reports.

- Evaluate the bit settings in each "non-callprocessing" command and determine (for example) if your host application actually needs to be informed of the status of every port in the system at this particular time.

File System

Disk Utility Commands

VCO allows you to move to the root directory a log file with today's date, but will not automatically create a new log file until midnight

The system allows you to move (using the Rename Files command) a log file that is "open" (i.e., named as today's date) to the root directory (C:/) or to another C-drive directory. But, the system will not automatically create a new today's log file in C:/log until midnight.

To restart today's log file without having to wait until midnight:

Step 1 After moving and renaming the log file, make a note of the time on the system and on your watch.

Step 2 Change the time on the system to 23:59:55, from the Clock/Calendar Configuration screen, and wait one minute. A new log file, "tomorrow's" log file, will be created in C:/log and "today's" log file will close.

Step 3 Change the time on the system back to the time you need. This will create a new "today's" log file in C:/log. Today's log file operation has now been restored.

Step 4 Delete "tomorrow's" log file from C:/log.

Missing Files

VCO will not create a new log file until midnight

See the "VCO allows you to move to the root directory a log file with today's date, but will not automatically create a new log file until midnight" section on page 2-13.

VCO Log File Messages—Special Considerations

Live Upgrade Log File Messages (C:/log/UGmmddyy.LOG)

"Event Handler failed. Returned LUPG_EVENT_ERROR"

For details, see issue CSCdp23217 on CCO.

Log File Messages (C:/log/x-mmmdd.LOG)

ALM096: Trace File Exceeded 1MB Size

Perform the following procedure to clear ALM096:

Step 1 Disable Host Message Trace and NBC Message Trace from the System Trace Configuration screen.

Step 2 Copy the file if you need it (we recommend using FTP).

Either delete the file, or move it (using the Rename Files command) to the root directory (C:/) or to another C-drive directory.

Step 3 Turn tracing on again (creating a new trace file) and let it run for 3 minutes; and then turn it off (you can do this during a slow traffic period).

Note The system writes 1000 time stamps to the new trace file and then it samples the size of the trace file. Three minutes (even during a slow traffic period) should be sufficient time to generate 1000-plus writes. When the Generic detects that 1000 writes have been made, it will then sample the trace file. When it samples the trace file, it will see approximately 40 kBytes (which is less than 1 MB) and clear ALM096.

Every 1000 writes generates approximately 40 kBytes of tracing.

Step 4 Verify that ALM096 clears in your Host, in the Log File, and in the System Alarms Display/Major screen.

Step 5 Delete this new trace file.

ALM097: Log File Exceeded 1MB Size

Perform the following procedure to clear ALM097:

Step 1 Identify and then eliminate the root cause of the streaming log file messages through troubleshooting.

Note Streaming log file messages are typically the result of a Service Circuit card or Network Interface card that is failing. In this case the corrective action would be to remove the defective card from the system.

Step 2 Copy the file if you need it (we recommend using FTP).

Step 3 After midnight, either delete the file, or, move it (using the Rename Files command) to the root directory (C:/) or to another C-drive directory.

Note The system does not permit you to delete a log file that is open (i.e., named as today's date). The message “Error during Disk Operation” is returned. The system does allow you to move (rename) a log file that is open but the system will still not create a new log file until midnight (see CSCdm85746 on CCO). See the “VCO allows you to move to the root directory a log file with today’s date, but will not automatically create a new log file until midnight” section on page 2-13.

The system will automatically clear ALM097 when the following conditions are met: The system needs to write 1000 date/time stamps to the subsequent log file(s) before it samples the size of the new open log file. Approximately 107 kBytes of logging (29 printed pages of log file messages) will generate 1000-plus writes. When the Generic detects that 1000 writes have been made, it will then sample the log file and see less than 1 MB and clear ALM097.

Note If the system then runs without error after the alarm incident, it will take the system approximately 50 days before generating 1000-plus log file writes (necessary to automatically clear ALM097).

You can also clear ALM097 within 2 hours.

You can clear ALM097 in approximately 1 hour and 15 minutes by running Test Port Card as specified below. This procedure will manually introduce log file messages. (we recommend performing this procedure during a slow traffic period.)

You can clear ALM097 in approximately 1 hour and 45 minutes by running Test Service Circuits as specified below. This procedure will manually introduce log file messages. (we recommend performing this procedure during a slow traffic period.)

The Test Port Card procedure setup:

```
T E S T    P O R T    C A R D
Port Card  R,L,S  1 1 15-1-2    Start Channel 1_  End Channel 24
MRC/DRC    R,L,S  1 1 11-1-3    Start Port 1_     End Port 32
Port Card Type    ____          Receiver Type     ____
(*)Print Error Messages Only (Y/N) N
(*)Continually Loop Through Test (Y/N) Y
```

Note The network span and the service circuit engine that you select for the Test Port Card procedure *must first* be placed in Diagnostic Mode using the Card Maintenance screen. Spans in the diagnostic state cannot be used for call processing.

Note also the settings indicated by (*).

The Test Test Service Circuits procedure setup:

```
S E R V I C E    C I R C U I T    T E S T    U T I L I T Y
Receiver R,L,S   1 1 11-1-3__      Card Type DTMF
Monitor R,L,S,P  _ _ ______ ___
Start Test at Port 1             End Test at Port 32
(*)Print Error Messages Only (Y/N) N
(*)Continually Loop Through Test (Y/N) Y
```

Note Port numbers start at 1. The start port *must* be specified. If the end port is not specified, or if the end port is less than or equal to the start port, only the start port will be tested. The service circuit engine that you select for the Service Circuit Test Utility procedure *must first* be placed in Diagnostic Mode from the Card Maintenance screen. Spans in the diagnostic state cannot be used for call processing.

Note also the settings indicated by (*).

Verify that ALM097 clears in your Host, in the Log File, and in the System Alarms Display/Major screen.

FRM340: CODE Error - ethernet_rx.c,393: SOCK == EOF

For details, see issue CSCdk80666 on CCO.

If you see "`FRM 340 CODE Error - ethernet_rx.c,393: SOCK == EOF`" in the log file, along with "`HST013: Host <host-link-name-Z> ... $A30:Addr already in use`", then the Ethernet socket connection between the Host and the VCO, called <host-link-name-Z>, has become permanently unusable.

The only way to make this socket reusable is to reboot that side of the VCO.

Note This problem is intermittent. Your system may never experience this problem.

The best defensive strategy is to define, in the VCO Host Configuration screen, all eight sockets. If you use only two socket connections between the host and a given side of the VCO, still define all eight sockets.

When a socket becomes permanently unusable, reassign the host connection to one of the other sockets currently not in use.

When all sockets become permanently unusable on one side of a VCO, that side of the VCO must be rebooted.

Problems with the SS7 Subsystem

Boot

Stack Start Error Messages

Scrolling "srv_connect" Message Upon SS7 Startup

Sometimes if the standby side of SS7 system is started without first starting SS7 on the active side, or if the standby side of SS7 is started first and then SS7 on the active side is started, EBS "tli" processes do not sync up. Redundancy does not work and following message is displayed.

```
"        srv_connect :: an event requires attention enabling connect timer
.......wait .."
```

Stopping and starting the SS7 on either side does not help.

The following procedure (run on both the A- and B-sides) will fix the problem and enable redundancy between SS7 sides:

Step 1 Enter the following on the A-side:

```
- ps -ef | grep tli
```

This returns information on the tli process.

Step 2 Enter the following on both sides:

```
- kill -9 <process id>
```

This kills the tli process.

Step 3 Enter the following on the A-side:

```
$EBSB/tli &
```

This restarts tli on the A-side.

Step 4 Repeat on the B-side.

ECPT Modules are Not Seen Being Loaded During Execution of the ebs_start or start-ss7.sh Script

See the "Reinstalling EBS Drivers" section on page C-15, Case 2.

Solaris sys-config returns error message if "none" is selected for "Name Service"

During the sys-config, when the Name Service screen is reached, there are four options to select from. If the customer is not using any Name Service, then the obvious selection is None. But when that is selected and F2 is pressed, the following message is displayed:

```
switch file: config-nsswitch error -4, errno 2, No such file
or directory.
```

Resolution:

When you run sys-config, the system expects a name service to be defined. When the Name Service screen option is set to NONE, the system still tries to look for a service type and becomes stuck in a loop. If the system is in this situation, do the following:

Step 1 The terminal you are using determines how you get to the system prompt.

- If you are using a UNIX/Solaris terminal, press the Stop key followed by the 'a' key.

  This places you at an OK prompt.

- If you are using a WYSE terminal / PC, press the Cntrl (control) key followed by the Pause/Break key.

  (Sometimes the Alt key followed by Pause/Break works.)

  This will place you at an OK prompt.

Step 2 From the OK prompt, type

```
boot -s.
```

This brings up the system in single-user mode.

Step 3 The system will prompt with a message:

```
Press Ctrl-D to continue with normal startup or a root password for maintenance.
```

Step 4 Enter the standard root password followed by the Return/Enter key

Step 5 Once logged in as root, change directory to /etc and create the file nsswitch.conf and nsswitch.files as dummy files.

Basically you are creating files that the system was missing.

Files could easily be created using the vi editor:

vi /etc/nsswitch.conf (this creates the file when exit from edit mode by option wq)

vi /etc/nsswitch.files (this creates the file when exit from edit mode by option wq)

Step 6 Verify if the files now exist under the directory /etc.

Step 7 Change directory to /usr/sbin.

Step 8 Run the command sys-unconfig to revert to an unconfigured system.

Step 9 Type reboot to bring the system back in configuration mode (sys-config).

Step 10 Continue with the regular sys-config procedure. This time when Name Service option is set to NONE, the system will allow you to configure the rest to the fields without any problem.

Installation/Upgrade

Stack Start Error Messages

ECPT Modules are Not Seen Being Loaded During EBS Software Install

See the “Reinstalling EBS Drivers” section on page C-15, Case 1.

Solaris sys-config returns error message if “none” is selected for “Name Service”

See the “Solaris sys-config returns error message if “none” is selected for “Name Service”” section on page 2-17.

Protocol Errors/Violations

ISUP

COT, Report Interpretation “Continuity Failures (COT)”

To resolve SS7 COT (Continuity Test) failures, do the following:

Step 1 Find out what flavor of SS7 the customer is running (ITU or ANSI) and the version.

Step 2 Determine which of the four types (Incoming on Present Circuit, Incoming on Previous Circuit, Outgoing on Present Circuit, or Outgoing on Previous Circuit) of COT Failure they are getting.

Step 3 Obtain a copy of the CKTINT Log with Debug Flags 2, 5, 9, 11, 12, 21, 22 and 28 enabled which shows the COT Failures and a copy of the VCO Host and NBC Trace (if possible).

Step 4 Using the model identified in Step 2, analyze the CKTINT log and the VCO Host/NBC Trace to determine cause of the COT Failures. Some things to look for include missing messages and rejected commands.

Figure 2-1 Incoming COT on Present Circuit (SUCCESS)

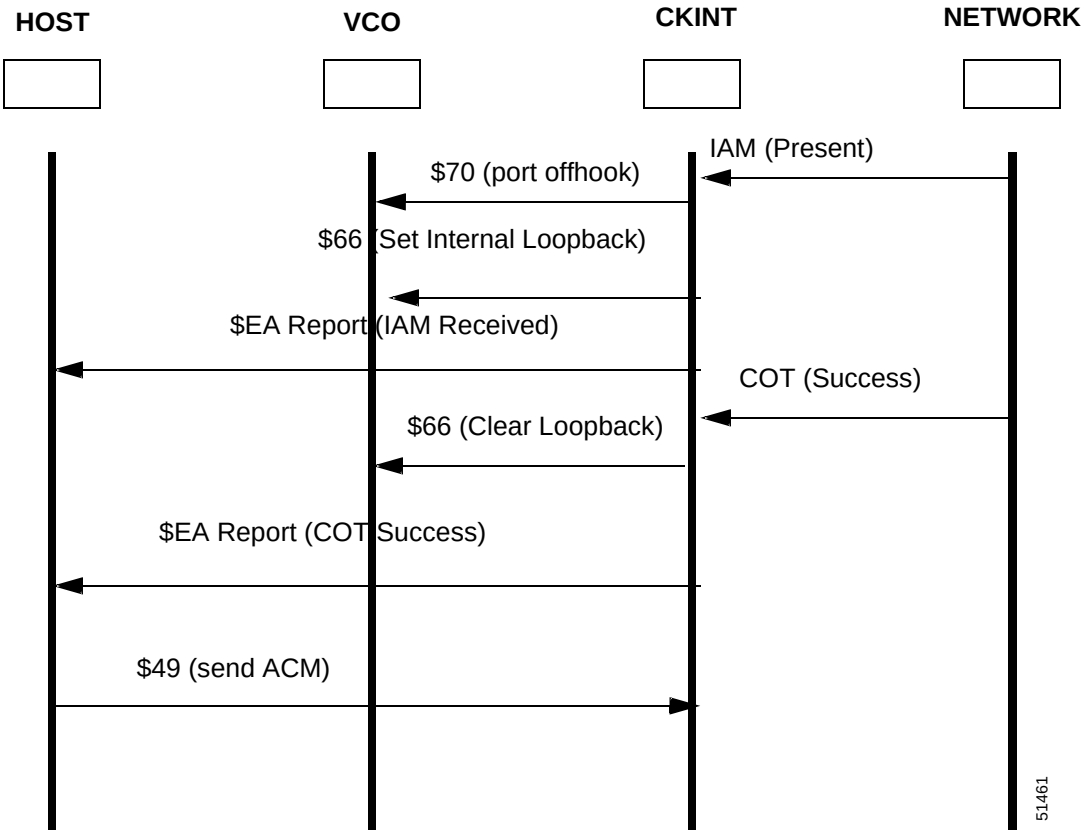


Figure 2-2 Incoming COT on Present Circuit (FAILURE)

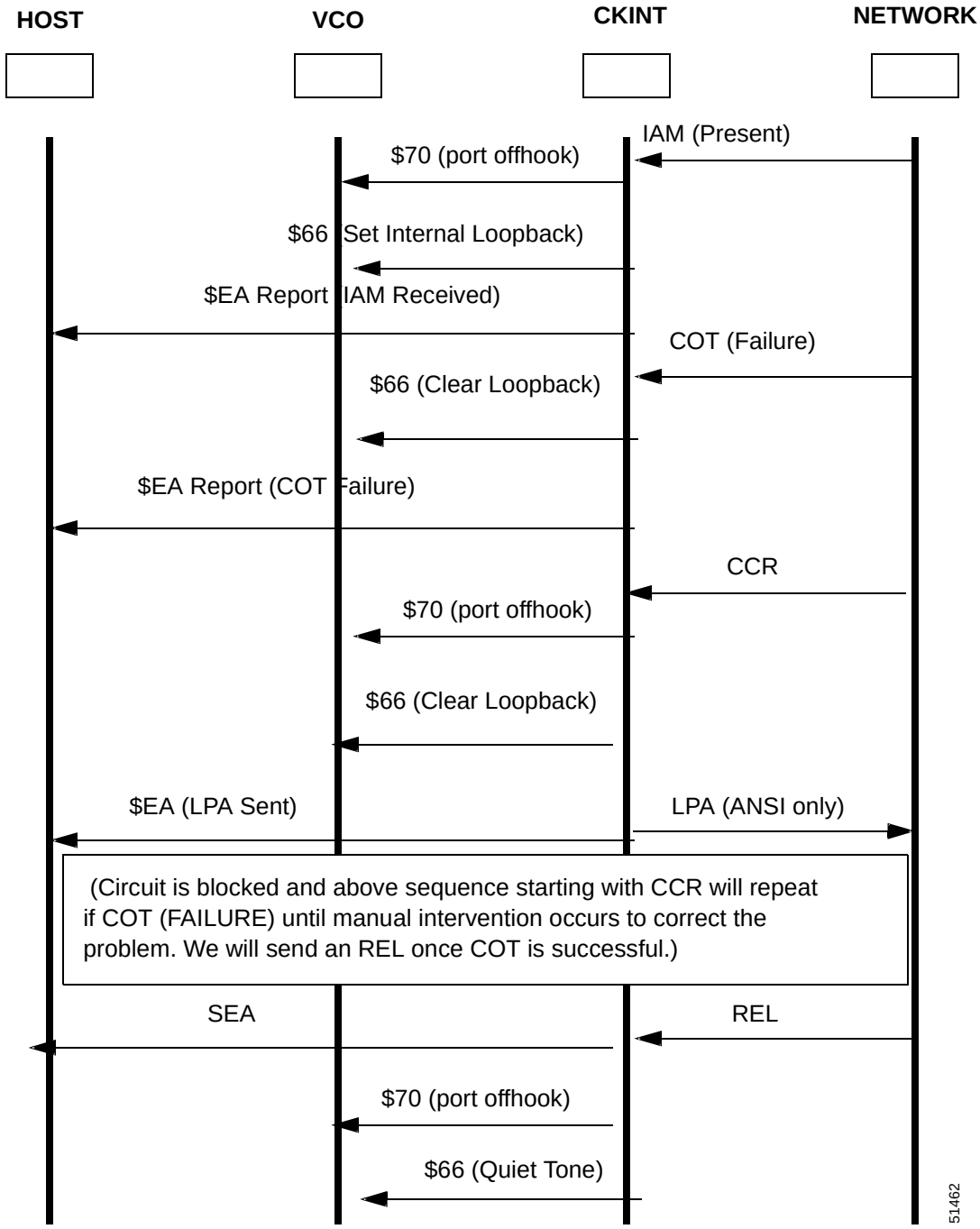


Figure 2-3 Incoming COT on Previous Circuit (SUCCESS)

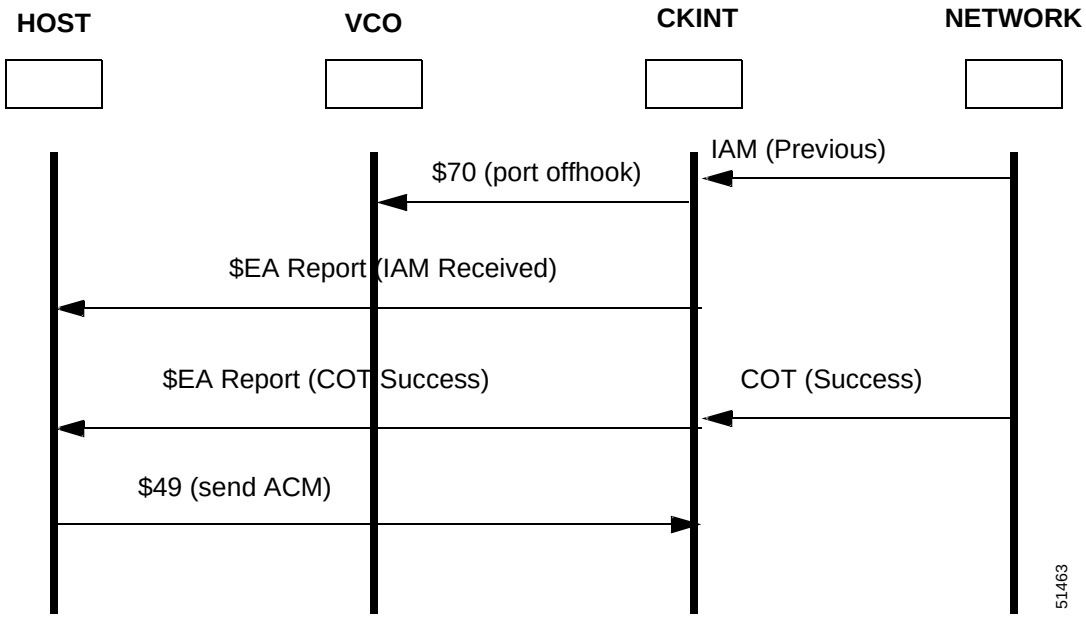


Figure 2-4 Incoming COT on Previous Circuit (FAILURE)

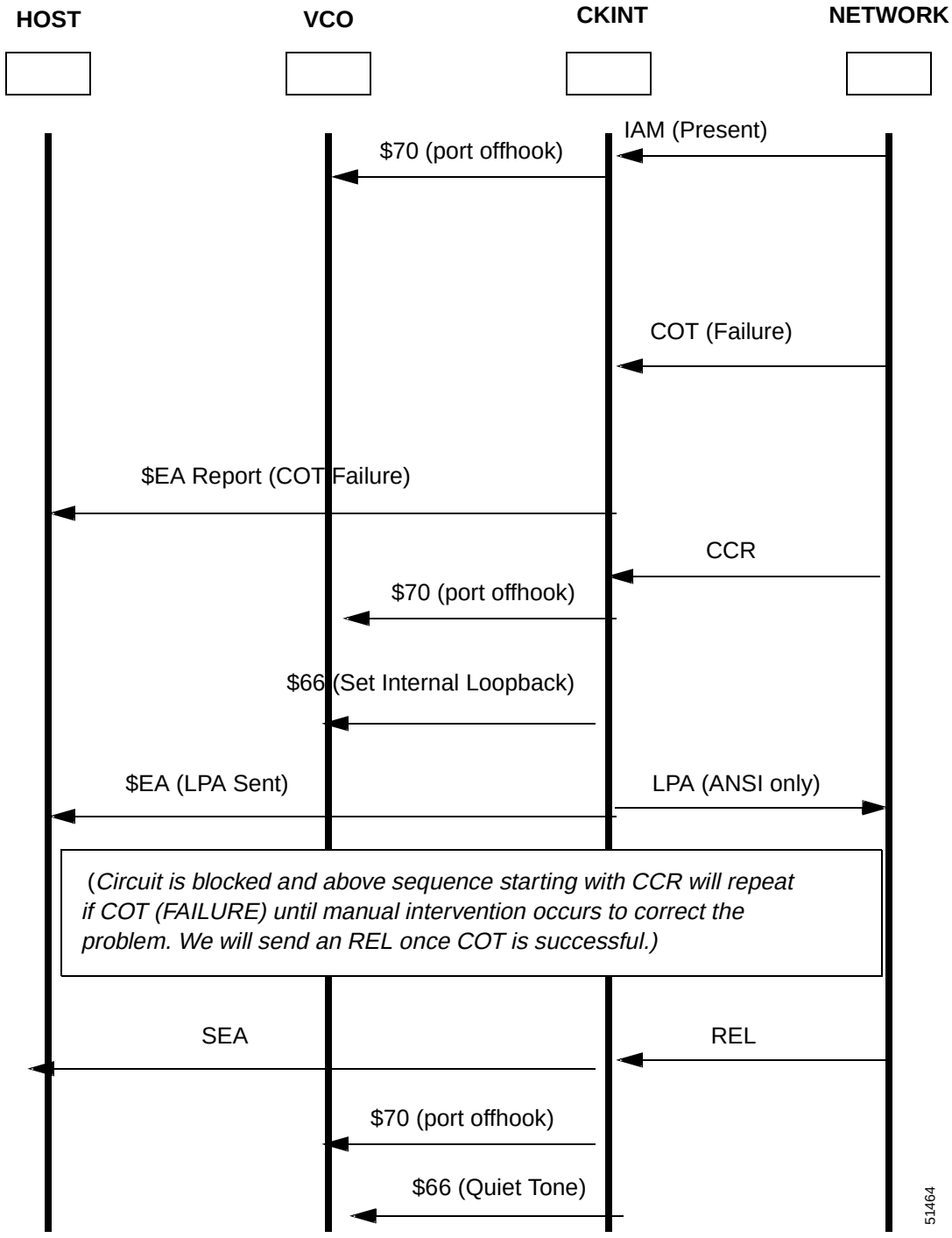


Figure 2-5 Outgoing COT on Previous Circuit (SUCCESS)

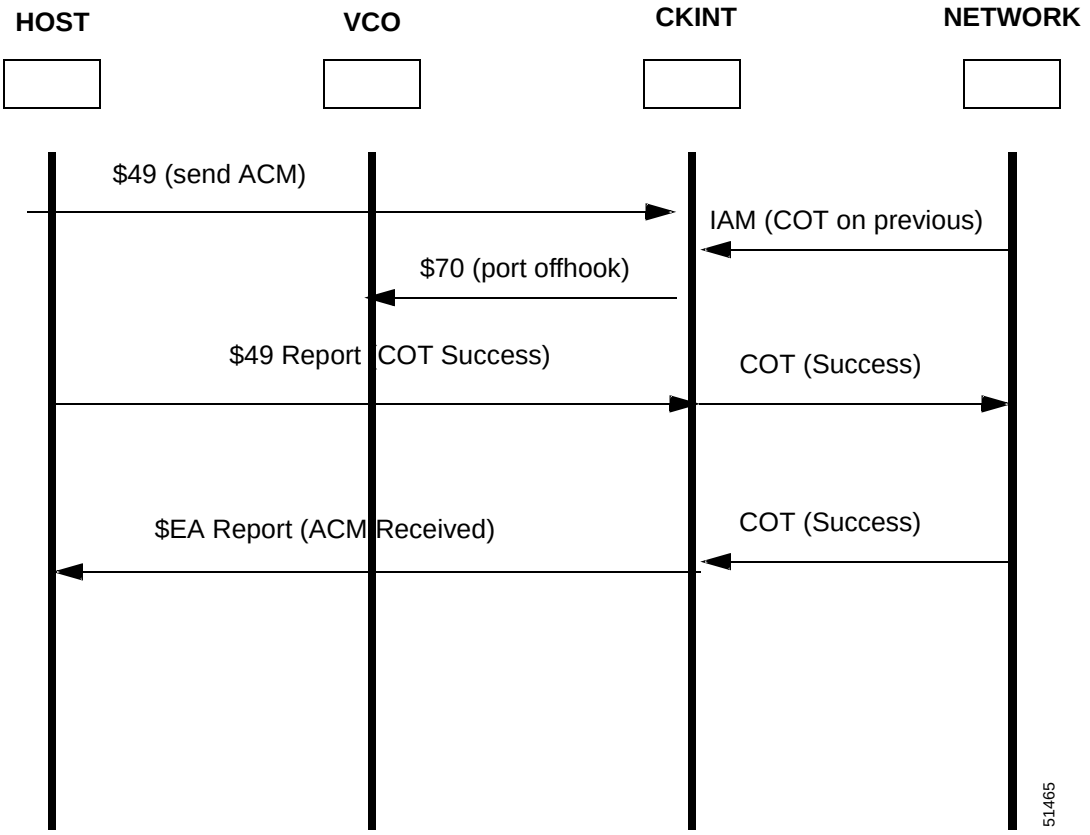


Figure 2-6 Outgoing COT on Previous Circuit (FAILURE)

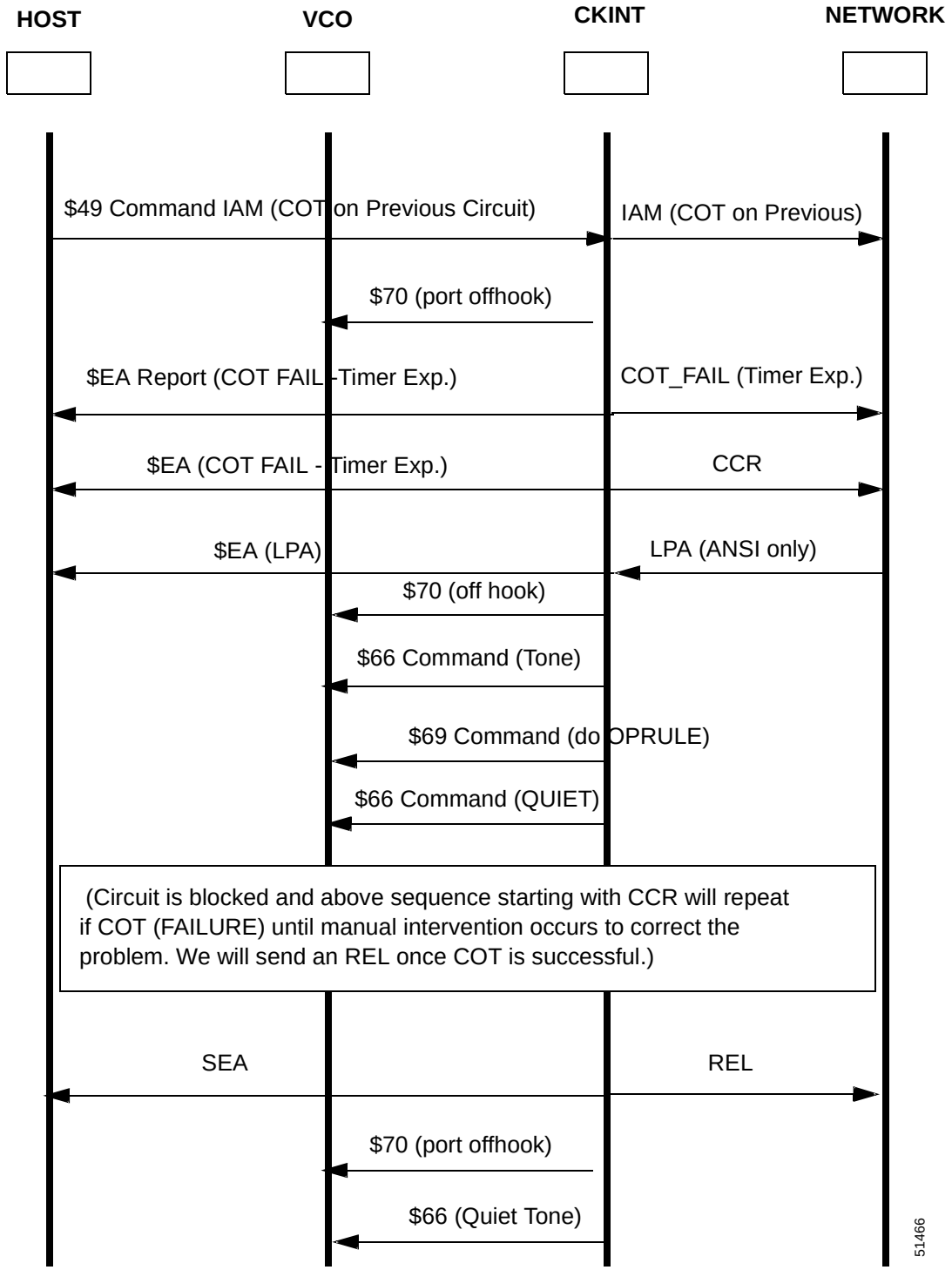


Figure 2-7 Outgoing COT on Present Circuit (SUCCESS)

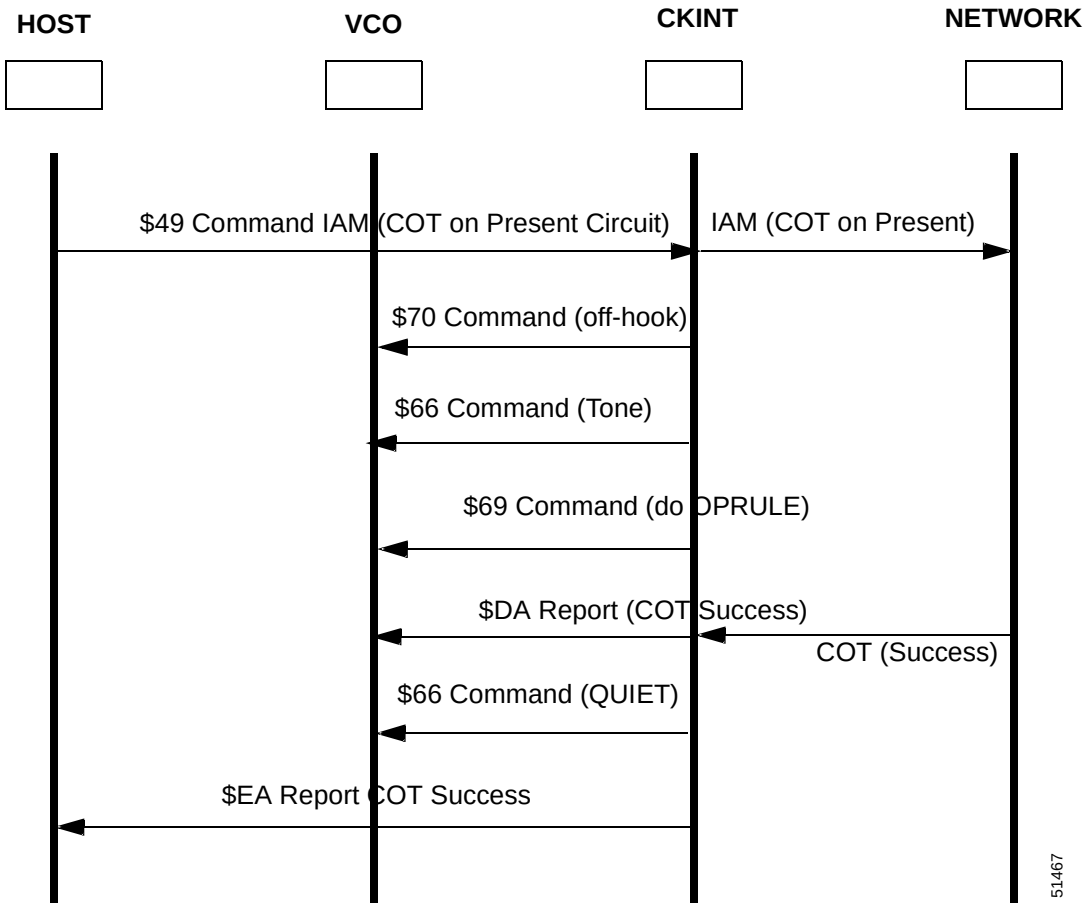
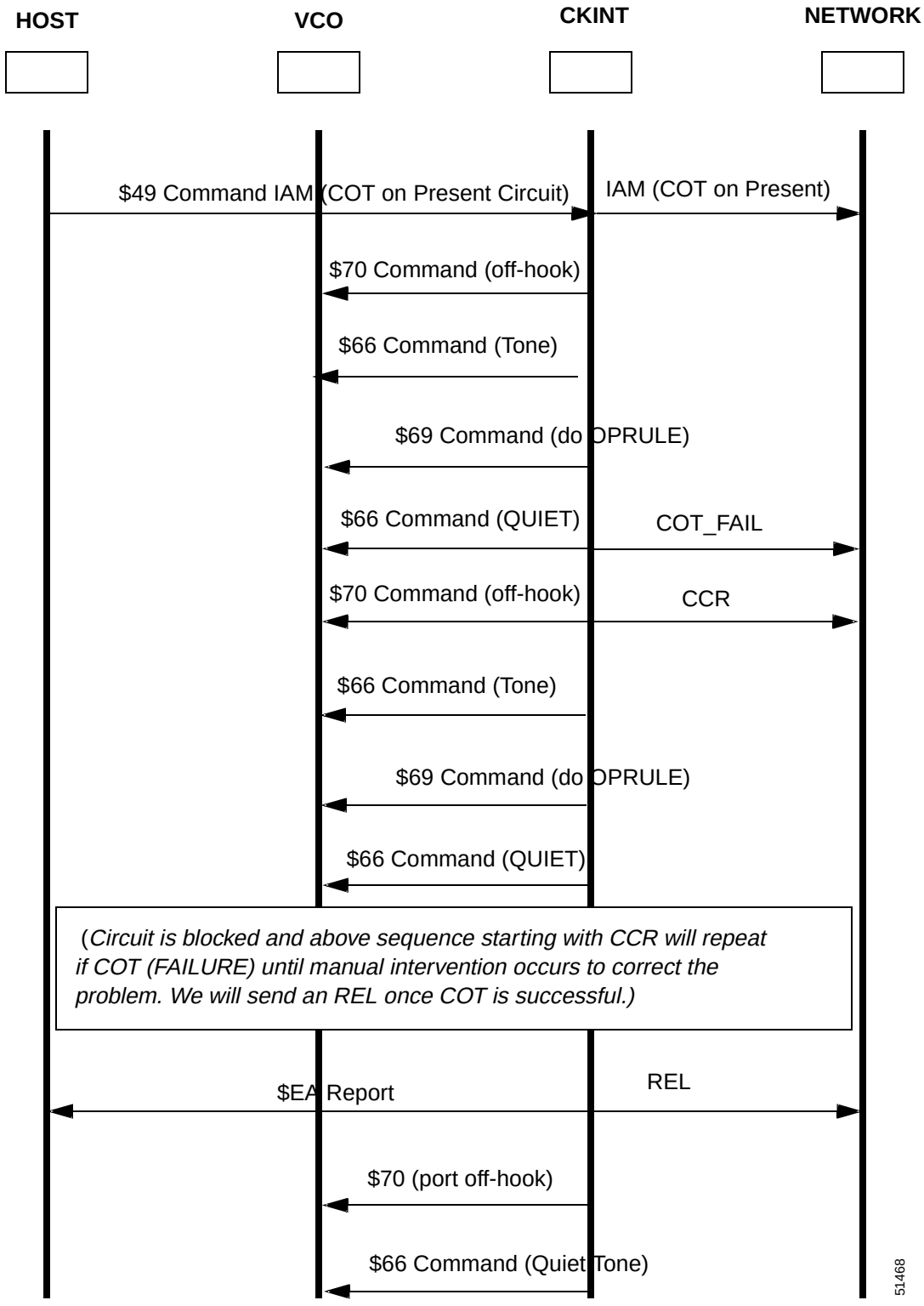


Figure 2-8 Outgoing COT on Present Circuit (FAILURE)



MTP

LUA/LUN, SS7 Subsystem Fails to Send LUA Message in Response to the Network's LUN Message During Test "Q.782,7.9)

If your SS7 Subsystem is configured with only one link in the LinkSet (ADD-LSET:,...ACTIVE=1, LOADED=1) then you will encounter this protocol problem.

You can resolve the problem by adding alternate routes as in lines 6 and 7 in the EBS mtp.mml file. The example .mml file is given as follows:

```
(1)  MODIFY-SP:NAME=HOME,SPC=3-8-3,NI=NATIONAL,TYPE=SEP;
(2)  ADD-LSET:LSET=LSET1,DPC=1-1-1,ACTIVE=1,LOADED=1,TYPE=ALINK,BR=56000;
(3)  ADD-LSET:LSET=LSET2,DPC=1-1-2,ACTIVE=1,LOADED=1,TYPE=ALINK,BR=56000;
(4)  ADD-LINK:LINK= LINK-0,LSET=LSET1,SLC=0,PORT=1,TYPE=DTE,PRIORITY=0;
(5)  ADD-LINK:LINK=LINK-0,LSET=LSET2,SLC=0,PORT=2,TYPE=DTE,PRIORITY=0;
(6) ADD-ROUTE:RTSET=LSET1STP,LSET=LSET2,PRIORITY=1;
(7) ADD-ROUTE:RTSET=LSET2STP,LSET=LSET1,PRIORITY=1;
(8)  ADD-CMBLSET:CMBLSET=CLSET12,LSET1=LSET1,LSET2=LSET2;
(9)  ADD-RTSET:RTSET=RSET12,DPC=2-2-2,ROUTE1=CLSET12;
(10) MODIFY-LSET:LSET=LSET1,ADMINSTATE=ACTIVE;
(11) MODIFY-LSET:LSET=LSET2,ADMINSTATE=ACTIVE;
(12) EXIT:;
```

CHAPTER 3

System Troubleshooting

This chapter provides a very high-level view of the VCO/4K system and its environment. It will assist you in troubleshooting the VCO/4K system when you have not been presented with an error message documented in the *Cisco VCO/4K System Messages* or when the nature of the problem does not fit one of the scenarios presented in Chapter 2, “Problem Scenarios.”

The primary purpose of this chapter is to isolate the problem to a non-VCO/4K system category (i.e., the customer or telco world external to the VCO/4K) or to a major component of the VCO/4K system (VCO subsystem, SS7 subsystem, host application software, a peripheral, etc.).

The emphasis is on identifying problems that result in call loss.

This chapter covers the hierarchy of possible causes for system malfunctions and the diagnostic tools available. Appendix A, “Diagnostic Tools” contains descriptions of the diagnostic tools available.

System Log

The VCO/4K incorporates error detection features which output messages on the bottom display lines of the system console. These messages are defined in the *Cisco VCO/4K System Messages*. Messages displayed are time stamped, logged to a specified storage device (based on selections in the File System Configuration screen), and sent to the system printer. The system software maintains the error log for 30 days. You can recall the log for display or selectively print it using the Maintenance menu.

Performance Monitoring

The system log on the VCO/4K stores the following information:

- Status messages reflecting changes to the system database
- Messages associated with read/write functions to storage devices
- Status and results from diagnostic utilities
- System status messages generated during normal system reboot and whenever a switchover of redundant controllers occurs
- Alarm conditions, including host communication link failures

Systems with redundant control maintain “shadow” error logs for both controllers. The administrator or technician can specify which controller’s log file to display or print through the Maintenance menu. System logs include a designation as to whether the message was generated by the left or the right controller.

The system log file provides information on general alarm conditions. It contains combination messages with both ALM and FRM prefix codes to indicate alarm conditions. These messages are written to the log file only at the initial occurrence of the alarm condition; similarly, messages are generated only for the clearing of the last occurrence of the alarm. An optional periodic alarm report can be written to the log file five minutes after system initialization and at 30-minute intervals thereafter. This option is activated or deactivated from the System Feature Configuration screen (refer to the *Cisco VCO/4K System Administrator's Guide*).

The *Cisco VCO/4K System Administrator's Guide* discusses administration screens that display alarm conditions and system log file alarm messages.

If problems are detected and repaired in the early stages, system downtime is greatly minimized. System logs are also accessible through a remote maintenance terminal and modem connection.

However, a true indication of overall system performance requires a history of system performance. Record your configuration data and monitor your system's performance on an ongoing basis. Cisco Systems recommends that users keep the printed output of daily error and status logs for a month. Both the VCO subsystem and the SS7 subsystem create an error log. They provide an excellent history of performance problems and maintenance activities requiring system reinitialization.

Note To assure that a continuous hard-copy record of the system error logs is always available, Cisco Systems recommends not turning off (deselecting or powering OFF) the system printer except for maintenance purposes. You can also write system log files to either floppy or hard disk for later use depending on the File System Configuration screen selections you make (refer to the *Cisco VCO/4K System Administrator's Guide* for more information).

Note During periods of high traffic volume, performing database maintenance might not be desirable. Database maintenance can overload the Combined Controller, causing calls to be dropped or lost.

Alarm Condition ($F0) Report

The Alarm Condition ($F0) report notifies the host of alarms. This report provides the same level of information to the host as the System Alarms Display provides to the system administrator. Alarm codes within the report map to the same ALM alarm messages that appear on the System Alarms Display and in log file messages. Refer to the *Cisco VCO/4K Standard Programming Reference* or *Cisco VCO/4K Extended Programming Reference* for a description of the $F0 report.

System Fault Isolation Procedures

Figure 3-1 presents a high-level view of VCO/4K System troubleshooting.

Figure 3-1 System Fault Isolation

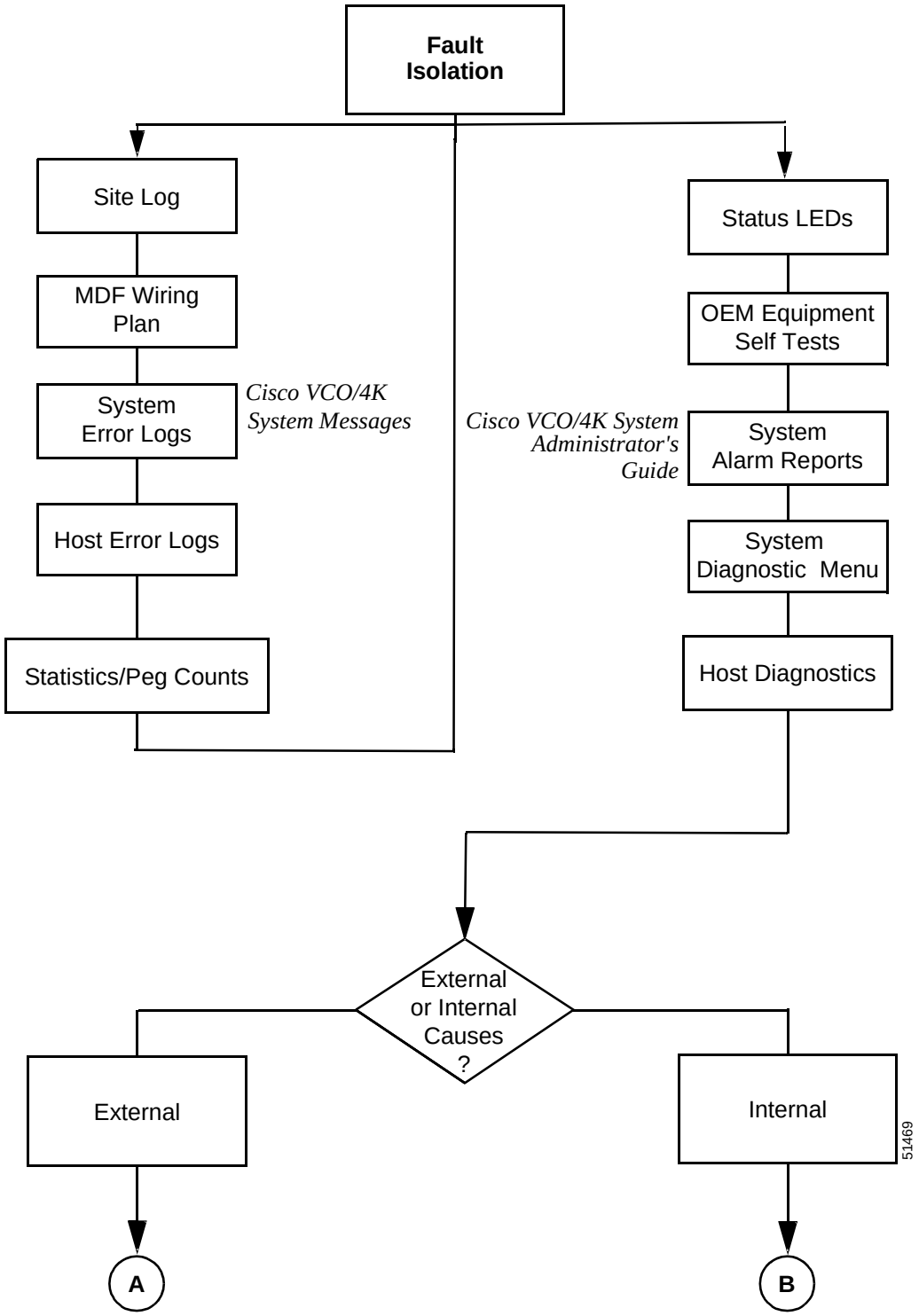
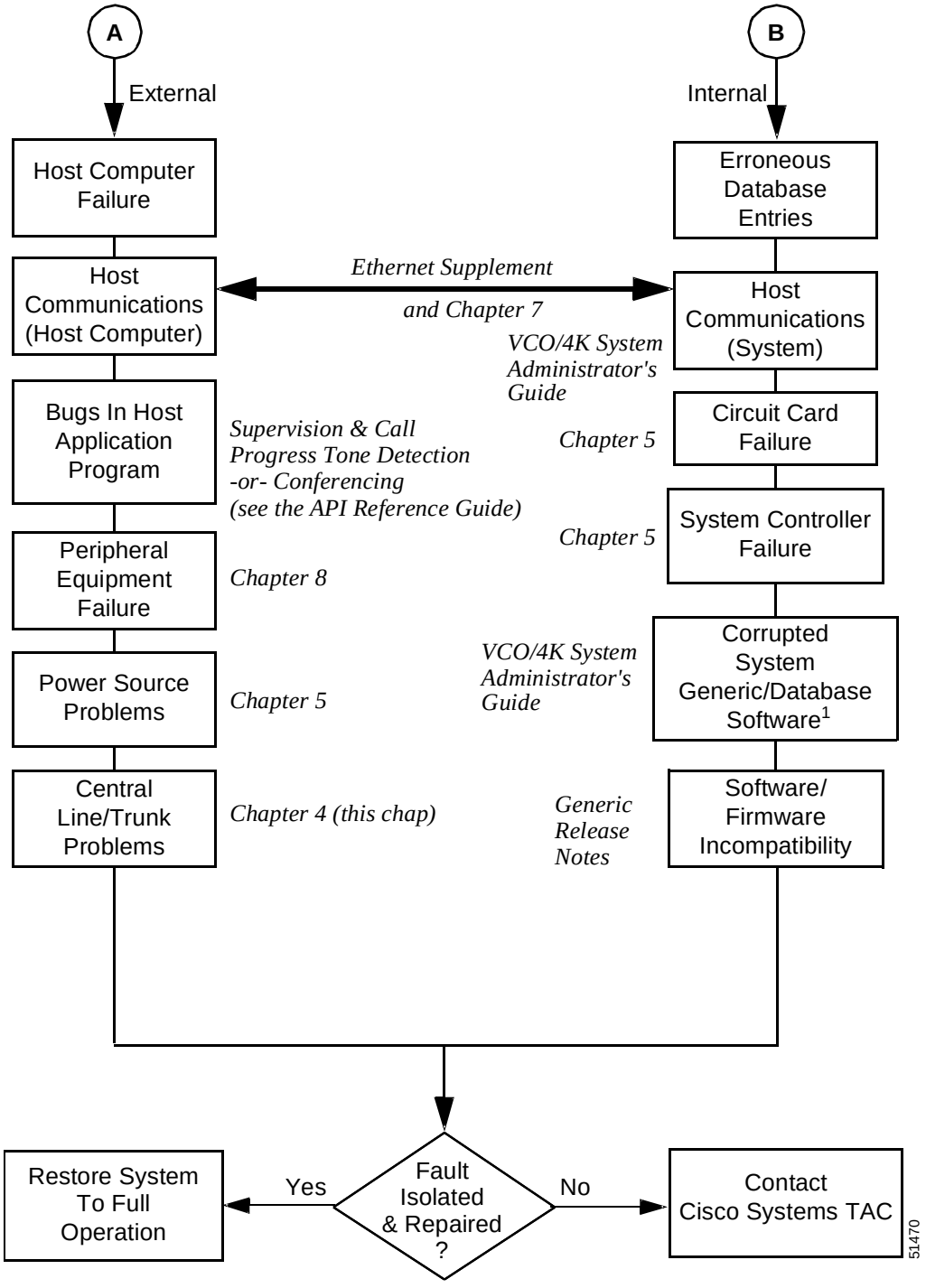


Figure 3-1 System Fault Isolation (continued)



1 Compare the file sizes of the .tbl files in C:/dbase on the system with the file sizes of the .tbl files in a:/dbase on Generic disk #2. (You can put the diskette into the system or into a PC to read it.)

When performance monitoring indicates a system problem, the administrator or technician should compare the symptoms of the problem against the following possible hierarchy of causes:

- Human error
- External causes of system malfunctions
- Internal causes of system malfunctions

Human Error

The human factor is the most likely cause of a system malfunction. Failure to follow recommended procedures for installing, programming, and maintaining the system can result in problems which are sometimes difficult to trace.

The VCO/4K is a system of integrated components. Its operation depends on data entered into the system database by the administrator. The systems coupled to external CO facilities through a main distribution frame that should be carefully mapped and updated as changes are made to the system configuration.

The technical documentation set contains information about, and organizational tools for, installing and maintaining a VCO/4K system. Technicians responsible for maintaining the system should be thoroughly familiar with the documents listed in the “Related and Referenced Documentation” section on page xi

External Causes of System Malfunctions

Analog and digital interface circuits connect the VCO/4K to external telecommunication environments. Problem isolation requires establishing whether the fault stems from external causes or with internal circuit cards and adapters.

The following subsections present a hierarchy of external causes of malfunctions leading to call loss.

- Central Office (CO) services—See the “Station or CO Line/Trunk Problems - Interface Circuits” section on page 3-5
- Host computer, its application, and/or its communications software— See the “Host Computer System” section on page 3-7
- Peripheral equipment—See the “Peripheral Equipment” section on page 3-8 and Chapter 7, “Peripheral Equipment Troubleshooting.”
- Power and ground irregularities—See the “Power and Ground Irregularities” section on page 3-9 and the “VCO/4K Chassis Power” section on page 4-29.

Station or CO Line/Trunk Problems - Interface Circuits

Poor signal quality and/or loss of line/trunk service can adversely affect system operation. Line/trunk connections can also be broken or miswired (tip and ring reversal) at the MDF/Digital Cross Connect serving the system or through the MDF/Digital Cross Connect cables running to the Storage/Control I/O Module cards.

Note Check the jumpers on the UTC-2 and ECT/LCT circuit card for Ground Start/Ground Connect or Loop Start /Loop Connect operation. The jumper settings must correspond to database entries for the individual ports set via the Trunk Card Configuration screen. Refer to the card-specific technical description in the *Cisco VCO/4K Card Technical Descriptions* for jumper settings.

Lines, trunks, and channel banks connect the VCO/4K to the local Central Office (CO) or to specialized telecommunications equipment. Problems associated with CO facilities include:

- Loss of, or degraded transmission over, CO incoming direct connect lines from telephone stations
- Loss of, or degraded transmission over, CO dial-up trunks or incoming digital trunks
- Loss of, or degraded transmission over, CO outgoing analog or digital trunks
- Improper or missing answer supervision on CO outgoing lines
- Failure to complete routing of CO outgoing calls to VCO/4K
- Failure of CO to complete routing of outgoing calls to terminating numbers
- Failure of CO to complete access to InterLATA (long distance) carriers
- Hardware damage to interface cards in CO switches

When individual CO interface circuits fail, calls are blocked from obtaining service or completing a connection to the terminating number. CO traffic reports log the loss of service.

When a block of interface circuits fails, the problem is usually the failure of a VCO/4K interface card. The exception to this general rule is the failure of a digital span, which causes the loss of up to 24 channels. A digital span can be lost at the channel bank, the digital switch, or at its interface point with the VCO/4K.

Poor Signal Quality

A line/trunk with poor transmission characteristics can cause intermittent problems that may be difficult to detect without using special transmission test sets. Answer supervision and in-band call setup signaling can be lost even though voice transmission is intelligible.

If the VCO/4K is implemented behind a PBX, excessive cumulative losses in signal levels going out and returning through the PBX can greatly affect the intelligibility of voice-band transmission and reception. Similar problems may occur with losses through a CO in dial-up implementations.

Note SLIC-2, DID-2 and UTC-2 circuit cards offer jumper-selectable output level options (0 dBm or –3 dBm) on a per port basis. The UTC-2 also supports jumper-selectable 600Ω and 900Ω impedance on a per port basis. Refer to the card-specific technical description in the *Cisco VCO/4K Card Technical Descriptions* for jumper settings.

Loss of Lines/Trunks

Out-of-service lines/trunks can cause a degradation in system performance because calls must wait for available lines/trunks before processing can be completed. Calls made through dial-up stations may be blocked at the CO because no dial-up trunk is available to complete the routing to the VCO/4K.

Note Reversed tip and ring connections prevent the VCO/4K from seizing an outgoing trunk. Tip and ring reversal on an incoming trunk causes calls to be dropped immediately.

Detecting Station and CO Line/Trunk Problems

The best way to assure early detection of line/trunk problems is to run frequent checks of call completing trunks. Do this at the MDF/Digital Cross Connect with a handset. Dial-up service can also be checked, but the procedure is more complicated and would require progressively busying out each dial-up trunk.

Another method of checking trunk status is to use the Card Display function under the Diagnostics menu to monitor individual trunk cards. If a port on an interface card does not appear to be processing calls, use the Port Display to look at the specific circuit. Use the Set Up Paths Utility to verify voice path to a suspected port.

Permanent signal conditions inform the host that a line or trunk has not released within 30 seconds of a release by the VCO/4K system. Refer to the *Cisco VCO/4K Standard Programming Reference* or *Cisco VCO/4K Extended Programming Reference* ($D2) for information on the Permanent Signal Condition (PSC) report.

Port supervision errors, which occur when tip and ring is reversed on outgoing trunks or when there is no response to an outgoing seizure, are also reported to the host.

Correcting Station and CO Line/Trunk Problems

If the problem is on the system side of the MDF/Digital Cross Connector, check interconnecting cables, the midplane adapter, and the current status of the interface card to which the faulty line/trunk is connected. If an entire group of lines/trunks is out-of-service, suspect a bad interface card.

If the problem is on the network or direct connect station side of the MDF/Digital Cross Connect, the responsibility for repairing the circuit depends on where the system is located and who is supporting line/trunk services. The faulty circuit number should be recorded and a repair history maintained.

Host Computer System

Problems with the host will be due to a failure of the application running on the host or a failure of the host computer.

Host Application

Because the VCO/4K functions as a server to a host computer, fault isolation must also take into account the state of the host computer and its application software at the time a fault is discovered. Troubleshooting thus requires knowledge of the host computer system, the diagnostic capabilities of the application software, the error logging and diagnostic capabilities of the VCO/4K, and basic telephone network test and service procedures.

Application developers must provide service technicians with details of the diagnostic capabilities of the host computer system and its application package.

Host Computer

Hardware or software problems occurring at the host can manifest themselves in the following ways:

- The host is not reading the VCO reports fast enough, or the IP network is not transmitting the VCO reports to the host fast enough.

- Failure to complete calls through the system due to:
  - Host timeouts
  - Erroneous or incomplete commands sent by the host
  - Host computer downtime
  - Host throttling caused by improper overall system configuration
- The host triggers an alarm condition
- There is a loss of host communication link(s)
- There is frequent reinitialization of the host system

Cisco Systems encourages VCO/4K application developers to incorporate diagnostic capabilities into their application programs. Refer to the *Cisco VCO/4K System Administrator's Guide*, the *Cisco VCO/4K Standard Programming Reference* or *Cisco VCO/4K Extended Programming Reference* (sections on Supervision & Call Progress Tone Detection and Conferencing) for additional details on the performance monitoring features of the VCO/4K system software.

The host application must be able to generate its own error messages. This is particularly true whenever the host receives an alarm report from the VCO/4K. Such alarms are usually the result of a failure (in call processing or communications) detected by the host application software. A detailed error message should indicate why the alarm was triggered so that a service technician can quickly isolate and remedy the cause.

Troubleshooting the host computer system is covered in more detail in Chapter 5, “SS7 Subsystem Troubleshooting.”

Peripheral Equipment

Problems with peripheral equipment reduces your ability to access the VCO/4K system, but the likelihood of a peripheral malfunction causing the VCO/4K system to drop calls is remote. Problems can be related to the following:

- VDT
  - Erratic error messaging or display faults on the system console
  - Inability to access or make changes to the database
  - Inability to access error logs or maintenance and/or diagnostic submenus
- Printer
  - Garbled printout
  - Loss of error messages
  - Periodic reports
- Modem
  - Inability to perform remote maintenance
  - Multiple login attempts due to noisy lines
- Telnet
  - Inability to perform remote maintenance
- SNMP
  - Inability to perform remote, real-time system monitoring

The principal causes of these problems are improper installation, improper cabling, and/or loss of setup parameters (some peripherals may loose parameter settings if power is lost). The *Cisco VCO/4K Installation Guide* specifies the cabling and setup parameters required for interface with the VCO/4K. Users must enter peripheral operating parameters in the system database through the Peripheral Configuration utility (refer to the *Cisco VCO/4K System Administrator's Guide* for instructions). These parameters must match the setup parameters defined at the peripheral (refer to the OEM documentation supplied with the peripheral for setup instructions).

VDTs usually experience keyboard and monitor problems because of frequent use. Printer mechanisms wear out over time, and modems can be damaged by line surges over power or CO connections.

Chapter 6, "Host Communications Troubleshooting" contains more detailed information on troubleshooting peripheral equipment.

Power and Ground Irregularities

Loss of input power results in failure of the VCO/4K system. Intermittent power surges and sags, as well as induced noise, can produce the following problems that lead to call loss:

- Memory and bus errors causing erratic system performance
- Frequent reinitialization attempts of controllers or individual circuit cards
- Shutdown of power supply modules
- Problems with peripheral equipment
- Problems with the host

For more information, see the "VCO/4K Chassis Power" section on page 4-29.

Internal Causes of VCO/4K Subsystem Malfunctions

The causes of failure within the VCO subsystem generally fall in the following categories:

- Database errors
- Bus errors
- CPU and memory errors
- Mass storage errors
- Interface and service circuit hardware problems
- Software/firmware incompatibility

Diagnostics Menu

The Diagnostics Menu offers several options that allow the administrator to do the following:

- Create voice paths between ports
- Display card or port data
- Display conference data
- Test service circuits
- Test port cards
- Display virtual call generation port data

- Monitor call progress tones during call processing

For a complete description of these functions and usage instructions, refer to the *Cisco VCO/4K System Administrator's Guide*.

Status LEDs

Status LEDs indicate the operational status of individual circuit cards and subsystems. Refer to the *Cisco VCO/4K Card Technical Descriptions* and the SS7 Supplements for the LED patterns for all VCO/4K system components.

Note The operational status of LEDs on peripheral and specialized telecommunications equipment varies according to manufacturer. Technicians are advised to review OEM manuals for detailed information.

The VCO subsystem is typically the core of the troubleshooting effort on a VCO/4K system. Chapter 4, “VCO Subsystem Troubleshooting” contains detailed procedures for troubleshooting the VCO subsystem.

Diagnostic Tools

The VCO subsystem generic software incorporates a variety of diagnostic tools to help isolate the possible causes of a problem. These tools include error logs, status LEDs, alarm conditions, and administrative maintenance and diagnostic routines.

The diagnostic tools supported by the generic software must be complemented by diagnostic routines incorporated into the host application software. The VCO subsystem command set includes support for the development of host-controlled diagnostics, including the ability to remove ports from service, monitor card status, and initiate alarms. Thus, the host can trigger events in the VCO/4K that can have the effect of placing portions of the system out of service. Replacing cards and performing other corrective maintenance procedures does not cure a fault caused by the host application.

Service Circuit and Trunk Card Downloads

Card downloads must be carefully coordinated with the Generic software. Mismatches here are a common cause of problems. See Chapter 4, “VCO Subsystem Troubleshooting” for more information.

During initial system power up (cold reset), the software downloads are broadcast simultaneously to each card type (SPC and ICC cards do not receive a broadcast download; they receive downloads one at a time). The system is restored to operation after all downloads have been completed. If an individual downloadable circuit card is removed and replaced, it is selectively downloaded when its power-up sequence is completed before being activated.

Alarm Conditions—System Wide

VCO/4K systems support an alarm condition scheme consistent with the alarm requirements described in Bellcore specification *OTGR: Network Maintenance: Network Element*.

Severity Levels

System-wide alarm conditions are divided into four severity levels—fatal, critical, major, and minor. Fatal alarms cause a system switchover (in redundant systems) or a system reset (in nonredundant systems).

Critical, major, and minor alarm conditions require the user to take action to resolve the problem. Recovery from a major alarm might require component replacement and a controller reset, thus placing the system out of service. Minor alarms might require software and/or hardware changes before the condition is eliminated and the alarm is reset.

The host can set two additional auxiliary alarms by sending a Set/Reset Host Alarms command ($C0 03). Refer to the *Cisco VCO/4K Standard Programming Reference* or *Cisco VCO/4K Extended Programming Reference*.

Alarm Condition Indicators

Alarm condition indicators appear:

- On the front panels of system cards
- In several system administration screen displays
- Within system log file messages
- In optional periodic alarm summary reports

The Alarm Arbiter Card (AAC) supports local and remote indications of system-wide problems by a combination of highly visible LEDs and external alarm contacts (when connected).

- The Major Alarm LED on the card front panel indicates fatal, critical, and major alarm conditions. You can connect the external alarm contacts to audible alarms.
- The Minor Alarm LED indicates that the Standy side is off line or has timed out.

An option on the System Alarm Display allows users to disable these audible alarms. There is also a switch on the AAC card to disable the alarms.

Note The Audible Cutoff (Y/N) option on the System Alarms Display disables the Major Alarm LED indicator on the AAC as well as the external audible alarms. It does not clear the alarm condition.

The *Cisco VCO/4K Card Technical Descriptions* describes major and minor alarm conditions for individual circuit cards and subsystems.

Screens for Monitoring Alarms

The following system administration screens provide indications of system alarms:

- System Alarms Display—Provides a general description of the alarm condition, the alarm's severity, and its number of occurrences
- Card Alarms Display—Provides detailed information on alarm conditions for all network interface cards and service circuit cards
- System Host Configuration—Provides detailed information on host link alarms

System Reset Procedures

The *Cisco VCO/4K System Administrator's Guide* and the *Cisco VCO/4K Installation Guide* provide detailed procedures for booting the system from hard or floppy disk. The following subsections describe the maintenance implications of a system reset.

Nonredundant Systems

A critical or major alarm in a nonredundant system might cause the AAC to initiate a reset (reinitialization) of the Combined Controller. (A fatal alarm condition always causes a system reset.) The CPU is cleared of all current data, thus dropping all calls in progress. Service disruption lasts until the entire reset process is complete.

Resets are not required to service the Combined Controller (where the floppy drive resides) and/or the Storage/Control I/O module (where the hard drive resides), or to replace an NBC3.

Redundant Systems

A critical alarm in a redundant system can cause the AAC to switch over to the standby controller. (A fatal alarm condition always causes a system switchover.) Port states are maintained during switchover processing to minimize disruption of service.

An enhanced redundancy feature enables the standby controller to process the new setup redundancy information. Both the active and standby controllers consistently track all ports in a stable or setup state, as well as conference calls.

A standby controller can be serviced while the active controller maintains system operation.

Note To avoid an inadvertent reset or switchover between controllers, the Select switch on the AAC should be set to the active controller side—not in the **AUTO** position. Return the **Select** switch to the **AUTO** position after you have completed servicing one side.

Automatic synchronization utilities copy and restore files from the active to the standby controller prior to restoring the standby controller to service. You can reboot standby controllers from hard disk or floppy disk without disrupting system operation.

CHAPTER 4

VCO Subsystem Troubleshooting

This chapter describes procedures that isolate problems that you have already determined to reside in the VCO subsystem. The problem has been determined to *not* reside in the telco network, the SS7 subsystem, the host (or host application), or any other associated equipment or software.

This chapter is organized primarily by card categories. Also covered are the power subsystem and the fan unit. The cards and subsystems are as follows:

- Control Circuit Cards
- Port Interface Cards
- Service Circuit Cards
- VCO/4K Chassis Power
- Fan Subassembly

Causes of VCO Subsystem Malfunction

The VCO/4K is designed to be fault tolerant with an optional provision for control and power subsystem redundancy. System logs and statistical reports provide a means of monitoring system performance. Status LEDs and diagnostic utilities help isolate faults to the subsystem and card level. Replacing cards, as opposed to repairing them, minimizes system downtime.

Common Sources of Information

LED Indicators

Light emitting diodes (LEDs) on system circuits and subsystems provide a visual indication of the operational status of individual system components. The *Cisco VCO/4K Card Technical Descriptions* identifies the meaning of the LED states on each component.

System Log

The VCO/4K incorporates error detection features which output messages on the lower left side of the system console. See the *Cisco VCO/4K System Messages* for a listing of these messages. Messages are time stamped, logged to a specified storage device (based on selections in the File System Configuration screen), and sent to the system printer. The system software maintains the error log for 30 days. You can recall the log for display or selectively print it from the Maintenance menu.

See Chapter 3, “System Troubleshooting” for more information on the system log.

System Database

The entries in the system database must meet the requirements of a specific implementation and must correspond to the external telecommunications environment. In VCO/4K systems, the environment includes circuit card locations, trunk or line card configurations, port configurations, inpulse and outpulse rules, answer supervision templates, and resource group configurations.

Entering and maintaining the VCO database information that defines the system configuration requires a thorough understanding of all the elements in the system. System performance degrades if a discrepancy (such as erroneous additions, moves, and changes to the database or configuration files) is introduced between system elements and database or file entries. The *Cisco VCO/4K System Administrator's Guide* describes the procedures required to maintain the VCO database and configuration files.

Problems with the VCO database files can result in the following problems that lead to call loss:

- Frequent system reinitialization
- Poor grade of service performance
- Rejection of multiple command messages sent by the host
- Inability of host computer to connect, or reconnect to the VCO
- Frequent inpulse and outpulse rule aborts

Tracing database problems requires a very detailed examination of database entries across all of the individual submenus associated with a potential problem.

Altering the Database

Adding or removing stations, lines, and trunks affects the contents of the database. If this environment changes, the database must be modified accordingly to keep the system in harmony with the environment. Unless the database is properly administered, VCO/4K call processing software will be unable to complete calls through the system.

Record Keeping

Cisco Systems recommends careful record keeping to monitor the system configuration as it changes. Changes made to the database should be recorded and appropriate alterations made to the system database.

Backing Up Copies of the Database

Make floppy disk backup copies of the original database, the immediate past database, and the current database. Clearly label the floppy disks and store them in a safe place so that you can quickly restore the system database if you must replace a hard disk or install new system software.

Note Since the A-side and B-side of the system may differ (for example, in the system configuration, host configuration, peripheral, and file system) separate backups are necessary.

Detecting Database Problems

System error messages and general error messages provide some indication of database configuration problems. Status information returned in reports to the host can also indicate configuration problems in the database. Use the Database Administration menu to access submenus, which you can use to correct the database configuration.

Refer to the *Cisco VCO/4K System Administrator's Guide* for information about database problems. Refer to the *Cisco VCO/4K System Messages* for error messages.

Correcting Database Problems

Use the Print Screen key or Print Database Detail function to obtain hardcopy listings of the contents of the database. Compare the listing against the original or immediate past database entries to determine where a change has been made that affects system operation.

Refer to the *Cisco VCO/4K System Administrator's Guide* for details on making changes to the system.

Bus Errors

Bus errors can occur as follows:

- During polling communications between interface and service circuit cards and the NBC3
- At the packet communications link between the NBC3 and SWI
- Along the VCO VME bus in the control system

These occurrences display error messages identifying the affected bus and cards.

Intermittent bus errors can be the result of:

- Abnormal interface signals
- Power surges or sags
- Environmental problems related to operating temperature, humidity, or grounding

Persistent bus errors can be a sign of:

- Circuit card failure
- Faulty midplane connections
- Internal interconnecting cables

General Card Information

Software/Firmware Compatibility

Some VCO subsystem circuit cards include one or more PROMs. The PROMs contain coded firmware that interacts with the VCO subsystem generic software to control operation. Refer to the *Cisco VCO/4K Card Technical Descriptions* for the locations of PROMs on VCO subsystem circuit cards. The release notes shipped with the system software lists the firmware revision levels required on all circuit cards. The system does not function properly without the correct firmware.

Note The VCO subsystem SPC and ICC cards (and SRM daughter cards) do not have PROMs.

If you experience system problems after loading the new generic software or when replacing a circuit card, check for firmware compatibility. Always refer to the configuration information contained in the release notes. Obtain the correct firmware PROMs from Cisco Systems and install them on all affected circuit cards, including those held as spares. See Appendix A in the *Cisco VCO/4K Software Installation Guide* for a complete description of PROM chip removal and replacement.

Removing and Replacing Cards

Control circuit cards require specialized procedures for removal and replacement. The required procedures depend on whether the system is equipped with nonredundant or redundant system controllers. Refer to the *Cisco VCO/4K Card Technical Descriptions* for detailed instructions on removing and replacing control circuit cards.

Caution Observe antistatic precautions whenever you handle VCO/4K circuit cards to avoid damage to sensitive CMOS devices. Wear a ground strap connected to the VCO/4K equipment frame whenever removing or replacing circuit cards. The ground point is indicated with a label on the front of the system (with the door removed).

Control Circuit Cards

The following comprise the control circuit cards and related assemblies:

- Combined Controller Assembly
- Storage/Control I/O Module
- Network Bus Controller (NBC3)
- Alarm Arbiter Card (AAC)

Combined Controller Assembly

Several control circuit cards are closely associated with one another because of their interoperation and interdependency. Together they are called the Combined Controller Assembly.

The Combined Controller Assembly consists of the following components:

- Central Processing Unit (CPU) card
- Switch Interface (SWI) card
- Floppy Disk Drive (FDD) assembly

The SWI/FDD assembly together acts as a connecting point for the CPU card.

Combined Controller Assembly problems can be caused by improper jumper settings on the card, card failure, or bus faults. Problems associated with the Combined Controller and that lead to call loss include:

- Continuous system reinitialization
- Failure to completely initialize the system
- Frequent file-related errors
- Inability to update database tables
- Host communication link failures
- Storage I/O Module
- Message parsing errors

If the Combined Controller fails to establish communications with the NBC3 during initialization, the CPU performs a Phase 4 reboot. A message on the system console indicates that a reboot is beginning. If this series of events recurs, there could be a problem with SWI and NBC3 communications.

Problems that most likely will not lead directly to call loss are:

- Update channel failures between redundant VCO controllers
- Communications problems with peripheral equipment

CPU Card

The CPU is a high-performance, single-board computer that serves as the heart of the system controller. It contains an NVRAM chip which stores the IP configuration information. A lithium battery prevents loss of this data when power is off.

Switch Interface Card

The Switch Interface card provides an interface between the system controller and the following subsystems: Network Bus Controller (NBC3), Alarm Arbiter Card (AAC), and redundant system controller. The SWI card serves as the VME portion of the bus controller complex that includes the NBC3. The SWI card functions as the intermediary for direct memory access between the system controller and the NBC3. SWI cards in redundant systems are linked through the controller midplane.

Information is downloaded to the NBC3 through the SWI. It acts as a path on initial startup for the NBC3 download. Interrupt requests to the VME bus are initiated by the NBC3 and are processed through the SWI. The SWI handles block mode transfers of data to and from the NBC3.

Floppy Disk Drive

The floppy disk drive (FDD) is a 1.44-MB, high-density, 3-1/2 inch, half-height assembly. The FDD is used to load software and make backup copies of the system database. The system database, and log and trace files can also be stored on the floppy disk.

Storage/Control I/O Module

Physical interfaces to host computers and peripheral devices are provided on the Storage/Control I/O Module. Two serial ports are available for Serial I/O (SIO) host links, and another two support the local system administration console and a remote maintenance modem. An Ethernet Transceiver interface and parallel printer connector are also located on the Storage/Control I/O Module.

Note Master console and remote maintenance modem operating parameters (Baud Rate, Stop Bits, Bits per Character, and Parity) are defined in the system database via the Peripheral Configuration screen (refer to the *Cisco VCO/4K System Administrator's Guide* for more information).

Detecting Problems

Mass storage problems are associated with read/write operations from or to the floppy or hard disk drive. The VCO mass storage complex includes the Combined Controller, which houses the floppy drive, and the Storage/Control I/O module, where the hard drive is installed.

Mass storage problems (which may lead to call loss) cause the following events to occur:

- File transfer errors between system memory and the database files
- Inability to open, close, read from, or write to a file
- Failure to download data from disk to downloadable cards
- Denial of access to error logs
- Inability to log in

Serial Port Configuration

Serial ports 1 through 4 can be configured as a modem (DCE) for connection to a terminal, or terminal (DTE) for connection to a modem. The serial ports Storage/Control I/O Module cards are configured for shipment in the DCE configuration. Table 4-1defines jumper positions and Figure 4-1 shows the locations of the jumpers for DCE and DTE.

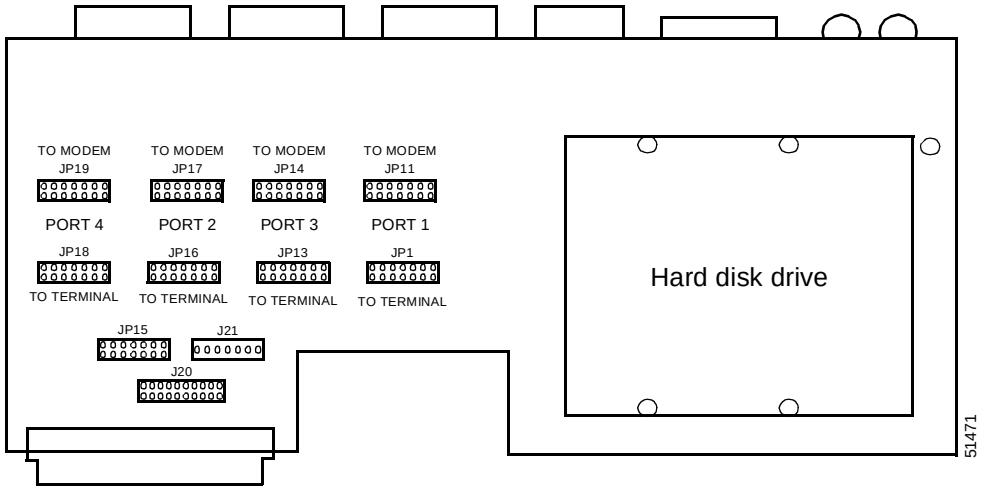
Refer to the *Cisco VCO/4K Hardware Installation Guide* for more information on serial cable requirements.

Note When modifying jumper positions on Storage/Control I/O Module boards, you must move all seven jumpers to the new location to ensure operation.

Table 4-1 Serial Port Configuration

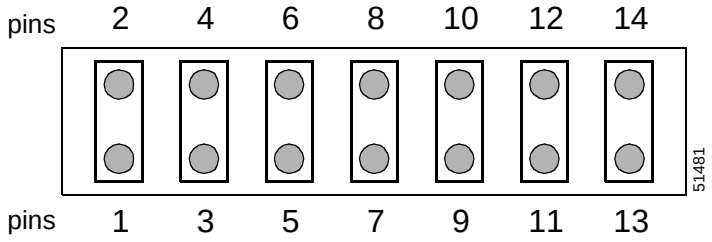
Port	DTE Operation	DCE Operation
1	Jumper –TO MODEM JP11	Jumper – JP1 TO TERMINAL
2	Jumper – TO MODEM JP17	Jumper – JP16 TO TERMINAL
3	Jumper – TO MODEM JP14	Jumper – JP13 TO TERMINAL
4	Jumper – TO MODEM JP19	Jumper – JP18 TO TERMINAL

Figure 4-1 Jumper Locations



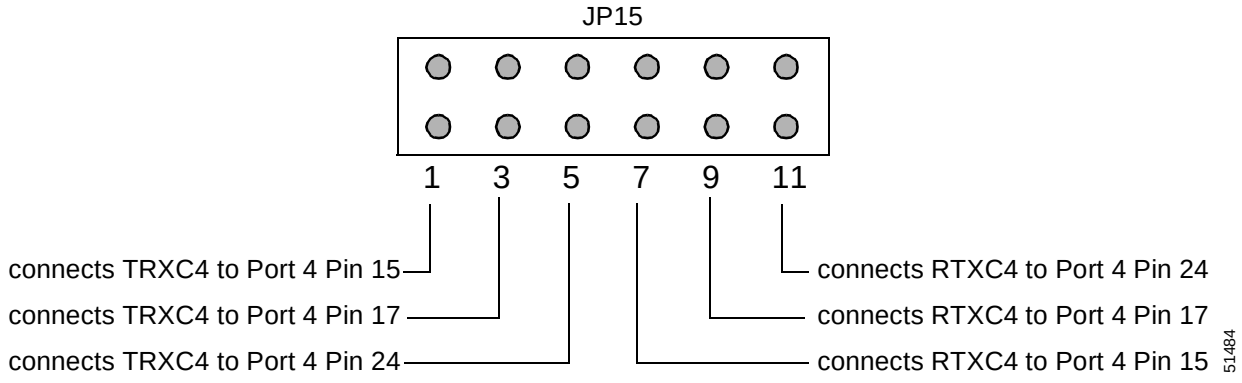
Seven jumpers are installed at jumper locations JP1, JP11, JP13, JP14, JP16, JP17, JP18 and JP19, connecting pins 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14 as shown in Figure 4-2.

Figure 4-2 Jumper Configuration for DCE/DTE, Serial Ports 1-4



Serial port 4 can be configured to use clock signals by the TRXC4 and RTXC4 signal lines. Jumper JP15 configurations of the clock lines are shown in Figure 4-3. The module is shipped without clock lines connected.

Figure 4-3 Jumper 15 Configuration of Clock Lines, Serial Port 4



Network Bus Controller Card

The Network Bus Controller (NBC3) contains its own 68360 processor that allows it to serve as bus controller. The SWI card functions as a secondary DMA to the NBC3. Redundant NBC3s operate in active or standby mode depending on which controller has been selected as active by the AAC.

The NBC3 utilizes DRAM for program storage and relies on the system controller to download or boot program tasks over the SWI/NBC3 interface. (The SWI cards in a redundant system are linked through the controller midplane.)

Because problems with the NBC3 critically affect system operation, VCO/4K software provides system error messages describing what type of NBC3 fault has been detected. These error messages are fully described in the *Cisco VCO/4K System Messages*. This document also provides messages that identify problems with T1 and NBC3 synchronization.

Alarm Arbiter Card

The Alarm Arbiter Card (AAC) is a control point for system resets. Switches on the front panel enable system controller resets and select which system controller is to be master. Status LEDs indicate the currently enabled system controller and alarm conditions.

The AAC is a stable device that does not usually fail during normal operation. However, the AAC interfaces with system controllers and external alarm systems, which may cause frequent alarm indications. Always investigate the operational status of the system controller(s) and the external alarm contacts for faults before suspecting that the AAC needs replacement.

If the problem is not with the system controller(s) or external alarm circuits, try rebooting the system (both controllers in a redundant system). A system reset may clear the condition. If a reset fails, then replace the AAC.

Detecting Problems with Controller Cards

System-level error messages indicate an inability of the CPU to process calls or access the system hard drive. Refer to the *Cisco VCO/4K System Messages* for a list of error messages and meanings.

Each controller card is equipped with a status LED that indicates its operating condition. For card LED indicators, see the *Cisco VCO/4K Card Technical Descriptions.* With system error messages as pointers and status LEDs as indicators of specific card failure, you should be able to isolate controller card failures.

Jumpers

Control circuit cards are multipurpose OEM-supplied packages, modified for operation in the VCO/4K system by Cisco Systems. Modifications include the installation of custom PROM chips in firmware sockets.

Caution Removing or repositioning the jumpers on control cards will result in system failures and possible damage to the card or to peripheral devices connected to it. Always verify that the jumpers are in their proper positions before installing a new or replacement card.

Control Circuit Card Configuration

Card configuration is the process of setting jumpers on service circuit cards to meet application requirements. The *Cisco VCO/4K Card Technical Descriptions* details configuration requirements for VCO/4K Control Circuit cards.

If a card is improperly configured, it may fail to function properly. Therefore, you must verify configuration settings before installing a replacement control circuit card in the system. Always check the firmware version against the requirements specified in the configuration portion of the *Generic Release Notes*. If the wrong version of firmware is installed, the system does not operate properly.

Troubleshooting

Figure 4-6 shows general troubleshooting procedures for VCO/4K control circuit cards. Refer to the *Cisco VCO/4K Card Technical Descriptions* for more detailed information.

Figure 4-4 Troubleshooting Control Circuits

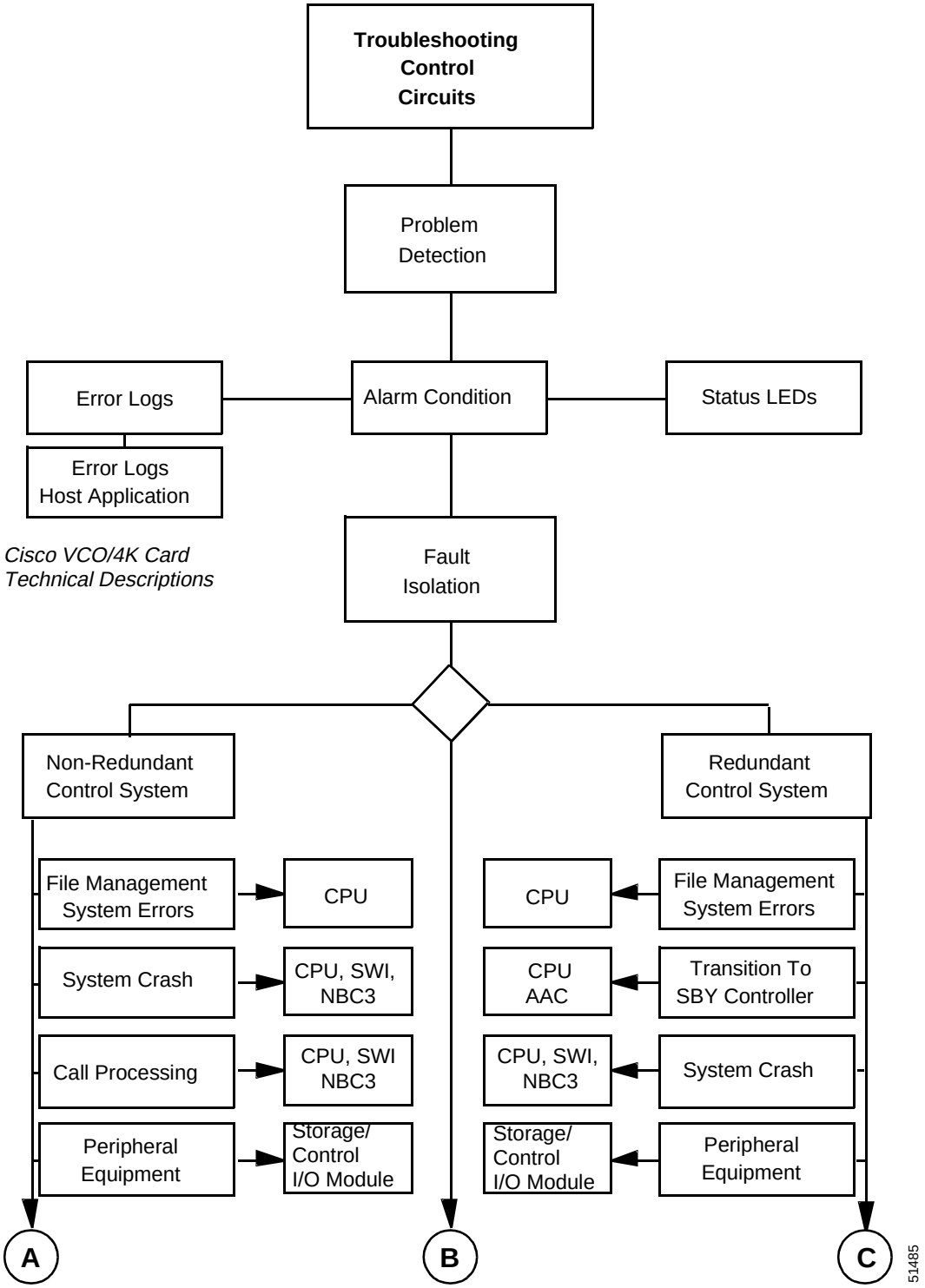
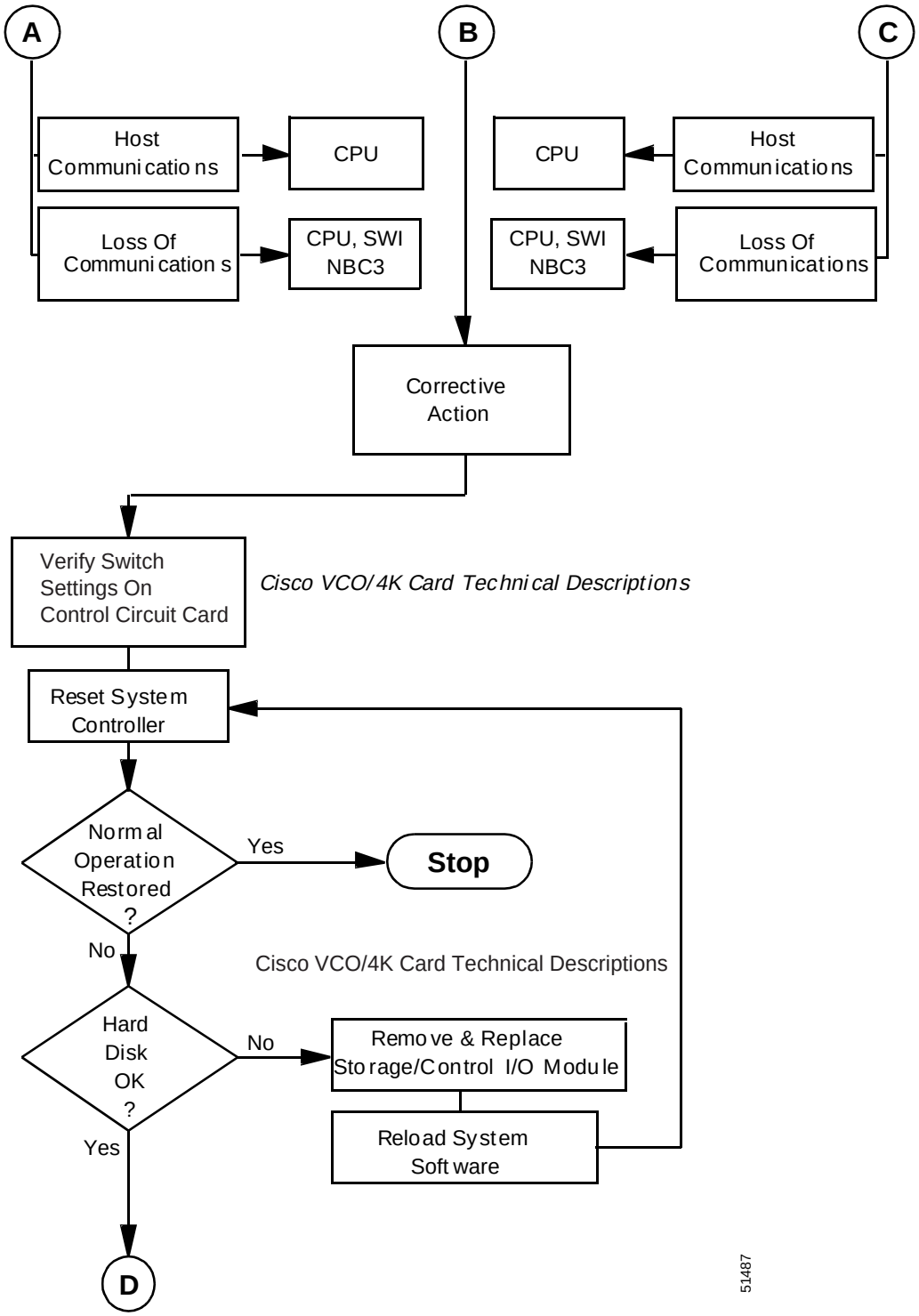


Figure 4-4 Troubleshooting Control Circuits (continued)



Port Interface Cards

Port interface circuits connect the VCO/4K to external telecommunication environments. Problem isolation requires establishing whether the fault stems from external causes or with internal circuit cards and adapters. This section reviews general troubleshooting procedures for VCO/4K port interface cards.

The following comprise the port interface cards:

- ICC Card
- LTC-8 Card
- D+I Card

For detailed information about specific circuit cards, refer to the *Cisco VCO/4K Card Technical Descriptions.*

Fault Isolation—Interface Circuits

The demarcation point for interface with the VCO/4K is the card's I/O Module in the rear of the VCO/4K. From this module, problems are external to the VCO/4K and must be corrected using conventional analog and digital telephone troubleshooting techniques.

Database entries define the external telecommunication environment with which the VCO/4K interfaces. If the entries do not reflect the reality of the environment, the system cannot effectively process calls. Problems with the database can be caused by human error in administering the database and by undocumented alterations to the external wiring plan or telephone station programming.

Other hardware-related faults include faulty CO lines, defective interconnect cables and backplane adapters, and software/firmware incompatibility. VCO/4K status LEDs on the front panel provide a visual indication of operating status.

Digital Interface Card Problems

Interface to digital channel banks across a T1 span line requires the use of the following digital trunk interface cards: LTC-8, ICC, or D+I.

The NBC3 assures synchronization between VCO/4K internal clocks and incoming/outgoing spans; T1, E1, or ISDN.

Digital Alarm Conditions

Factors which cause Digital Interface major alarm indications include:

- Loss of carrier
- Failure of internal communications bus test (card self-test)
- Card out-of-service (manually via Master Console or due to a communication bus error)

Table 4-2 summarizes the Master Console actions that affect these cards. For more information, refer to the *Cisco VCO/4K System Administrator's Guide*.

Table 4-2 Master Console Major Alarm Response

Action Taken at Master Console	Outward Action
Change card state to Diagnostic from Active or Maintenance	VCO/4K: Tears down any active calls and goes into local loopback; sends all 1s, all bits alarm. Stops sending, which causes Red alarm at far end.
Change card state to Maintenance	New seizures are not processed.
Change card status to Active from Diagnostic	Starts sending bits or stops sending all 1s, all bits. Yellow alarm sent from far end. Far end stops sending Yellow alarm when carrier is restored. If card was previously in Maintenance state, it returns to Maintenance. Otherwise it returns to Active. VCO/4K: Any ports that have been deactivated from the Card Maintenance menu or by host command are seized out (busied out).
Change to OOS	Sends all 1s, all bits.
Change card status to Active from OOS or Maintenance	Card is reset. VCO/4K: Any ports that have been deactivated from Card Maintenance menu or by host command are seized out (busied out).

Factors which cause Digital Interface minor alarms include:

- Loss of remote carrier
- Detection of a signaling bit alarm
- Slips
- Out-of-Frame (OOF) condition
- Out-of-Frame (OOF) maintenance threshold reached

Loss of carrier can be attributed to a fault in the span line or a failure of the digital side of the terminating equipment. Loss of synchronization can be related to problems with the T1/PRI span line providing external sync with the VCO/4K, an external sync pulse source connected to the NBC3, or NBC3 Digital Interface phase lock timing.

Verify terminating equipment operation and the span line connection before removing and replacing a digital interface or NBC3 card. Loss of a channel(s) may be the result of problems on the originating side of the terminating equipment/digital switch.

Test Port Card Option

The Test Port Card screen from the Diagnostics menu allows a technician to send a digit string through specified channels of a Digital Interface card and loop the results through a DTMF or MF Receiver card. The test compares the expected string against the received string and sends an error message to the file and printer, indicating the error and ports affected.

Note The Test Port Card function can only be used to test T1 channels or ISDN B-channels. PRI/N D-channels cannot be tested using this utility.

For DTMF receivers, the following string of digits is sent through the first and subsequent T1 channels: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, *, #. For MF receivers the following string of digits is used: KP, 0, 1, 2, 3, ST, 4, 5, 6, 7, ST3, 8, 9, ST1, KP, 0, 1, 2, STP. The test automatically cycles through the range of receiver ports entered by the administrator as each T1/PRI channel is tested.

Note Use the Card Maintenance screen under the Maintenance menu to place the desired receiver card and T1/PRI card in Diagnostic (D) mode. This test does not work unless both cards have been placed in Diagnostic mode.

If all messages are printed, the screen shows the RLSP addresses of both the receiver and the Digital Interface card ports, as well as the results when each channel is tested. If a channel passes the test, a message appears on the screen and the port numbers are incremented for the receiver and Digital Interface cards. When all channels of the Digital Interface card have been tested, a message appears at the bottom of the screen.

If a channel fails a test, an error message, the two-digit test strings and the address of the channel are sent to the error log and the system printer. For additional information, refer to the *Cisco VCO/4K System Administrator's Guide.*

Interface Card Configuration

Card configuration refers to the process of setting jumpers and switches on interface cards to meet application requirements. The *Cisco VCO/4K Card Technical Descriptions* details configuration requirements for VCO/4K analog and digital interface cards.

If a card is improperly configured, it may fail to perform its interface function between external lines/trunks and the system. You must verify configuration settings before installing a replacement interface card in the system. Always check the firmware version against the requirements specified in the configuration portion of the *Cisco VCO/4K Release Notes*. If the wrong version of firmware is installed, the system does not operate properly. Refer to Appendix A in the *Generic Release Notes* for details on removing and replacing firmware PROMs.

Class of Service (COS) also affects operation of the card. A COS of T or 2 sees inward seizures as call originations. A COS of O interprets inward seizures as the port being busied out by the far end. If calls are not being properly processed, check the COS.

Pay special attention to configuring E+M cards. The configuration of an E+M card is closely tied to the midplane adapter through which connections are made to the backplane. If the card configuration does not match the specifications for a USOC interface, problems will result. Refer to the *Cisco VCO/4K Card Technical Descriptions* for card configuration.

Troubleshooting

Figure 4-6 shows general troubleshooting procedures for VCO/4K port interface cards. Refer to the *Cisco VCO/4K Card Technical Descriptions* for more detailed information. Figure 4-6 shows the procedure for removing and replacing an interface card.

Note Removal and replacement procedures shown in Figure 4-6 apply to replacement with identical cards meeting the parameters currently contained in the database.

Caution Observe antistatic precautions when handling interface circuit cards to avoid damaging sensitive CMOS devices. Wear a ground strap connected to the VCO/4K equipment frame whenever you service or clean circuit cards. The ground point is indicated by a label on the upper right side in the front of the system (with the door removed)

Figure 4-5 System Fault Isolation

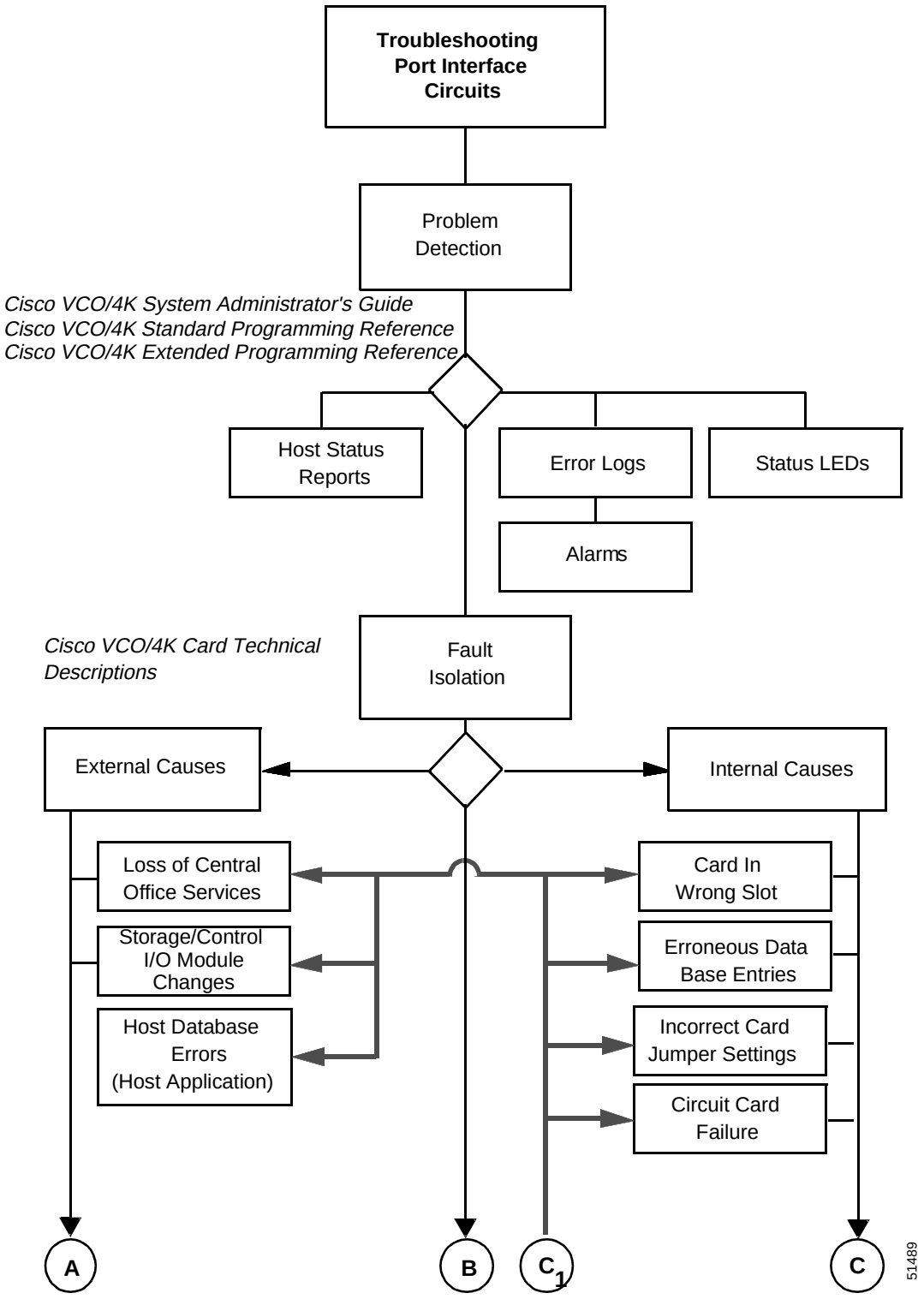
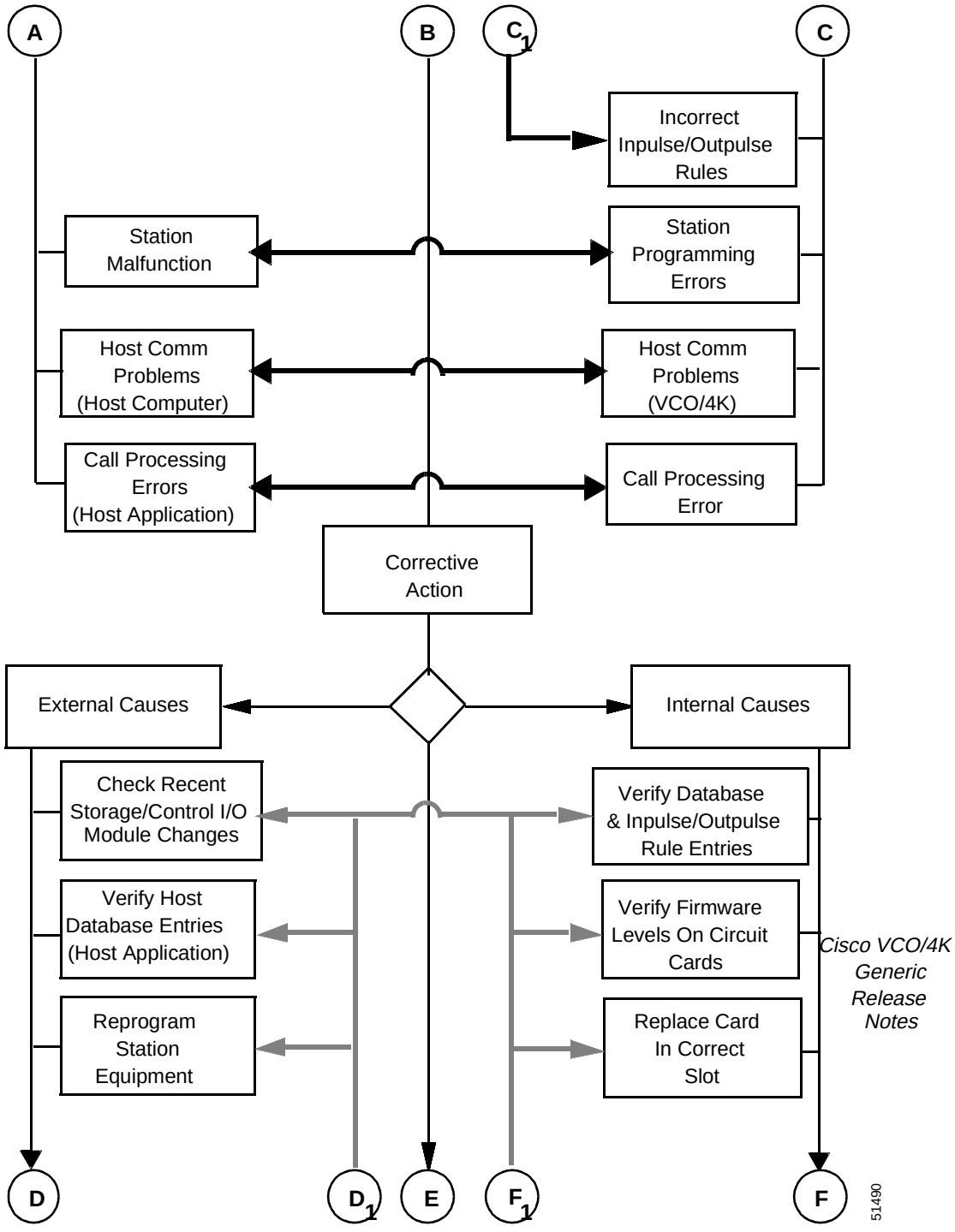
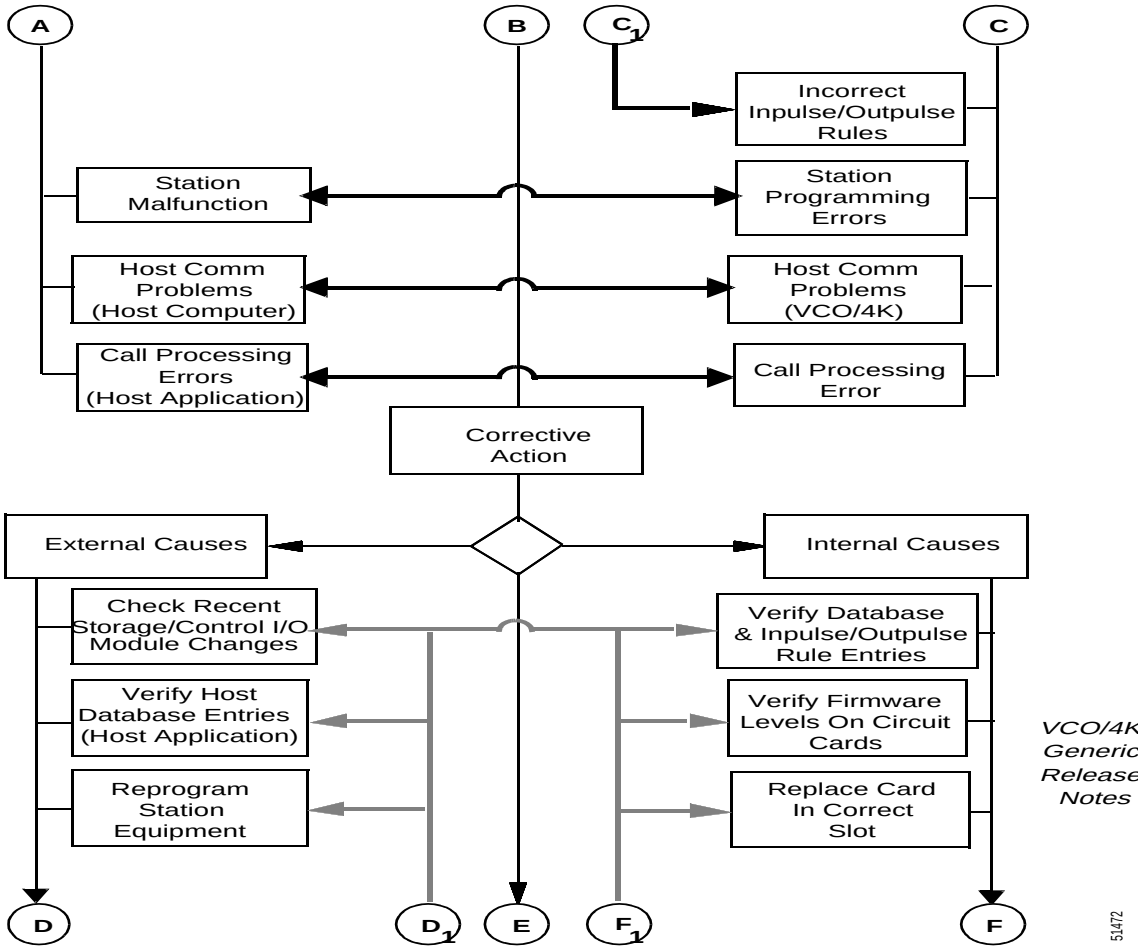


Figure 4-5 System Fault Isolation (continued)



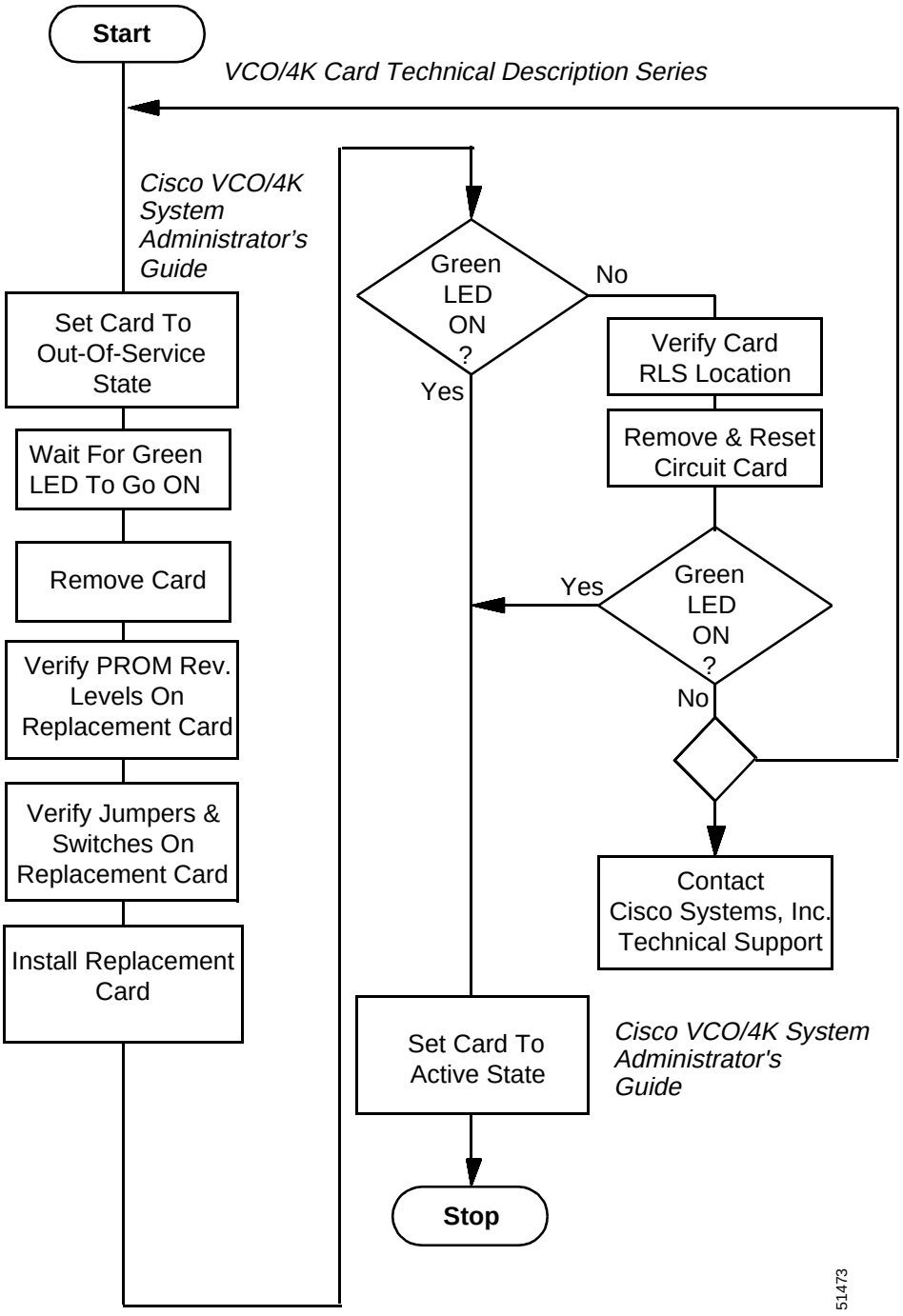
Cisco VCO/4K Generic Release Notes

Figure 4-5 System Fault Isolation (continued)



VCO/4K Generic Release Notes

Figure 4-6 Removing and Replacing an Interface Card



Service Circuit Cards

Service circuits provide pooled resources to be used by call processing software when answering or initiating calls over interface circuits. Services include tone generation, voice announcements, conference ports, DTMF or MF receivers, and call progress tone detection. This section reviews general troubleshooting procedures for the VCO/4K service circuit cards.

VCO/4K tone services, including tone generation and receiving/decoding, are provided by circuit cards containing appropriate firmware. Tone generation is accomplished through DTG cards. Individual tones are output in reserved Port Addresses (PAs) which the system controller can map to an interface circuit. The DTG-2 card is located on the NBC3 card in slot 1 (and slot 2 in redundant systems).

Service circuit cards include the following:

- Digital Tone Generator (DTG-2)
- Integrated Prompt/Record Card (IPRC) with 8, 64, or 128 ports
- Service Platform Card (SPC)
- Service Resource Moduls (SRM)
- Subrate Switching Card (SSC)

For detailed information about specific circuit cards, refer to the Cisco *VCO/4K Card Technical Descriptions*.

Causes of hardware failures on individual circuit cards can be:

- Incorrect interface configuration
- Environment (operating temperature and static electricity)
- Transient power surges
- False signaling from external sources (lightning, transient or recurring overvoltage or shorts)
- Faulty midplane connections
- Discrete component failures

Service Circuit and Trunk Card Downloads

The following service circuit and trunk cards require a software download from hard disk prior to being brought into service:

- IPRC[8], IPRC[64], IPRC[128]
- SSC Subrate Switching Card
- SPC

During initial system power up (cold reset), the software downloads are broadcast simultaneously to each card type (SPC and ICC cards do not receive a broadcast download; they receive downloads one at a time). The system is restored to operation after all downloads have been completed. If an individual downloadable circuit card is removed and replaced, it is selectively downloaded when its power-up sequence is completed before being activated.

Receiver Cards

Receiver cards can be placed in any available slot starting with slot 7.

Depending on the application, SPC-DTMF and SPC-MF cards may be required, such as for incoming T1 service. The number of receiver cards required for a configuration is based on anticipated traffic and desired grade of service performance.

Note All DSPs on an SRM of an SPC card must be placed in resource groups of the same type.

Failure of a single DSP card in a system with multiple receiver cards results in a lower grade of service, as fewer circuits are available to meet requests for receiver service. The system processes calls as long as at least one receiver card is available in the system.

Note The LTC-8 card incorporates dedicated DTMF receivers for each circuit on the card. ICC T1/E1 spans require pooled receivers of the SPC.

Voice announcements are provided by IPRC cards. Announcement data is downloaded from the Storage Subsystem whenever the interface is booted. Voice data is stored in RAM on these cards.

Digital conference cards (SPC-CONF) allow voice paths to be bridged together for conference calling purposes. The card performs all tasks associated with adding callers under host control and tearing down the conference as callers leave the conference bridge.

Call progress analysis (SPC-CPA) cards detect a wide range of voice-band signaling, including presence/cessation of ringback, dial tone, busy, reorder, Special Information Tones (SITs), presence/cessation of voice, and pager cue tones.

The loss of a service circuit card can result in the inability of the system to process calls or in poor performance, as calls must wait for resources to become available.

Integrated Prompt/Record Cards

The Integrated Prompt/Record Card (IPRC) plays and records digitized voice prompt information. The card is available in the following port configurations:

- 8 playback/4 record ports
- 64 playback/32 record ports
- 128 playback/32 record ports

Note The IPRC does not operate in record mode in VCO/4K systems with C-bus enabled.

The IPRC can play voice information on up to 128 channels and record on up to 32 channels. All channels can operate simultaneously. The IPRC supports up to 15 prompt libraries of up to 256 prompts each.

Note All IPRCs must be placed into a single resource group.

SPC-CONF Card

Each SPC-CONF card has 64 ports and an on-board processor. By mapping the third and subsequent interface ports (up to seven), conference calls with up to eight callers can be established through the system. Each party in the call hears all the other participants in the call.

The SPC-CONF card can maintain the summation of seven PCM transmit samples. Since a conference port is only required when more than two participants are engaged in a call, the seven-sample summation allows up to eight callers to participate in a call.

Depending on the application, loss of the only SPC-CONF card in a system may block call originations through the switch. If one SPC-CONF card fails in a system with multiple SPC-CONFs, grade of service performance suffers but calls can be completed. Call set-up time may increase as delays in mapping conference ports occur.

SPC-CPA Card

The call progress analyzer card (CPA) detects the presence of dial tone, busy, reorder, SIT tones, and pager cue tones. It also detects the presence or cessation of audible ringback and voice. Each SPC-CPA is equipped with 24 circuits and mounts in any port card slot. An SPC-CPA port is allocated and released during a call as specified by outpulse rule processing. Answer supervision templates are used in conjunction with outpulse rules to configure VCO call processing, timing, reporting, outgoing port answerback, and error processing for signaling and supervision scenarios.

The Call Progress Analyzer application is downloaded from hard disk to the SPC-CPA via the VCO communication bus. Downloads are simultaneously broadcast to all configured SPC-CPA cards whenever a system is reinitialized (rebooted) from hard disk, or a directed download takes place when an SPC-CPA is reset and the download file on the hard disk is different than that stored in the SPC-CPA's RAM.

Note All SPC-CPAs must be placed into a single resource group.

The customer specifies the number and type of SPC-CPA cards required by a system based on anticipated traffic and the call scenario.

Digital Tone Generator-2

The DTG-2 generates DTMF, MF, and call progress tones required by call processing software, and controls the outpulsing sequence over call-completing trunks. It supports 63 outpulsing channels and 64 ports for static tones. One DTG-2 is required in every VCO/4K. Two DTG-2s are provided in VCO/4K systems equipped with the redundant control system option.

In redundant systems, the redundant DTG-2 is in standby status during normal operation. If the primary DTG-2 fails, the other is automatically placed in active service to process calls. A minor alarm is triggered to indicate the need to service the failed DTG-2.

If a DTG-2 fails in a nonredundant system, calls cannot be completed, a major alarm is triggered, and a Phase 4 reboot occurs.

The DTG-2 card is mounted on the NBC3 card and it occupies the same slot as the NBC3.

Note the following:

- If the active NBC3 card switches to standby, the DTG-2 mounted on that NBC3 switches with it.
- An active DTG-2 does not switch with the NBC3 on which it is mounted if the standby DTG-2 has failed, or if there is no standby DTG-2.
- If the active DTG-2 switches to standby, the corresponding NBC3 does *not* switch with it.
- If you remove the NBC3 card, the DTG-2 mounted on that NBC3 is also removed.

- To remove the DTG-2 card, the NBC3 on which it is mounted must be removed.
- Remove the corresponding Combined Controller before removing the NBC3.

Note In bullets 2 and 3, the NBC3 and DTG-2 could be active on different sides, even though they are located on the same card. If you have to remove and replace a problem NBC3 or DTG-2, make certain you know the current active configuration of your system.

Detecting and Correcting Service Circuit Card Problems

For card LED indicators, see the *Cisco VCO/4K Card Technical Descriptions*.

Test Service Circuits

From the Diagnostics menu, you can use the Service Circuit Test Utility screen to perform port tests on specified SPC-DTMF, SPC-MF and SPC-CPA cards.

Note Use the Card Maintenance screen under the Maintenance menu to place the desired service card(s) in Diagnostic (D) mode. This test function does not work unless the card has been placed in Diagnostic mode.

Refer to the *Cisco VCO/4K System Administrator's Guide* for detailed instructions on using this function.

Resetting DTG-2 Cards

VCO/4K systems equipped with redundant control have two DTG-2 cards. The DTG-2 card is mounted on the NBC3 card. Only one DTG-2 is active (all LEDs off) while the other remains in standby (green LED on). The current DTG-2 status is indicated on the Card Maintenance menu.

To change the current status of a DTG-2 card, reset the active card from the Card Maintenance menu. Select the active DTG-2 and use the Change Status (C) function to reset the card to Out-of-Service (O) status.

Note VCO/4K systems do not allow a DTG-2 to be marked OOS if it is the only DTG-2 currently in-service.

The system automatically forces a standby DTG-2 card to active status, and places the active DTG-2 in out-of-service status. A minor alarm occurs, but is cleared when the DTG-2 cards have assumed their new operating status. To reset the out-of-service DTG-2, use the Change Status (C) function to reset the card to Active (A) status. The DTG-2 is reset and placed in standby status. This may take up to four minutes. The minor alarm for the card is cleared.

Refer to the *Cisco VCO/4K System Administrator's Guide* for information on the Card Maintenance menu. Refer to the *Cisco VCO/4K Card Technical Descriptions* for additional information on the DTG-2 card and its active/standby status in relation to the NBC3.

Service Circuit Card Configuration

Card configuration refers to the process of setting jumpers on service circuit cards to meet application requirements. The *Cisco VCO/4K Card Technical Descriptions* details configuration requirements for VCO/4K service circuit cards.

If a card is improperly configured, it may fail to function properly. You must verify configuration settings before installing a replacement service circuit card in the system. Always check the firmware version against the requirements specified in the configuration portion of the *Generic Release Notes*. If the wrong version of firmware is installed, the system will not operate properly. Refer to the *Cisco VCO/4K Software Installation Guide* for details on removing and replacing firmware PROM chips.

Troubleshooting

Figure 4-8 shows general troubleshooting procedures for VCO/4K service circuit cards. Refer to the *Cisco VCO/4K Card Technical Descriptions* for more detailed information. Figure 4-8 shows the procedure for removing and replacing service circuit cards.

Figure 4-8 illustrates general troubleshooting procedures for VCO/4K service circuit cards. The flowchart refers to the *Cisco VCO/4K Card Technical Descriptions* for detailed information on troubleshooting and repair/replacement of VCO/4K service circuit cards.

Note Removal and replacement procedures described in Figure 4-8 apply to replacement with identical cards meeting the parameters currently contained in the database.

Caution To minimize the risk of injury from hazardous voltages, use the ejector tabs on the cards when removing cards. Wear a ground strap connected to the VCO/4K equipment frame whenever servicing or cleaning circuit cards. The ground point is indicated by a label on the upper left front of the system (with the door removed).

Figure 4-7 Troubleshooting Service Circuits

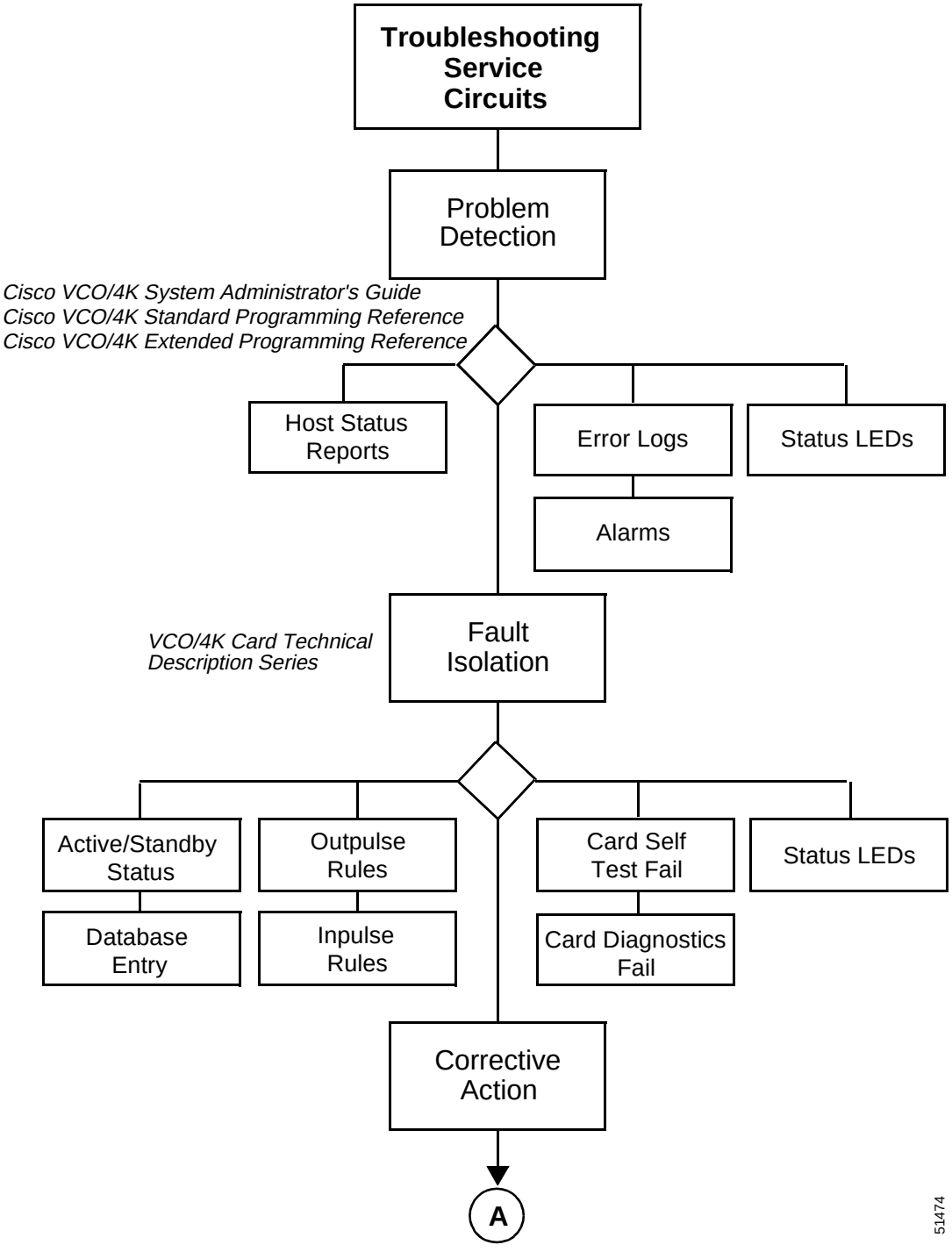


Figure 4-7 Troubleshooting Service Circuits (continued)

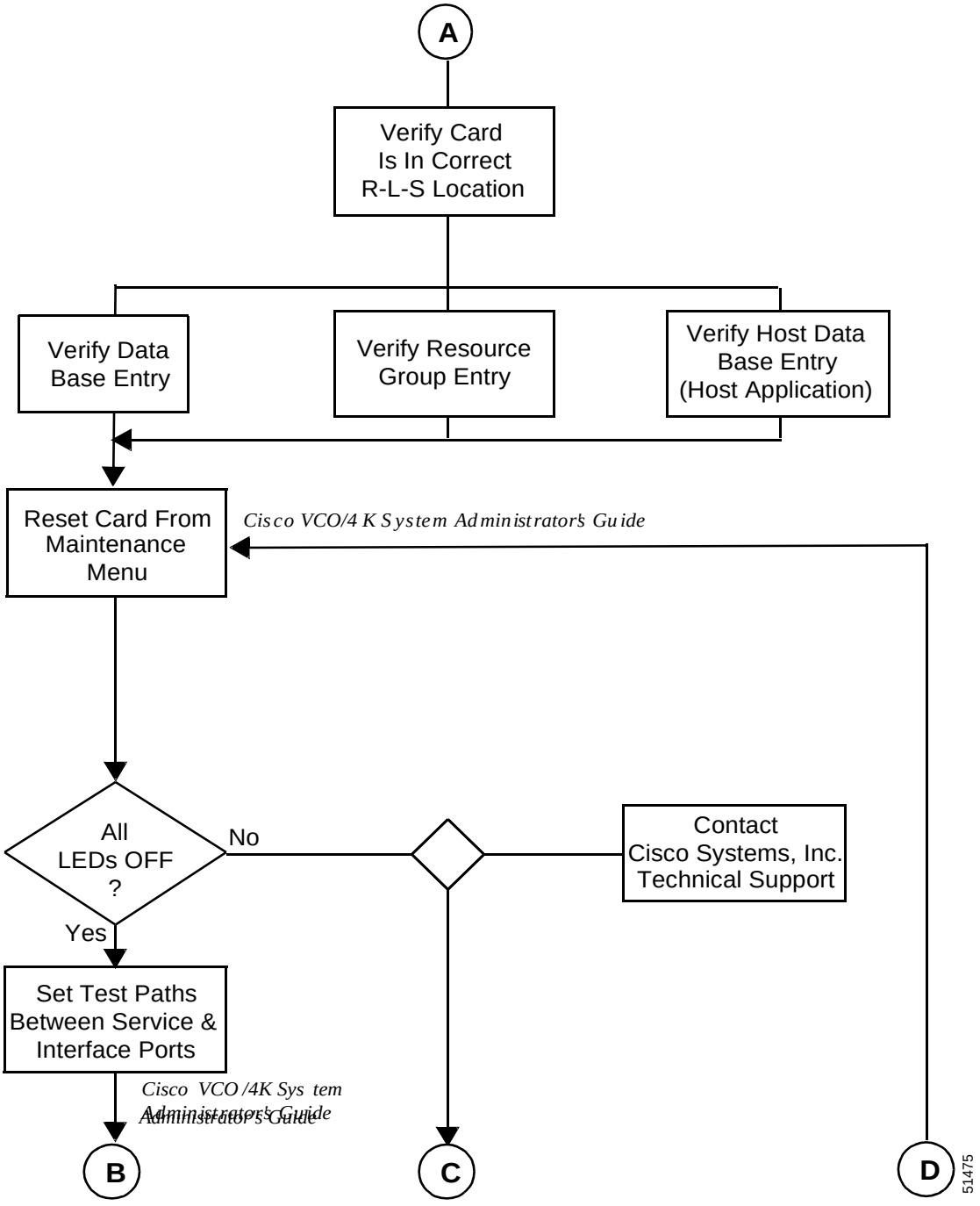


Figure 4-7 Troubleshooting Service Circuits (continued)

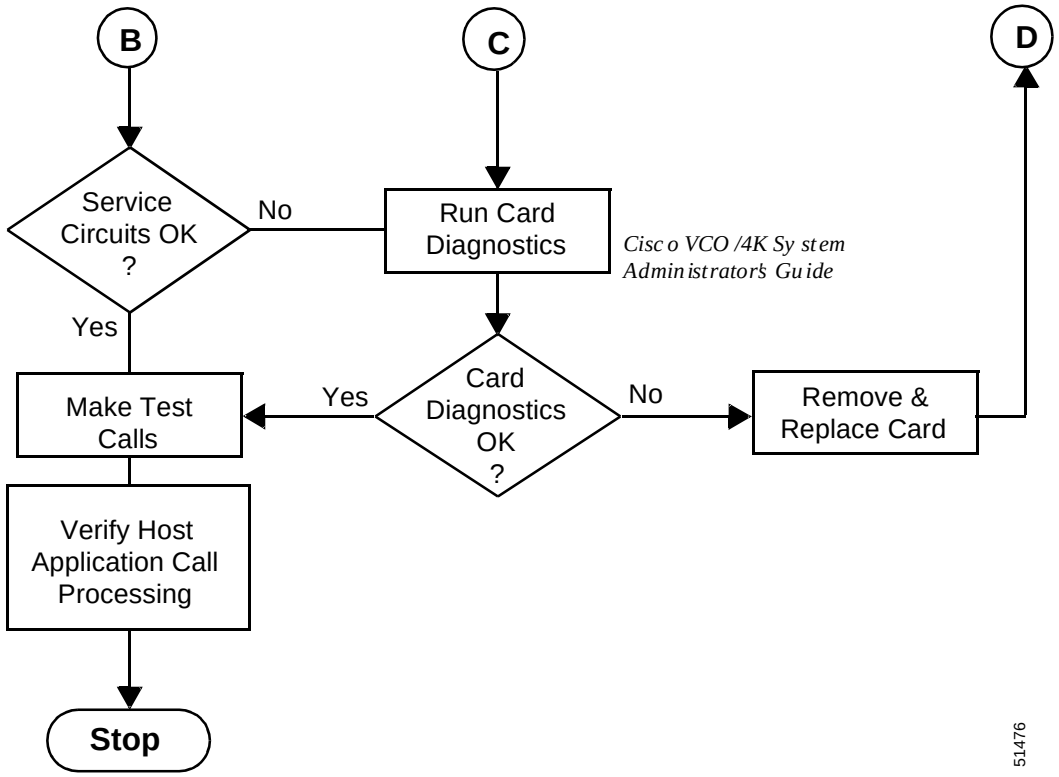
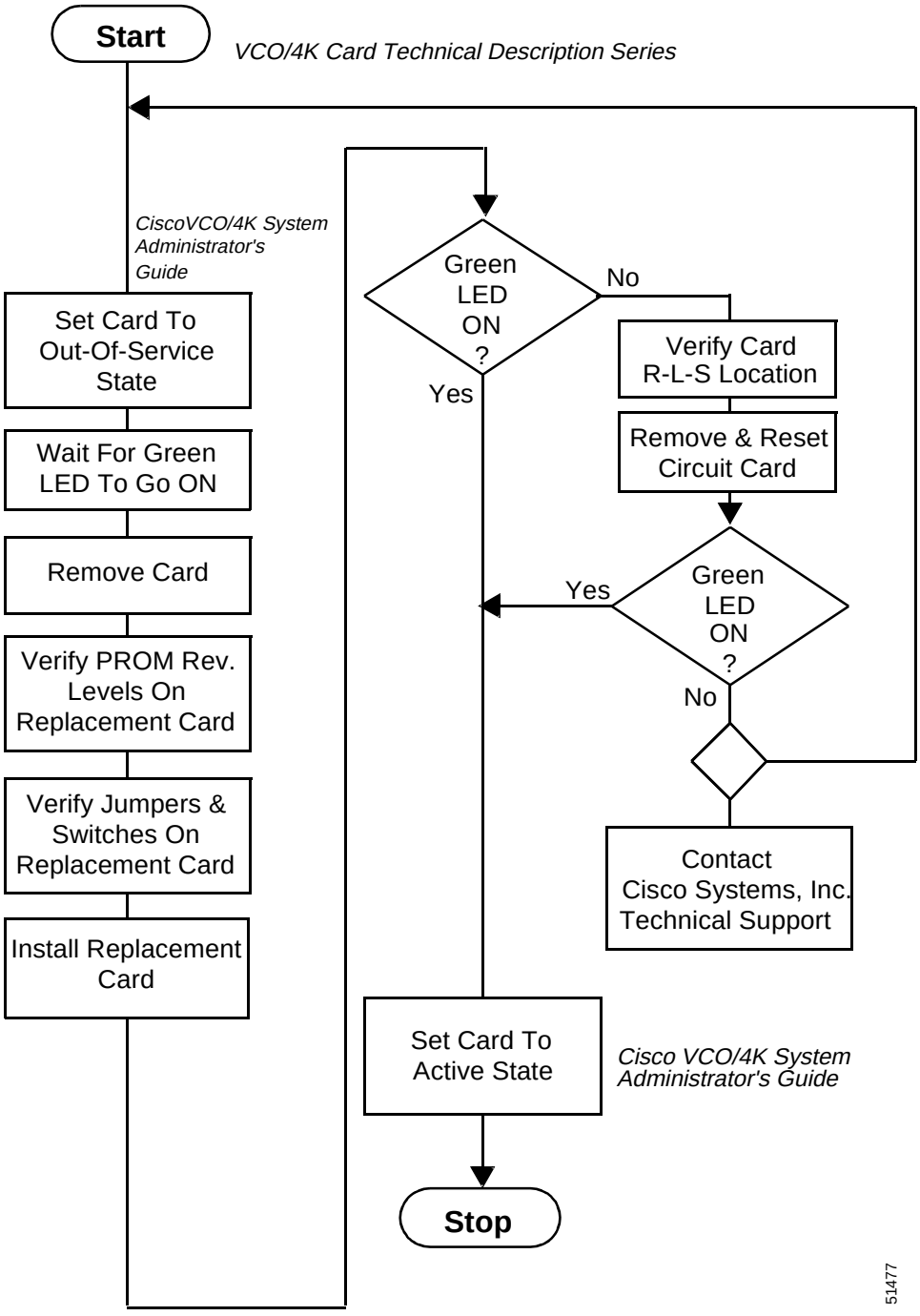


Figure 4-8 Removing and Replacing a Service Circuit Card



VCO/4K Chassis Power

This section describes the subsystem and fault isolation techniques for the power subsystem of the VCO/4K Open Programmable Switch. Refer to the *Cisco VCO/4K Card Technical Descriptions* for a more complete description of the power subsystem components.

Power Distribution

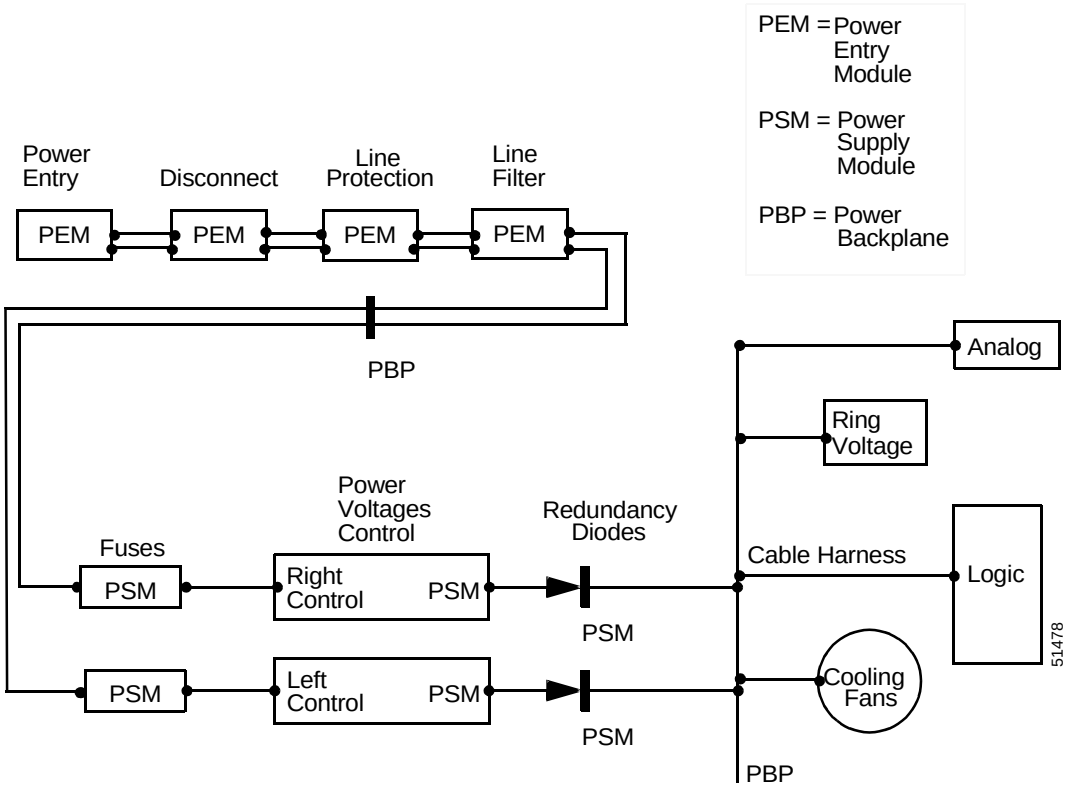
Input power from the power entry module travels through the power backplane to the power supply module where it is converted to usable voltages. The power supply module distributes the voltages to the power backplane, which distributes them to the rest of the system.

The power backplane contains:

- Four fuses (can be automatically reset)
- Connections for alarm signals
- Internal equipment safety connection

Figure 4-9 is a system-level functional diagram of the power subsystem.

Figure 4-9 Power Subsystem Functional Diagram (Dual Supply)



Power Entry Module

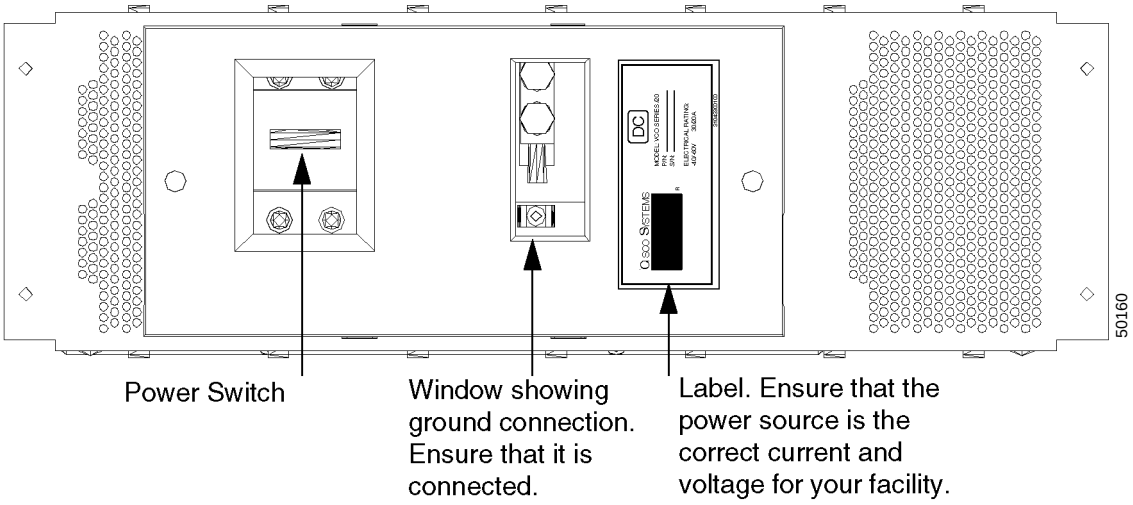
The power entry module serves as a mechanical connection point for site power. It includes the following (see Figure 4-10):

- Ground connection
- Power connector (not in figure)
- Power switch
- Power line filter (not in figure)

Note The power entry module is factory-configured for AC, DC, or dual DC power sources. The factory-installed power supply modules are compatible with the power entry module configuration. Check the label on the power entry module to ensure that the power source is the correct current for your facility before cabling the power source.

The line filter ensures that electromagnetic interference (EMI) neither enters nor exits the system.

Figure 4-10 Power Entry Module



Ring Generator

The ring generator is active only when it is installed in the left power supply module. Ring generators can be installed in both power supply modules in a redundant system. However, the ring generator in the right power supply module is not connected to the system and is considered a spare. Power loss to the left power supply module results in loss of the ring generator (if installed).

Troubleshooting

Power Subsystem LEDs

When the power is off, the left indicator LED on the power supply module is not illuminated.

For card LED indicators, see the *Cisco VCO/4K Card Technical Descriptions*.

Alarms

Two events occur simultaneously whenever voltage monitoring on the control board of the power supply module detects either an over-voltage or an under-voltage condition:

- An alarm is sent to the Alarm Arbiter Card (AAC) and is visually displayed on the AAC. The red MAJOR LED turns on, and the yellow AUX1 LED turns on.
- The power LED on the power supply module turns red.

When these events occur, you must remove and replace the power supply module.

There are two tasks you might need to perform when troubleshooting the VCO/4K power subsystem:

- Replace a fuse or fuses
- Replace the power supply module

Input Power Redundancy

The VCO/4K system can be factory-configured with redundant power supply modules with or without redundant input power.

Figure 4-11 Troubleshooting the VCO/4K Power Subsystem

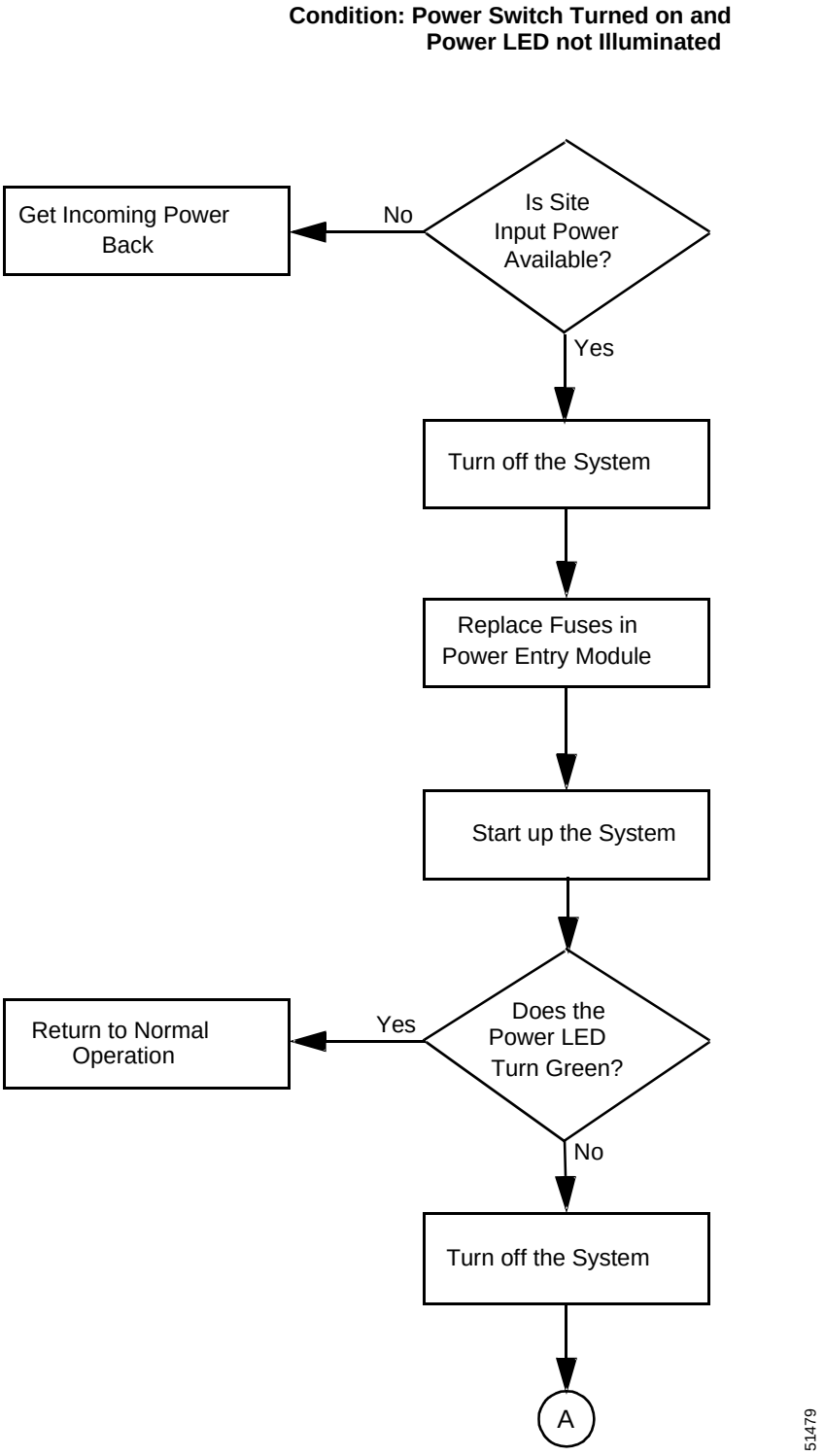


Figure 4-11 Troubleshooting the VCO/4K Power Subsystem (continued)

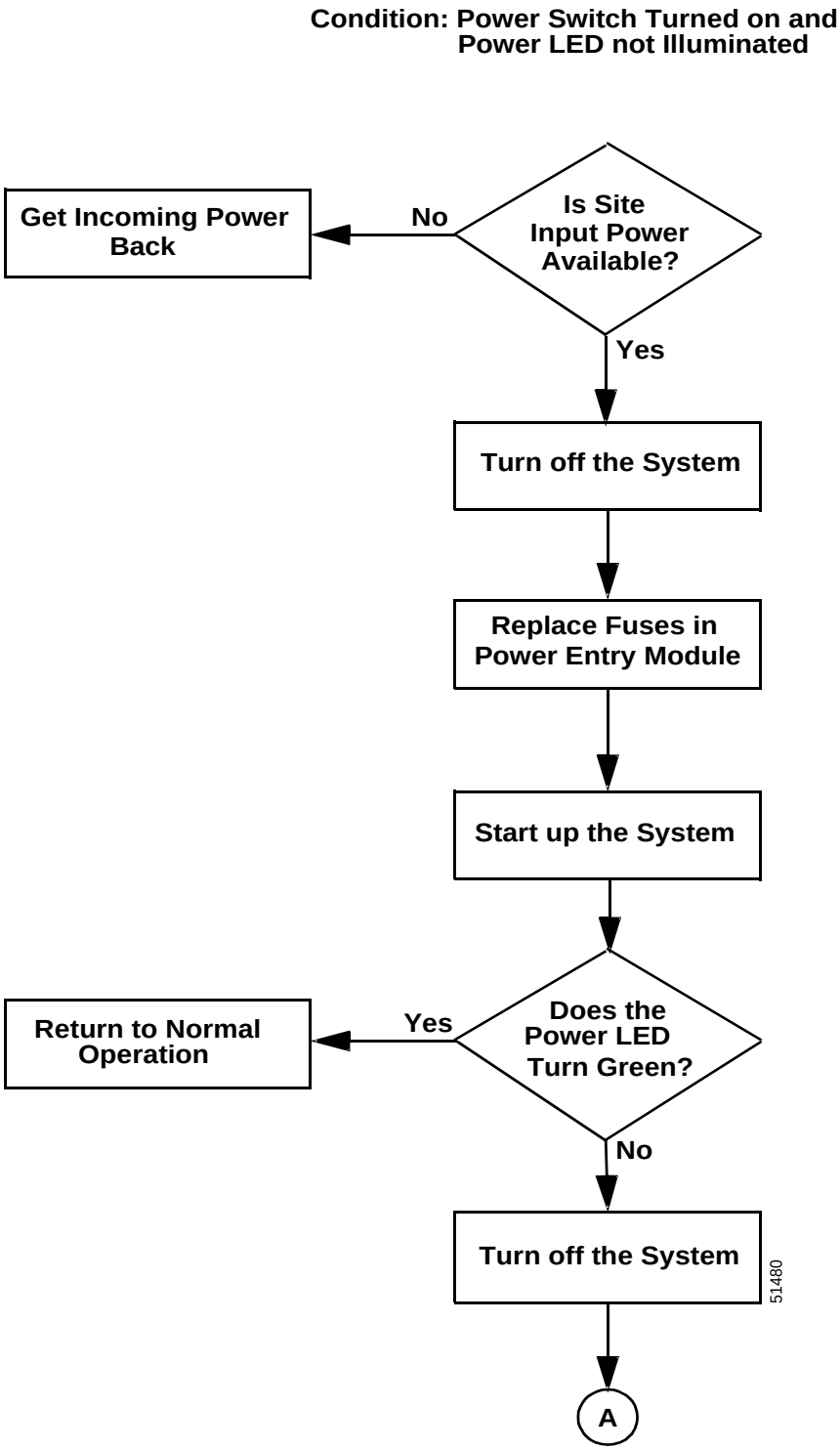
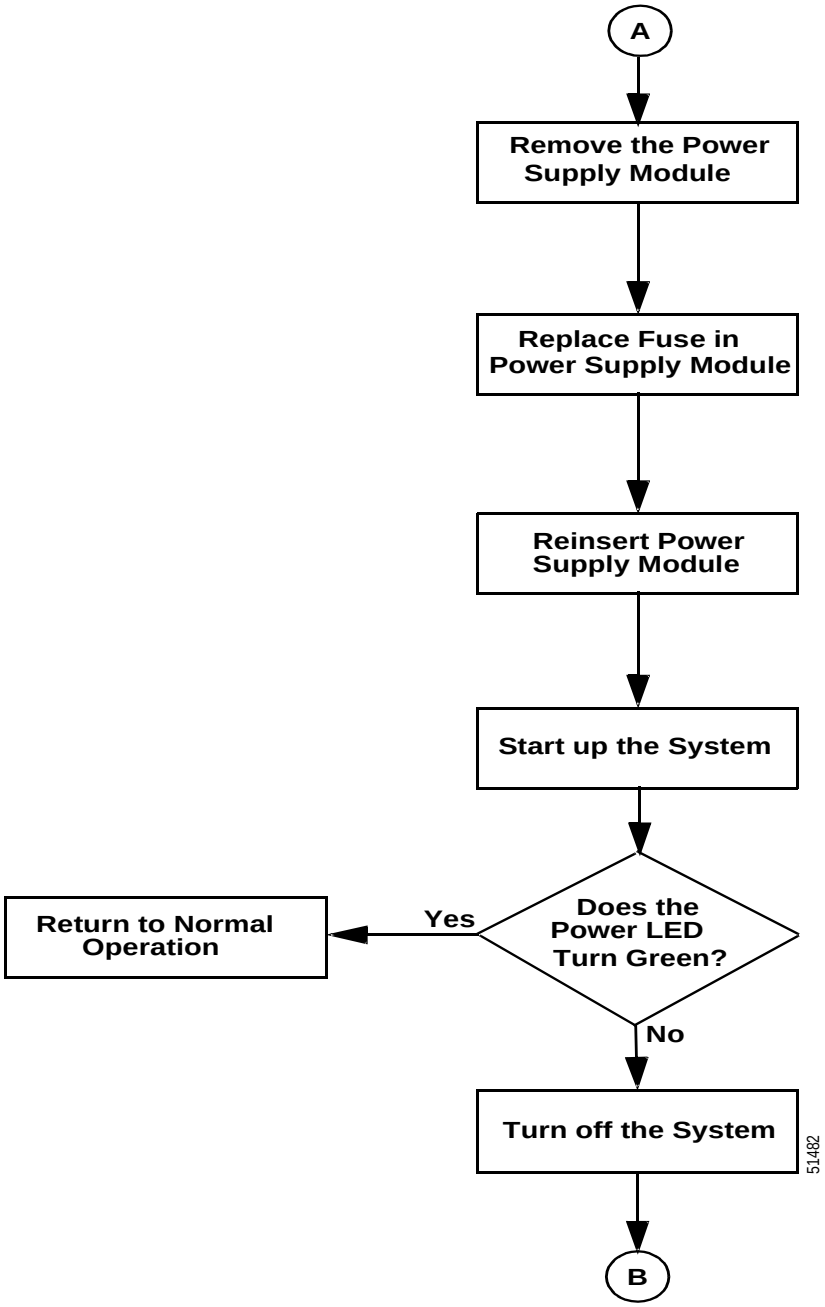


Figure 4-11 Troubleshooting the VCO/4K Power Subsystem (continued)



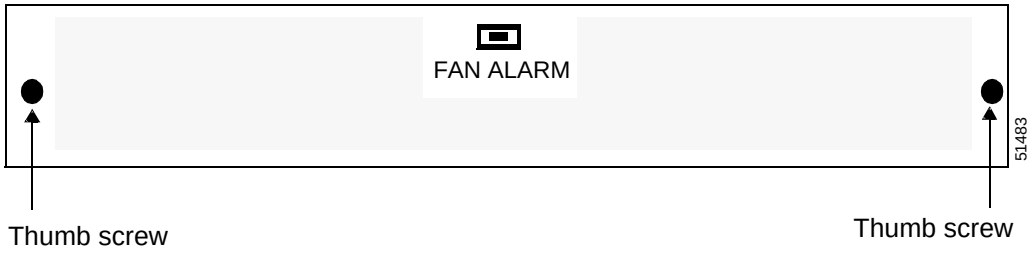
Fan Subassembly

The *Cisco VCO/4K Card Technical Descriptions* describes fan units used in the VCO/4K system.

Power is provided to the fan unit from the power backplane. The fan unit is powered automatically when one or both Power Supply Modules is powered on.

The front of the fan unit refers to the part of the unit which is visible when the unit is installed in the VCO/4K. The front is visible when looking in the rear of the system's enclosure. (See Figure 4-12.)

Figure 4-12 Fan Unit – Front View (Rear of Chassis)



Fan Controller Cards

The fan unit contains three controller cards located between the fans and the front panel, inside the tray. Power is supplied to the fan unit from the VCO/4K's power backplane through the plug located on the right rear side of the unit.

Troubleshooting

Alarm Indicator

The fan controller card monitors its own cooling fans. If current fails to flow through any of its fans, the FAN ALARM LED is illuminated and a signal is sent to the AAC to trip MAJOR and AUX1 alarms. If these alarms are tripped by the AAC, suspect problems with the fan unit. Check the status of the alarm indicator on the fan unit.

For card LED indicators, see the *Cisco VCO/4K Card Technical Descriptions*.

Caution Do not operate the VCO/4K until the fan unit has been replaced.

Fan Failure

If the FAN ALARM LED on a fan unit illuminates, check the following to identify and correct the problem. These troubleshooting procedures require that the fan unit be removed from the VCO/4K.

- Check to determine if a foreign object is blocking fan rotation.
- Check that the internal connectors have not become disconnected.
- Make certain that the J5 power connector has not become disconnected.

If the failed fan does not operate, and all troubleshooting details have been checked, remove the fan unit, pack, and ship it to Cisco Systems for service.

Note Refer to the *Cisco VCO/4K Card Technical Descriptions* for removal procedures.

Power Failure

If a fan unit fails to operate, be sure that power is being provided to the system. Check that the power supply LED is illuminated.

If the power LED is illuminated and the fan unit's front panel LED is extinguished, suspect that no power is being supplied to the fan unit. Remove the fan unit and check that the power plug on the left rear side of the fan unit is plugged in.

If the fan unit still does not operate, contact and report your findings to Cisco Systems Technical Support and request further assistance.

Fan Failure Problem Fails to be Detected by LED or AAC

The troubleshooting procedure below requires that the fan unit be removed from the VCO/4K.

Note Refer to the *Cisco VCO/4K Card Technical Descriptions* for removal procedures.

If a fan fails to operate and the LED does not illuminate, or an alarm is not sent to the AAC, check the following.

- The internal connectors have not become disconnected between the three fan control cards.
- The plug to the LED has not become disconnected.

If an alarm is not sent to the AAC, check that the internal connectors have not become disconnected.

CHAPTER 5

SS7 Subsystem Troubleshooting

This chapter provides procedures that isolate problems that you have already determined to reside in the SS7 Subsystem. The chapter is organized with the following topics:

- SS7 Database Configuration Files
- SS7 Bus Errors
- Mass Storage and CPU Card Problems
- SS7 Datalink
- Hardware Problems

Database

The entries in the cktint, sept, or EBS configuration files must meet the requirements of a specific implementation and must correspond to the external telecommunications environment.

Entering and maintaining the SS7 configuration files that address the system configuration requires a thorough understanding of all the elements in the system. System performance degrades if a discrepancy (such as erroneous additions, moves, and changes to the configuration file) is introduced between system elements and database or file entries. The *SS7 Supplement* describes the procedures required to maintain the configuration files.

Problems with the SS7 configuration files (which may lead to call loss) can cause the following problems:

- Frequent system reinitialization
- Poor grade of service performance
- Rejection of multiple command messages sent by the host
- Inability of host computer to connect or reconnect to the switch

Tracing configuration file problems requires a very detailed examination of configuration file entries across all of the individual configuration files associated with a potential problem.

Bus Errors

In the SS7 subsystem, bus errors can occur in the SS7 VME bus in the control system. These occurrences display error messages identifying the affected bus and cards.

Intermittent bus errors can be the result of:

- Abnormal interface signals
- Power surges or sags
- Environmental problems related to operating temperature, humidity, or grounding

Persistent bus errors can be a sign of:

- Circuit card failure
- Faulty midplane connections
- Internal interconnecting cables

Mass Storage

Mass storage problems (which may lead to call loss) cause the following events to occur:

- File transfer errors between system memory and the database files
- Inability to open, close, read from, or write to a file
- Denial of access to error logs
- Inability to log in

CPU Card

The SS7 CPU card contains an NVRAM chip which stores the IP configuration and EBS license information. A lithium battery prevents loss of this data when power is off.

SS7 Datalink

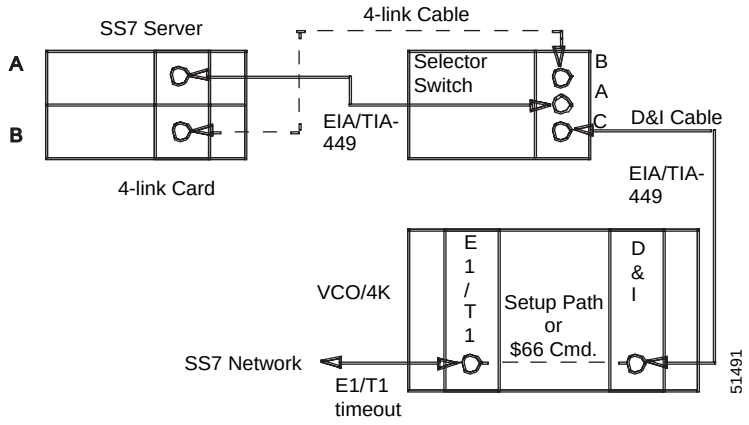
Troubleshooting SS7 link failure can be as simple as correcting a misconfiguration or as complicated as having to change the 4-link card or reloading Solaris. The failure can be due to software, hardware, or configuration.

This procedure assumes familiarity with the installation of the hardware/software components and configuration of the SS7 subsystem. Follow the troubleshooting procedure until you achieve link alignment on your SS7 link. When link alignment is achieved, there is no need to complete the rest of the steps.

Overview

The SS7 link signal starts at the miniature connector of the 4-link card, goes into the Selector (Fallback) Switch (on a redundant system), and then into the back of the Drop & Insert (D&I) card. The signal is EIA/TIA-449 up to this point. The signal is cross-connected to an E1 or T1 using the Set Up Path feature of the VCO system (or a $66 command from the Host). It is then carried in one particular time slot of this E1 or T1 into the SS7 network. Figure 5-1 shows this overview.

Figure 5-1 SS7 Link Problem Overview



Basic Troubleshooting

The following steps describe a basic troubleshooting procedure.

Step 1 From the VCO Diagnostics menu, perform a Display Card Data on the E1/T1 card. Ensure that the E1/T1 is Active and there are no alarms on the card.

Step 2 Ensure that the network has the SS7 link turned on. Contact the personnel responsible for the SS7 network and make sure that they keep the SS7 link turned on until you achieve link alignment.

Step 3 Stop both circuit-interworking and the EBS processes using the **stop-ss7.sh** command. Enter **ebs_ps** and make sure that all the processes are stopped. The following processes will *not* be present:

```
OBJECT
nmdobj  [name=alarmrd]
daemon  [name=spmd]
daemon  [name=upmd0]
daemon  [name=snmd0]
ss7obj  [sp=0 up=5]
```

Step 4 Start up just the EBS processes by using the **start-ss7.sh** command. Watch the screen carefully during startup. Look for the following lines:

```
Loading /dev/ecp0   - device does not exist
Loading /dev/ecp1   - device does not exist
Loading /dev/ecp2   - device does not exist
Loading /dev/ecp3   - device does not exist
Loading /dev/ecp4   - device does not exist
Loading /dev/ecp5   - device does not exist
Loading /dev/ecp6   - device does not exist
Loading /dev/ecp7   - device does not exist
Loading /dev/ecpt0
Loading /dev/ecpt1  - device does not exist
Loading /dev/ecpt2  - device does not exist
Loading /dev/ecpt3  - device does not exist
Loading /dev/ecpt4  - device does not exist
Loading /dev/ecpt5  - device does not exist
Loading /dev/ecpt6  - device does not exist
Loading /dev/ecpt7  - device does not exist
```

There should be at least one blank line after “ecpN” or “ecptN,” where “N” is from 1 to 7. If all lines show “device does not exist,” proceed to the “Hardware Problems” section on page 5-6.

Step 5 Check that all EBS processes are running by using the **ebs_ps** command. The following are some of the processes which must be present:

```
OBJECT
nmdobj  [name=alarmrd]
daemon  [name=spmd]
daemon  [name=upmd0]
daemon  [name=snmd0]
ss7obj  [sp=0 up=5]
```

Step 6 Check the status of the SS7 links using the following MML command:

```
MML_TH>DISPLAY-LINK:LINK=*;
```

Note Use the **mml 0** command to get to the MML_TH> prompt.

Step 7 Open up another Telnet window and execute the following command:

```
tail -f $EBSHOME/access/AlarmLogs/AccessAlarms.n
```

where n is the largest number (i.e., the latest alarm log file) in that directory. If the SS7 link aligned at any time, you should see the message “Port-X available,” where X is the corresponding EIA/TIA-449 port which carries the SS7 link.

Step 8 From the VCO diagnostics menu, check the Set Up Path. Make sure that the correct ports on the D&I and E1/T1 cards are entered. Talk to the SS7 network personnel and make sure that you have entered the correct port (time slot) in the E1/T1. Delete and add back the Set Up Path. Check for SS7 link alignment.

Step 9 From the VCO Card Summary screen, check the configuration of the D&I card. Ensure that the Termination is set to DCE and Bit Packing Order is set to Reverse. Set the Data Rate to be the same as that in your ADD-LSET command in your mtp.mml file. Reseat the D&I card and wait for the card to become Active. Delete and then add back the Set Up Path. Check for SS7 link alignment.

Step 10 From the VCO Card Summary screen, check the configuration of the E1/T1 card. Ensure that there is no Law Conversion occurring in your E1/T1 card. Make sure that the Law setting of the port on the E1/T1 card which carries the SS7 link is set to SYS. Alternatively, make sure that the Law setting on this port is the same as that on the VCO System Feature screen. If you are using the 4xE1/T1 card (as opposed to the ICC card), make sure that the Law setting is the same as that configured by the DIP switches. Also make sure that the time slot which carries the SS7 link is configured for “Sig Type = Clear.”

Step 11 Move the D&I cable to other ports on the D&I card. You must change the Set Up Path accordingly to point to the correct D&I port. Check for SS7 link alignment.

Step 12 Change to another D&I card if you have a spare. Delete and then add back the Set Up Path. Check for SS7 link alignment. If you have a known good spare E1 card, you can also try swapping it with the spare.

Advanced Troubleshooting

At this point, you should be convinced that there is no problem with the EBS software, the VCO Set Up Path Utility, the E1/T1 card, or the D&I card. If you still have problems, do the following:

Step 1 If you are running a nonredundant SS7 system, try the following:

- **a.** Make a DB-9 (male) to DB-9 (female) straight-through cable (i.e., Pin 1 to Pin 1, Pin 2 to Pin 2, etc.) of about 2 meters.
- **b.** Use this cable to extend the D&I cable by about 2 meters.
- **c.** Check for SS7 link alignment.

Step 2 Connect an SS7 protocol analyzer (e.g., Inet Turbo-7, or Inet Spectra) to the E1/T1 to monitor the SS7 link. Set the protocol analyzer to monitor mode. Make sure you are monitoring the correct timeslot. You can use the protocol analyzer to check if the Network has its SS7 link turned on. If it is turned on, you will see SIOS/SIO from the network on the protocol analyzer. If you cannot see SIOS/SIO from the network, talk to the SS7 network personnel to verify that they have turned on the SS7 data link.

Step 3 Monitor the outgoing path of SS7 server. To ensure that you are monitoring the outgoing path, you can delete/add the Set Up Path and watch the protocol analyzer closely. When you delete the Set Up Path, the messages from the 4-link card will not reach the protocol analyzer. You may see, on the protocol analyzer, one of the three following scenarios. Proceed to the corresponding subdivisions of Step 4 for each of these.

- **a.** SIO/SIOS is seen repeatedly.
- **b.** There is a constant stream of octet counts.
- **c.** Garbage output fills up screen after screen.

Step 4 Depending on the results of Step 3 (case a, b, or c), see the corresponding action below:

- **a.** If you are seeing SIO/SIOS sent from both the SS7 server and the network, recheck your settings in your mtp.mml file. This file is generally placed in the $SPC directory (for the ITU configuration) or $SPA directory (for the ANSI configuration). Use the following MML commands:

  ```
  DISPLAY-SP:;
  DISPLAY-LSET:LSET=*;
  DISPLAY-LINK:LINK=*;
  ```

  Recheck all point codes, NI, SLTC, SLC and Layer 2 Timer values. Make sure they are set to the network requirement. Also recheck your Set Up Path and ensure that it is correct.

- **b.** A constant stream of octet counts generally means there is no SS7 signal coming in. The octet counts are fillers from the E1 stream. Reseat the D&I and E1 card. Delete and add back the Set Up Path. Check for SS7 link alignment. If the SS7 link still fails to align, proceed to the “Hardware Problems” section on page 5-6.
- **c.** If garbage output fills up the protocol analyzer screen, it means that the SS7 signal output by the 4-link card has been garbled. Revisit the “Basic Troubleshooting” section on page 5-3, Step 9 and Step 10 If the SS7 link still fails to align, proceed to the “Hardware Problems” section on page 5-6.

Hardware Problems

The hardware problem here refers to either the Sparc5, the 4-link card, the Master/Slave cards in the Selector Switch, or any interconnecting cable. Generally, a hardware problem can be resolved by swapping with a known good piece of hardware. Since there are a number of hardware and cables involved, knowing which one to swap and which one not to can be a tedious task. Also, for the Sparc5 and 4-link card, the SS7 Server needs to be powered down before the hardware can be swapped. This is time consuming.

To determine which hardware to swap, do the following:

Step 1 If the EBS software is not detecting the 4-link card, try to power down/up the SS7 Server to "kick-start" the 4-link card. Before powering down, you may move the file /etc/rc3.d/S85ss7 to the /export/home directory so that you don't have to wait 20 minutes for the SS7 server to come back up. Also remember to perform su, sync, sync, halt command sequence so that Solaris is shut down properly. Connect a console and watch the screen during powerup. Watch for the following lines:

```
Configuring the /devices directory
ecp Driver v3.5.0
Copyright (c) 1991-1995, EBS
SBS334 @0xfcebb000[0x20000]:0xfceb9000[0x10]:0xfceba000[0x28] ipri=4
```

If you can see these lines, it means that Solaris is able to detect the 4-link card. Reload the EBS software and check for SS7 link alignment after that.

If you cannot see the lines, you can try the "kick-start" method two more times. If it still fails, change the 4-link card. If changing the 4-link card still fails the "detect" test, you may have to change the Sparc5. The SBus is, after all, residing on the Sparc5 card.

Step 2 Once EBS ecp/ecpt drivers are capable of detecting the 4-link card, you can connect the protocol analyzer directly to a 4-link card using one of the 4-link cables. Note that the signal is EIA/TIA-449, thus you will need a EIA/TIA-449 pod on your protocol analyzer to make this connection. Set your protocol analyzer to Emulate mode, with Layer 1 set to Terminate and DCE. Note that the DCE (protocol analyzer) supplys the clock signal. You should be able to see SIO/SIOS from the SS7 server; if not, it is likely that to be one of the following:

- You have not started the EBS processes.
- You have started the EBS process but you have not configured the MTP layer.
- There is a faulty 4-link cable.

Step 3 Cabling is a common source of problems. Because the cable from the 4-link card via the Selector Switch to the D&I card consists of many segments, the best approach is to use a cable which has proven capable of obtaining SS7 link alignment. Check the cables for bent pins. Take care not to over-tighten the miniature EIA/TIA-449 connectors at the 4-link card. You may tighten the rest of the connectors at the Selector Switch and at the back of the D&I card.

Caution Do not add an extension to any cable except as described in the "Advanced Troubleshooting" section on page 5-5, Step 1.

Attempt to isolate the problem with one of the following options:

a. Swap the cable with a known good cable. Test for SS7 link alignment.

b. Use a different D&I port. Remember to change the VCO Set Up Path accordingly. Test for SS7 link alignment.

c. Change to a different Master/Slave card in the Selector Switch. You can toggle the A/B switch to the side on which you are trying to achieve link alignment with Test for SS7 link alignment.

.

A Last Resort

Consider the following possibilities for causes of uncommon problems:

- An EMI (Electromagnetic Interference) problem. It will often present strange results because EMI is unpredictable. It is difficult to find equipment to detect or measure EMI. In a practical sense, however, the solution is quite simple. Observe the protocol analyzer screen checking for SS7 link alignment as you move the cables (connected securely) side to side and up and down. Observe the screen while you disconnect all unnecessary cables or remove them completely.
- Solaris indicates that there is no problem, but in fact is not functioning properly in using the ecp/ecpt drivers to drive the 4-link card. Generally you are not able to see messages in its log file that support this, but a reload of the Solaris may solve the problem.
- If all else fails, contact Cisco TAC to open a case. Remember that on-site troubleshooting is not possible without an protocol analyzer test set with the appropriate pods.

CHAPTER 6

Host Communications Troubleshooting

This chapter describes general corrective procedures for host communications links. Refer to the *Cisco VCO/4K System Administrator's Guide* for additional details on configuring Ethernet host communication links. The *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference* describe the command and reports passed between a VCO/4K and a host. Refer to the *Cisco VCO/4K Ethernet Guide* for information on TCP/IP sockets and additional maintenance practices.

Reference is made to other OEM manuals supplied with the host computer I/O package and modems employed for a remote access (optional), and to documentation related to the communication and application packages to be run on the host computer.

Overview

In a VCO/4K, the CPU card in the system controller controls initializing and deinitializing the host link(s) and data transfer to and from the host. All control sequences are initiated by the CPU card; the Storage/Control I/O Module is merely a connector panel which provides physical connectivity between EIA cables and the CPU card.

Before a host communication channel can be initialized, you must first define it with the Host Configuration utility (refer to the *Cisco VCO/4K System Administrator's Guide*). This utility is used to configure host interfaces and software overlays (TeleRouter) and indicate the status of alarm conditions for host interfaces. The following constraints are placed on this configuration:

- In general, the more host interfaces you define, the more system processing time is dedicated to host interface processing.
- You can define up to eight Ethernet interfaces (sockets). Refer to the *Cisco VCO/4K Ethernet Guide* for more information on Ethernet interfaces.
- You can define a total of eight external interfaces.
- Configure the internal interface only if the TeleRouter software overlay is to be used. If you do not configure the internal interface, TeleRouter call routing is not performed.

The host communication parameters are defined in Table 6-1.

Table 6-1 Host Communication Parameters

Interface	Parameters
Ethernet	Host Name
	Connect Password (for local port)—optional
	Loc. Port (logical port number of local port)
	Rem.Inet.Addr (Remote Internet Address)
	Rem. Port (logical port number of remote port A)
	Trace
	Protocol (fixed at TCP)
	Reset Time

A reset deinitializes the link (if it was already in service) and then initializes it and applies the configuration parameters stored in the database. Three events can cause a link reset:

- A system reset occurs on the VCO/4K (system reboots or is powered up).
- The link configuration is modified with the Host Configuration utility.
- An error occurs on the link (polling timeout, signaling error, etc.).

Problem Isolation Techniques

VCO/4K administrative software continuously monitors host communications links. Since the VCO/4K acts as a subordinate node in a network configuration, it expects the host (master) to poll the communications channels at regular intervals for message exchanges.

Error and status messages reflect the status of the data links between the VCO/4K and the host computer. If a communication channel fails, the appropriate message is sent to the VCO/4K error log (stored to disk and/or printed on the local printer, depending on the File System Configuration selections). Messages with the HST prefix indicate errors or status changes in host communication. Refer to the *Cisco VCO/4K System Messages* whenever a host error or status message appears on the local system printer.

The following subsections offer general troubleshooting guidelines for remedying the cause of a host communications link failure.

Host Communications Failure on Power-On

If the system experiences a general failure of host communications at initial system power-on, check for the following:

- Verify proper installation and connection of communications cables. Refer to the *Cisco VCO/4K Installation Manual, Cisco VCO/4K Card Technical Descriptions,* and the *Cisco VCO/4K Ethernet Guide* for detailed information.
- Make sure that the host computer is on line and equipped with appropriate I/O hardware and software.
- Be sure that the host computer operating system and associated applications programs have been properly loaded and started.

Note For systems equipped with the optional Ethernet Communications Package, refer to the *Cisco VCO/4K Ethernet Guide* and the *Cisco VCO/4K System Administrator's Guide*.

- Make sure that the VCO/4K is powered on and that the Generic software is loaded on the system.
- If a VCO/4K is equipped with redundant system controllers, try switching from Side A to Side B. Monitor the system log for network messages. If host communication is restored, service the standby controller. If communication is not restored, recheck the I/O circuitry at the host computer.
- Enable the trace facility of the VCO/4K (refer to the *Cisco VCO/4K System Administrator's Guide* for information on setting message trace bits and using the System Trace Configuration utility). If the trace and message facilities fail to demonstrate data communications with the VCO/4K, insert a protocol analyzer in the communication link(s) to determine whether the VCO/4K (no responses sent) or host (no commands sent) is at fault.

Cabling

Cabling refers to the general wiring practices used to complete the physical connection between a host communications port and a DB-15 Ethernet port. The *Cisco VCO/4K Hardware Installation Guide* describes the possible host communication configurations supported by the VCO/4K. Cabling between the host and the VCO/4K is determined by the desired system implementation.

Use the following recommendations to detect and correct cabling problems:

- Make sure the cable used for the link meets electrical specifications.
- Select and install connectors on the cable in accordance with the pinout specifications detailed in the *Cisco VCO/4K Hardware Installation Guide* and/or the *Cisco VCO/4K Site Preparation Guide* and the OEM specifications for the I/O port on the host computer. Physical Ethernet connections are determined by the network environment.
- Route cables away from sources of EMI and RFI noise which might induce spurious signals. Induced noise can cause erratic system performance, including loss of service.
- Remove breakout boxes or other adapters and line analyzers from communications links as soon as possible. This is especially true when long cable runs are used between the host and the VCO/4K. Such devices increase the chance of errors caused by propagation delay of signals and low signal voltages.

Modems

Modem setup parameters are dictated by the type of interface, communication protocol, cabling requirements, and answering mode required for the intended application.

To determine the actual modem setup requirement, review the following documents:

- Cisco VCO/4K System Administrator's Guide
- OEM operation manual supplied with the modem
- I/O port driver specifications for the application software on the host computer
- Application throughput and load requirements

If the modems are connected over the switched public network or leased data lines, you must also contend with problems of noise, line losses and other problems common to data communications over analog networks.

Host Computer

Host computer I/O consists of hardware and software components which control data communications to and from the VCO/4K. The complexity of the data communications requirement is directly proportional to the number of channels between a host computer and the VCO/4K, the telecommunications traffic throughput expected for the intended application, the number of messages per call scenario, and the communications type/protocol selected for the links.

Traffic throughput requirements affect the CPU overhead required in the host computer. CPU overhead must also be provided for I/O processing of the communications links. The host computer communications software includes drivers for the I/O ports and I/O performance is controlled by the relative sophistication of the communications package running on the host.

If excess CPU overhead is expended on trying to run the call processing application, the I/O rate of the data links may be insufficient to prevent timeouts and resets at the interface ports of the VCO/4K. The host may be unable to receive, process, and return a command to the VCO/4K to prevent such autonomous timeouts and resets.

Host communications links must be operated and serviced in real time. All VCO/4K events and transitions are initiated over these links. Any delays in response affect the timely execution of the application.

If the call processing application requires sending/receiving a relatively large number of commands and reports over the communications links, the host I/O hardware and software should be selected to accommodate this requirement.

Use the following guidelines to reduce problems resulting from the handling of data communications between the host computer and the VCO/4K:

- Select the host computer and I/O hardware and software based on an analysis of the traffic and I/O requirements of the intended application, specifically the number of interrupts per second and network packets received or transmitted per minute, and buffering requirements to support these throughputs. Large system configurations with relatively complex call processing scenarios will require more powerful CPUs, intelligent I/O controllers and sophisticated communication protocols.
- Multiple active and redundant data link configurations also greatly affect the selection and configuration of the host computer. Dual host computers are recommended for large system configurations requiring full control redundancy.
- Strictly observe the interconnection and driver specifications for the selected host computer I/O hardware/software. Compare the desired communications requirements against the recommendations contained in the *Cisco VCO/4K Ethernet Guide*. Data communications problems often result from improper connection to, and control of, host I/O ports.
- The call processing application running on the host should incorporate the ability to monitor data communications to and from the VCO/4K. Refer to the *Cisco VCO/4K Standard Programming Reference* and the *Cisco VCO/4K Extended Programming Reference* for recommended use of commands and reports supported by the Generic software.
- If checking cabling, modem setup, and CPU status does not quickly resolve a host communications link failure, the problem is most likely the result of initial assumptions made when selecting the host computer and data communications options. This is particularly true when link failure occurs as traffic increases through the system.

- Cisco Systems recommends that physical host communications lines not be multiplexed or data compressed through statistical multiplexers. These devices induce transmit and receive latencies which cause timeouts between the VCO/4K and the host computer.

Corrective Procedures

The steps to be taken to correct host communications problems vary according to the suspected cause. Table 6-2 cross-references causes to corrective procedures.

Table 6-2 Lost Data and Lost Communications Causes

Possible Cause	Corrective Procedure	
	Erratic or Lost Data Communications at Initial Power-on	**Erratic or Lost Data Communications After Successful Power-on**
Host I/O Failure	1. Reboot the host computer and load application and communications software. 2. Reboot the VCO/4K. 3. If unsuccessful, verify host computer I/O performance via the protocol analyzer or other in-circuit device.	1. Verify the operational performance of host computer and its I/O ports. 2. Enable message trace facility to determine whether messages are being passed over the communication links. 3. If unsuccessful, insert a data communications analyzer in the link. Look to see whether messages are being sent by the host and/or the VCO/4K. Failure to send a command or report isolates the cause to either the host or the VCO/4K. 4. Review the host I/O driver and application package to assure that VCO/4K commands and reports are being properly handled, without excessive delay.
Cabling	1. Inspect all connections between the host and the VCO/4K. 2. Verify that the pinouts meet signaling requirements of host and the Storage/Control I/O Module.	
CPU Card	1. Verify that the CPU card is operating at normal parameters. 2. Use the Host Configuration Screen to verify link parameters. 3. Reboot the system. 4. If unsuccessful, refer to the *Cisco VCO/4K Card Technical Descriptions* and replace CPU card and/or the Storage/Control I/O Module.	
Nonredundant controller failure	1. Reboot the system. 2. If unsuccessful, service the controller and reboot.	
Redundant controller failure	1. Switch Active to Standby. 2. If successful, service the Standby controller.	
Modem SetUp	Refer to OEM modem manual and verify setup parameters against desired communication protocols and signaling parameters. Verify the integrity of the analog data link.	

Figure 6-1 Troubleshooting Host Communications Links

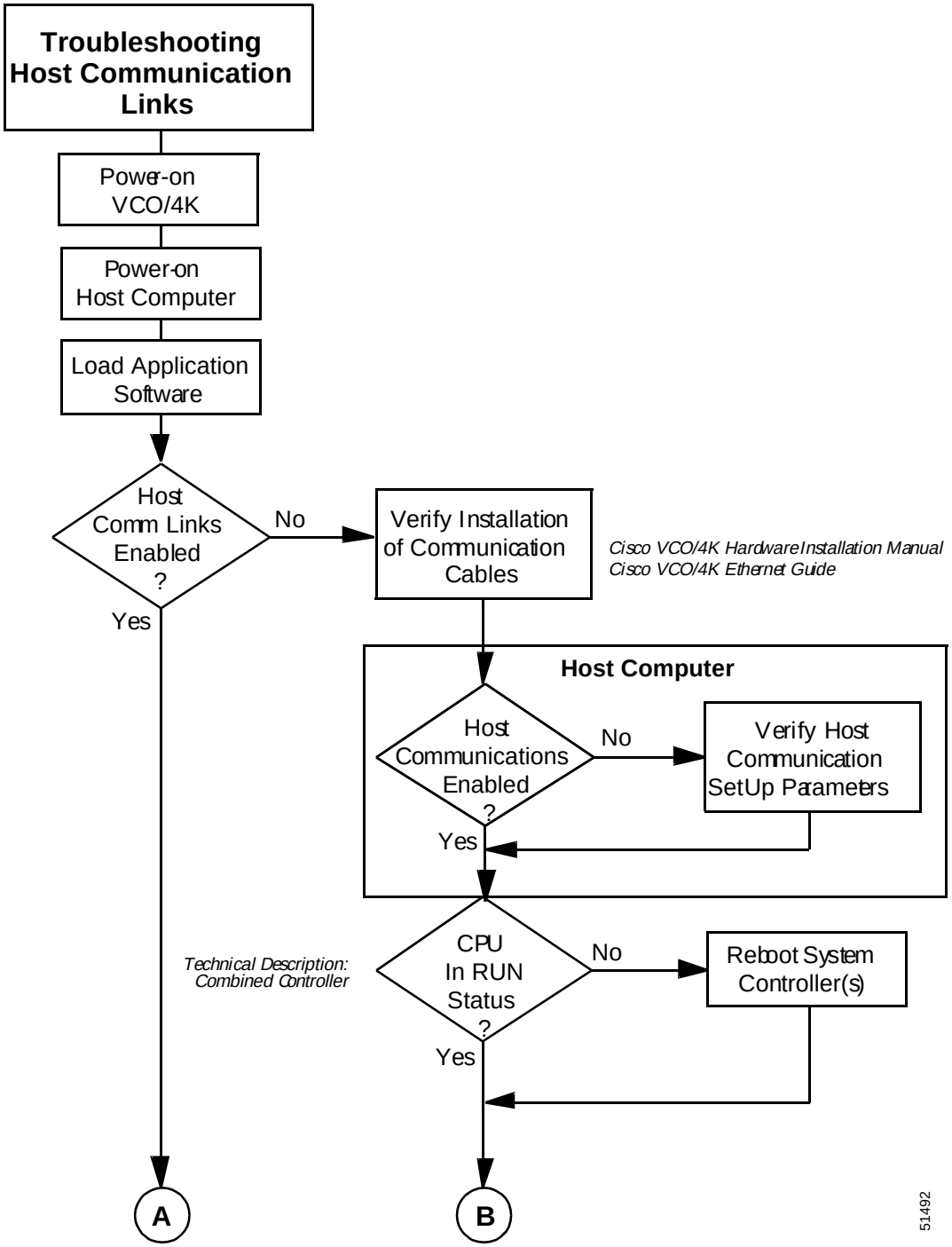


Figure 6-1 Troubleshooting Host Communications Links (continued)

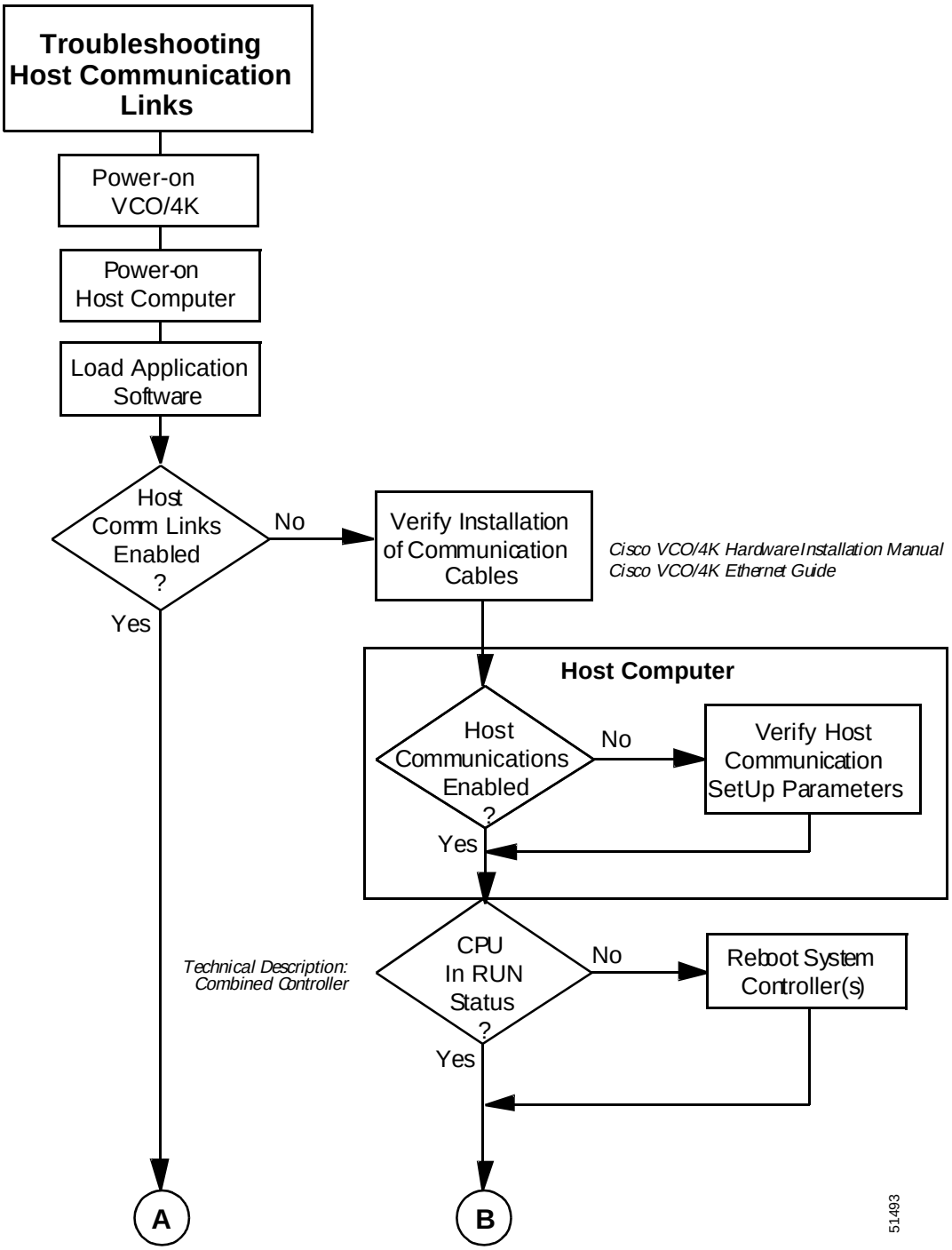
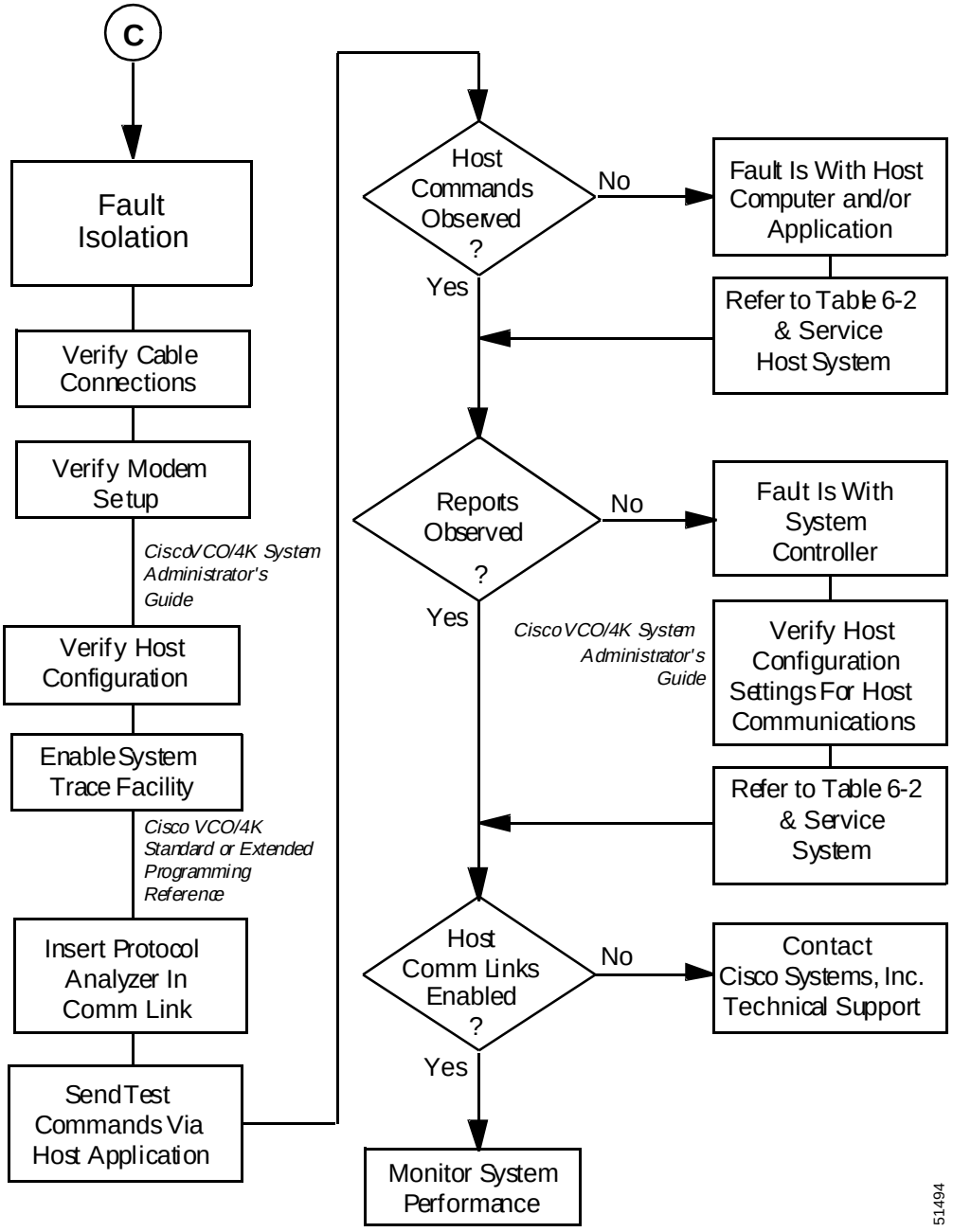


Figure 6-1 Troubleshooting Host Communications Links (continued)



CHAPTER 7

Peripheral Equipment Troubleshooting

This chapter reviews fault isolation and general repair procedures for peripheral equipment interfaced with a VCO/4K system. Peripheral equipment includes master console, system printer, remote maintenance modem, and external A/B Transfer Switch. This chapter also discusses problems with improperly configured interface parameters and cabling.

Interconnection and Interface Problems

Equipment that is not properly configured or is improperly cabled may fail to operate or may exhibit intermittent failures. Refer to the *Cisco VCO/4K Hardware Installation Guide* and OEM documentation supplied with the peripheral equipment for proper configuration (or setup) parameters. The parameters are defined in the VCO/4K database via the system administration Peripheral Configuration screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for information on how to configure peripheral equipment parameters.

Refer to the OEM documentation, *Cisco VCO/4K Hardware Installation Guide*, and the *Cisco VCO/4K Site Preparation Guide* for information on peripheral equipment cabling.

Typical problems associated with setup parameters and cable faults are described below.

Equipment Self-test

Begin your fault isolation with a self-test. A self-test is generally incorporated in the power-on firmware of most of the peripheral equipment.

If the self-test completes successfully, verify the cable connections. When a known working device is properly connected to the controller, the remaining causes of peripheral equipment failure are related to system controller hardware and/or the operating system.

Master Console

Master console operating parameters (Baud Rate, Stop Bits, Bits per Character and Parity) in the system database must match the VT220/320 or WYSE Technology WY-185/185ES setup parameters. Variations in the data bits settings can cause data fields in menu displays to contain strange characters. Mismatched baud rates can produce erratic screen displays, long blanking intervals, or no screen display at all.

VT220 mode operation with Application Keypad and Application Cursor Keys selected, enables the feature key functions on the digit keypad and the programmable function key settings along the top row of keys on the keyboard.

A three-conductor serial cable carries the receive and transmit lines along with signal and equipment ground to the Serial Port 1/Console port on the Storage/Control I/O Module. Cable or serial port problems may not blank the screen because the VDT stores the data for each screen display in its own memory.

The VT220/32 and WYSE WY-185/185ES compatible terminals recommended by Cisco Systems run a self-test immediately upon being powered on. If the test is successfully completed, the OK message appears. Press any key to place the console in service after powering it on.

- If the Power On indicator is not illuminated, check the power cord, AC outlet and circuit breaker.
- If the Power On indicator is illuminated but the self-test cannot be completed, refer to the *VT320 Owner's Manual* for basic troubleshooting procedures.

If you are not using the VT320 video display terminal, refer to the OEM documentation for specific information about self-test and basic troubleshooting procedures.

System Printer

The VCO/4K requires a parallel printer with a Centronics-type interface for use as the system printer. You must define the end-of-line (EOL) terminator for the printer interface in the system database, and match the printer setup configuration prior to use. If this parameter is improperly set, the printer may print without advancing the paper. Refer to the OEM documentation supplied with the printer for setup parameters.

If the printer stops in the middle of a print operation, check the Out-Of-Paper switch to determine if it has been erroneously triggered by torn paper walking off the tractor feed mechanism.

Before you run a self-test of the system printer, verify that fan-fold paper is properly loaded and a ribbon cartridge is installed. Refer to the OEM documentation for specific information about self-test and basic troubleshooting procedures.

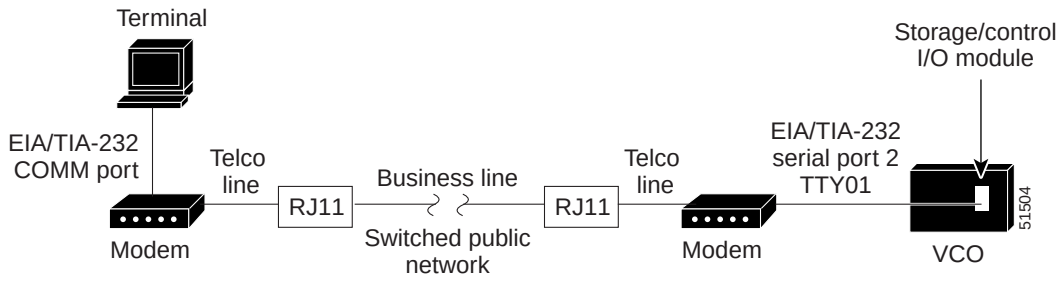
Remote Maintenance Modem

You may use a modem for the remote maintenance of a VCO/4K system. Modem operating parameters (Baud Rate, Stop Bits, Bits per Character, and Parity) defined in the system database must match the modem's setup parameters (refer to the OEM documentation supplied with the unit). Because of its high data transfer speed, a remote maintenance modem should not be connected to the switched public network behind a PBX. Induced noise from the PBX can create serious transmission problems.

If the remote maintenance modem is properly installed, problems will most likely be due to a faulty CO line to the modem.

Refer to the OEM manual supplied with your modem for details on hardware test procedures. A VDT and second asynchronous modem, or a PC with a communications package and modem, can be used to dial into the asynchronous modem connected to the VCO/4K. Figure 7-1 shows a simplified test arrangement.

Figure 7-1 Remote Maintenance Modem Test Call Setup



External A/B Transfer Switch

VCO/4K systems with redundant control may be equipped with an external A/B switch and drive cable. This Automatic Switching Unit (ASU) allows one set of peripheral devices to be automatically transferred between system controllers.

The following troubleshooting procedures are recommended if the ASU should fail to transfer connections between system controllers:

Step 1 Verify that the Select switch on the front panel of the ASU is in the AUTO position. Use the Select switch on the Alarm Arbiter Card (AAC) to manually switch from one side to the other. Observe the ASU. If the ASU fails to switch sides, proceed to Step 2.

Step 2 Verify that power is being supplied to the ASU by checking the voltage at the AC outlet into which it is plugged. Correct the AC problem and repeat Step 1.

Step 3 Use the Select switch to manually switch the ASU from side A to side B. If the switching action occurs, proceed to Step 4. If no switching action occurs, replace the ASU.

Step 4 Examine the control cable from the ASU to the AAC. Be sure there is no physical damage and that it is securely connected at both ends. Repeat Step 1. If no switching action occurs, replace the control cable and repeat Step 1.

Step 5 If replacing the control cable fails to correct the switching action of the ASU, replace the AAC. (Refer to the *Cisco VCO/4K Card Technical Descriptions*). Repeat Step 1.

Refer to the OEM manual supplied with the ASU for additional troubleshooting information.

Always verify that the cables from peripheral devices to the ASU, and from the ASU to the system controllers, are secure and free of signs of mechanical damage. Check these cables and the operation of the ASU before replacing any peripheral device that has passed a self-test but fails to operate properly in the system.

Refer to the *Cisco VCO/4K Hardware Installation Guide* for pin and signal information.

Diagnostic Tools

This appendix describes the tools available to assist you in troubleshooting a VCO/4K system and (to a limited extent) peripheral devices.

Safety Precautions

Warning **Cisco Systems, Inc. urges installers to observe the following safety precautions:**

- Never install telecommunication circuits during a lightning storm.
- Never install telecommunication connections in wet locations unless the connector is specifically designed for wet locations.
- Never touch uninsulated telecommunication wires or terminals unless the circuit is disconnected at the network interface.

Caution Observe the following:

- Use caution when installing or modifying telecommunication circuits.
- Avoid contact with rack power buses or connectors during the installation process to minimize the risk of injury from hazardous voltages.
- Arrange for 1 male for each 75 pounds and/or 1 female for each 40 pounds of lifting.
- Use an ESD wrist strap connected to the system for grounding to minimize the risk of injury when removing or replacing a system component. Connect the ESD wrist strap to the receptacle labeled CONNECT ESD WRIST STRAP HERE.

SS7 Subsystem Tools

EBS Log On/Off

For ANSI and CCITT SS7 versions 5.0 and higher, EBS logging is enabled/disabled with the following procedure:

Step 1 To turn on EBS logging, use the **ebslog on** command.

Step 2 To turn EBS logging off, use the **ebslog off** command.

The resulting log file will be called ebs and will reside in the directory $XNV/log.

Note The file size of this log file increases very quickly. Do not turn it on and leave it running for a long period of time.

APPENDIX B

Checklists

This appendix contains checklists to capture the information for a Cisco TAC to most efficiently address your problem.

VCO Subsystem

Data Checklist - General Questions for the VCO Subsystem

Before you start gathering information, consider the following high-level general questions:

- Have any recent host application changes been made?
- Has any hardware been recently added to or deleted from the switch?
- Was tracing turned on?
- Can tracing be turned on to gather data?

SS7 Subsystem

Data Checklist

This section deals with ckint software failure (with and without ckint core file). It guides you through a data collection process that requires you to enter commands at several points and to then paste the resulting information into a .txt file. Then send the .txt file to TAC for analysis.

This procedure is needed if the cktint software malfunctions, and is needed whether or not the core file was created.

Data Collection

Step 1 Is the VCO/SS7 platform a redundant or nonredundant platform?

Note Many questions that follow assume a redundant platform. Ignore these questions if you have a nonredundant platform.

Note All data to be collected and provided to Cisco is obtained by logging into cktint on the "SS7/cktint system" (as specified) - unless stated otherwise.

Step 2 Create a file stating the software version numbers of the following platform. Name this file versions.txt and list the versions in the following order and with the following labels:

a. VCO = (found by logging in to the VCO main menu)

b. CKTINT = (found by logging in to cktint)
Enter:
```
cd $XNV
version cktint
```

c. VARIANT = (cktint variant)
State which cktint variant you are running. This will be ANSI, ITU(CCITT), ITU(CCITT)-MSP (Multi Signaling Point), or Japan.

d. AMGR = (found by logging into cktint)
Enter:
```
cd $EBSHOME/access/dat
cat version.dat
```

e. SUN OS / Solaris = (found by logging into cktint)
Enter:
```
uname -a
```

Step 3 Are you running China-TUP?

a. If yes, then what version? Type:

CC_CONFIG = tup (to set environment as China)

cd $XNV

version ckint (version is displayed)

Step 4 Are you running TCAP (yes or no)?

1. If yes, then what version? Type:

sept (log in)

abc123 (password)

cd $XNV

`version sept` (tcap version is displayed)

Step 5 Were new circuits brought into service within the last 60 days?

a. If yes, then approximately how many days ago did you turn up the last circuit/span/trunk/trunk group?

What is the VCO RLSS designation for this span?

What is the hex address of the first port of this span?

(Obtain this information from the VCO Diagnostic / Display Card Data screen)

Preparing the Information for Transmission

To prepare the data you have gathered, do the following:

Step 1 Encode (uuencode, optional) the cktint core file, if any.

Step 2 Compress the VCO core file, if any (Winzip).

Step 3 Compress any cktint log file that is over 0.5 MB.

Step 4 Compress any VCO log file that is over 0.5 MB.

Step 5 When cktint died, was a cktint core file created?

- If yes, then what side was the core file created on (cktint-A or cktint-B)?
- If no, i.e., if cktint died but did not core, provide the following additional information:

  SUN OS / Solaris version. Log in to cktint from the a-side (and then again from the b-side) and issue the following UNIX command: **uname -a**. Put the output into a text file. Call it solver-a.txt when you log in to the a-side and solver-b.txt when you log in to the b-side. Then type:

  cd /var/adm

  ls -l

  Put the output into a text file. Call it varadm-a.txt when you log in to the a-side and varadm-b.txt when you log in to the b-side.
- Send all the files under /var/adm from the a-side.
- Send all the files under /var/adm from the b-side.

Step 6 When cktint died, was a VCO core file created?

- If yes, then what side was the core file created on (VCO-A or VCO-B)?

  Send the VCO core file and add an A or B to the filename.

Step 7 Log in to cktint and type **ps -ef** on the side that died.

a. Put the output into a text file. Name the file psef-died_x.txt (where "_x" is the side that you issued the command on).

b. Type **px** on the side that died.

c. Put the output into a text file. Name the file px-died_x.txt (where "_x" is the side that you issued the command on).

Step 8 When cktint died, did SS7/cktint properly switch over (yes or no)?

Step 9 When cktint died, did VCO/generic properly switch over (yes or no)?

Step 10 When cktint died and if a proper switchover occurred, then what event did the host application see, from its perspective, that caused it to decide to issue a switchover command (the host application switchover command, if issued, would be recorded in the VCO active-side log)?

Step 11 Analyze your host application logs and summarize what the host application was doing at the time of the switchover command.

Step 12 At the time that cktint died, was a system administrator logged in to cktint?

- If yes, then logged into what side (cktint-A or cktint-B or both)?

- What was the administrator doing and from what directory? (Be as precise as possible.)

Step 13 At the time that cktint died, was a system administrator logged in to the VCO system?

- If yes, then logged in to what side (VCO-A or VCO-B or both)?

  What was the administrator doing and from what VCO screen? (Be as precise as possible.)

  Provide the following files in addition to the core files specified above.

  – isup.mml
  – mtp.mml
  – ckt_ss7_to_sds
  – grp_ss7_to_sds
  – cktint-mmmdd.log from the ss7 a-side
  – cktint-mmmdd.log from the ss7 b-side
  – a-mmmdd.log from the vco a-side

    b-mmmdd.log from the vco a-side
  – b-mmmdd.log from the vco b-side

    a-mmmdd.log from the vco b-side

Step 14 Log in to the SS7/cktint a-side and provide the following ls -l outputs:

%pwd

/export/home/cktint/sys/CktintAnEnv/log

%ls -l

(Put the output into a text file. Name the file alogls-l.txt.)

%pwd

/export/home/cktint/sys/CktintAnEnv

%ls -l

(Put the output into a text file. Name the file aXNVls-l.txt.)

Step 15 Log in to the SS7/cktint b-side and provide the following ls -l outputs:

%pwd

/export/home/cktint/sys/CktintAnEnv/log

%ls -l

(Put the output into a text file. Name the file blogls-l.txt.)

%pwd

/export/home/cktint/sys/CktintAnEnv

%ls -l

(Put the output into a text file. Name the file bXNVls-l.txt.)

APPENDIX C

Subsystem Reconfiguration Procedures

This appendix contains procedures for updating your system after it has been installed.

VCO Subsystem

Increasing the Number of Licensed Time Slots

Systems at V5.1.4 and Higher

For systems at V5.1.4, enter “summ4” at the License Configuration screen to set the timeslot license to its maximum value. For more details consult the V5.1.4 Release Notes or the System Administrator’s Guide. Both are available at http://www.cisco.com/univercd/cc/td/doc/product/tel_pswt/.

Note If SPC-TONE is used in place of Tone Generator (DTG-2), confusing output in the License Configuration screen may appear. This confusing output, if it appears, will be explaned later but will have no operational efect on system performance.

SPC-TONE, although selectable in V5.1.4 is not usable or supported in that version. SPC-TONE is fully supported in V5.2.0 and higher.

To learn more about SPC-TONE, refer to the V5.2.0 Release Notes available at http://www.cisco.com/univercd/cc/td/doc/product/tel_pswt/.

Systems at V5.1.3 and Lower

Note In releases prior to Generic release V5.1.4, the License Configuration screen may display 4096 ports available instead of the true maximum value of 4088. See bug report CSCdr05012.

You can manually increase the number of timeslot licenses on a CPU when you have any of the following conditions:

- You are replacing a defective 16-MB CPU with a new 16-MB CPU and the number of ports allocated in the system is more than 1024 time slots.
- You are replacing an 8-MB CPU with a new 16-MB CPU, during a V4.x to V5.x upgrade, and the number of ports allocated in the system is more than 1024 time slots.
- You are not replacing a CPU, but you need to update the license in order for the system to permit you to add more resources.

How the System Notifies the User that it is Underlicensed

New CPUs are shipped from Cisco prelicensed for 1024 time slots. When you install the new CPU, the following message appears in the lower right corner of the admin console. This will be at the Administrator Main menu if your system is licensed for more than 1024 time slots:

```
Exceeding Time-Slot capacity By <X>
```

Where X = |(Number of Time-Slots Allocated) – (Number of Time-Slots Available)|

No log file message will appear. Only the message indicated above will appear.

Note The System Configuration menu / License Configuration screen uses the terms Number of Time-Slots Allocated and Number of Time-Slots Available. These are defined below.

The message on the screen appears because a license of 1024 time slots was entered into the NVRAM of the new CPU at the Cisco factory. Your system is detecting this and comparing the size of this license with the number of ports allocated in the system.

Note 1024 has been the timeslot license applied to all CPUs shipped by Cisco after February 1999; before that time CPUs were licensed for 880 time slots.

Note The system will run and process calls even if the system is underlicensed. If your system is not processing calls, then underlicensing is not the cause. Licensing restricts only the process of adding new resources to the Card Maintenance screen.

If you delete resources from the Card Maintenance screen while the system is underlicensed, then you will not be able to re-add or add new resources to this screen until you obtain the proper license from Cisco TAC.

Furthermore, standard problem isolation scenarios would never require you to delete (remove) resources from the Card Maintenance screen. The risk to a system while it is underlicensed is virtually nonexistent.

See the “License Update Procedure” section on page C-4 for the procedure for obtaining a new license number from Cisco TAC.

Example

Your system is licensed for 3960 + 128 = 4088 timeslots (the maximum number of licensed time slots available) and you swapped out the B-side CPU. You will see the configuration displayed in the System Configuration Menu/License Configuration screen (Figure C-1). The number and letter callouts are defined below.

Figure C-1 License Configuration Screen

```
                          LICENSE CONFIGURATION

                                                  A - Side      B - Side

(A)  Number of Time-Slots Allocated                 2392          2392
(B)  Number of Time-Slots Available                1152 (1)      1152 (1)
(C)  Number of Time-Slots Licensed                  4096          1024 (2)




(D)  Serial Number                          08003e123456     08003e654321
(E)  License Number                         xyz999xyz999     aaa123aaa123
(F)  Enter License #:                       ____________     ____________

     #A0 Mon Mar  6, 2000 17:28 A-ACT B-SBY
```

51495

Note Serial numbers and license numbers shown are fictitious and are used only for illustrative purposes.

Number and Letter Callouts for Figure C-1:

(A): Number of Time-Slots Allocated (a display-only field): The number of time slots currently in use that fall within the licensed range of time slots. The licensed range of time slots consists of a maximum of 4088 time slots (3960 + 128 = 4088). As resources are added to the system via the Card Maintenance screen, the Number of Time-Slots Allocated number typically increases.

Note the following general time slot characteristics:

- All resources (service circuit engines, network spans, and virtual ports) use time slots within the system, but not all resources use time slots within the licensed range of time slots.
- The time slots that are outside the licensed range of time slots are considered “free” time slots. SPC-DTMF, SPC-CPA, SPC-MFR1 (displays as SPC-MFRC), and Virtual Ports use “free” time slots.
- All network spans use time slots within the licensed range of time slots.
- The DTG-2 cards uses 128 time slots within the licensed range of time slots once the system detects that at least one DTG-2 card is active.

(B): Number of Time-Slots Available (a display only field): The Number of Time-Slots Available equals the Number of Time-Slots Licensed [see (C)] plus 128 if at least one DTG-2 card is active in the system. (The active and standby DTG-2 card take up the same 128 time slots.) The maximum number of time slots available is 3960 + 128 = 4088. If no DTG-2 card is active in the system, then the Number of Time-Slots Available equals the Number of Time-Slots Licensed.

(C): Number of Time-Slots Licensed (a display only field): The possible values for this field are 1024, 1560, 2096, 2632, 3168, 3704, and 3960 (3960 displays as 4096). This field changes as new license numbers [see (F)] are entered. Obtaining a new license number from Cisco TAC is explained in the "License Update Procedure" section on page C-4.

Note The value 3960 displaying as 4096 is a known display error scheduled to be corrected in a later release.

(D): Serial Number (a display only field): The Serial Number is the serial number of the CPU which is also the MAC-address of the CPU. The serial number is a 12-digit alphanumeric number whose first 6 digits are always 08003e. The serial number is also physically labeled on the CPU in the lower right corner of the component side of the CPU as ETHERNET ADDR 08003Exxxxxx, where xxxxxx is a 6-digit sequence number.

(E): License Number (a display only field): The License Number is the number that was entered into the Enter License #: field and which was issued by Cisco TAC. The license number is a 12-digit alphanumeric number. Obtaining a new license number from Cisco TAC is explained in the "License Update Procedure" section on page C-4.

(F): Enter License #: (a data entry field): Enter the license number that was issued to you by Cisco TAC. The license number is a 12-digit alphanumeric number. Obtaining a new license number from Cisco TAC is explained in the "License Update Procedure" section on page C-4.

(1): Number of Time-Slots Available = 1152. The Number of Time-Slots Licensed plus 128 (the 128 is to account for the active DTG-2 card). In this example a new CPU, prelicensed for only 1024 time slots, was installed on the B-side. (1024 + 128 = 1152).

(2): Number of Time-Slots Licensed = 1024. In this example, a new CPU, prelicensed for only 1024 time slots, was installed on the B-side.

License Update Procedure

The following procedures assume that the system has both A and B side control hardware, making it a redundant system.

If you have a nonredundant system, then it is assumed that the control hardware, i.e., the NBC3 and Combined Controller are installed in the A-side; slots 1, 3, and 4, of the system. You should be able to intuitively modify the following procedures to meet your needs.

Procedure #1 (the preferred procedure):

Follow these steps to apply the license(s):

Step 1 Make the state of the switch A-ACT/B-SBY.

Note If you cannot make the system A-ACT/B-SBY, then go to Procedure #2.

Step 2 Log in to the A-side and go to the System Configuration menu / License Configuration screen. Select this screen from the Installation Utilities screen (see Figure C-2).

Step 3 From this A-side login, enter the new license of one of the CPUs and press **Enter**.

Step 4 If you must also license the second CPU in this system, then from this A-side login, enter the new license of the second CPU and press **Enter**.

Step 5 See Figure C-5, Figure C-6, and Figure C-7 for how the Administrator Main Menu, License Configuration, and Card Maintenance screens will appear after the new license is correctly applied.

Procedure #2:

Follow these steps to apply the license(s):

Step 1 Make the state of the switch A-SBY/B-ACT.

Step 2 Log in to the B-side and go to the System Configuration menu / License Configuration screen.

Step 3 From this B-side log-in, enter the new license of one of the CPUs and press **Enter**.

Step 4 If you have to also license the second CPU in this system, then from this B-side log-in, enter the new license of the second CPU and press **Enter**.

Step 5 See Figure C-5, Figure C-6, and Figure C-7 showing the Administrator Main Menu, License Configuration, and Card Maintenance screens after the new license is correctly applied.

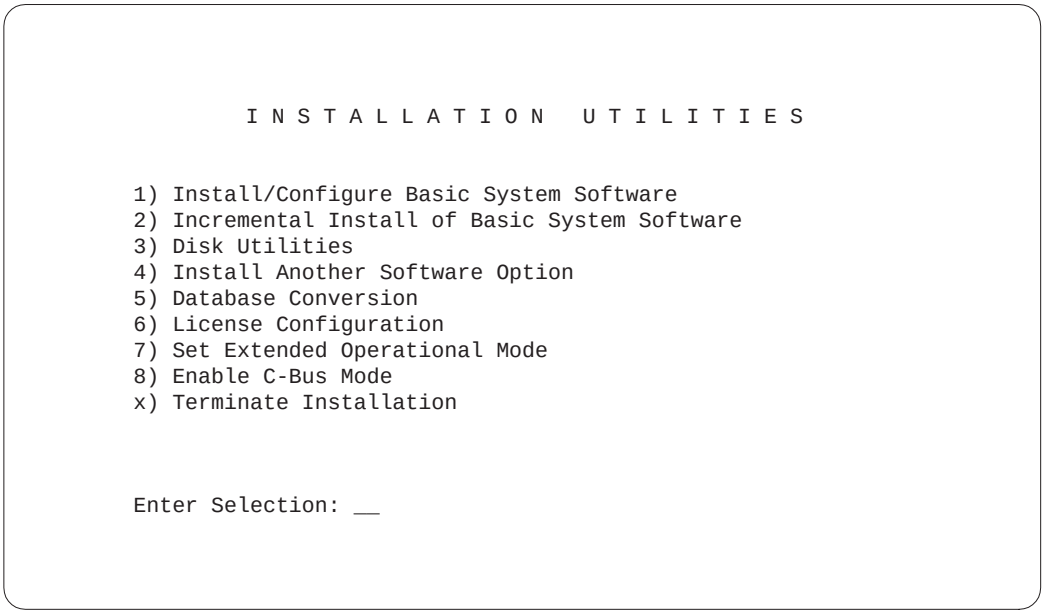
Procedure #3:

The only other way to install the new license number into the CPU is to boot from Generic floppy diskette #1, or any of the optional software diskettes: Ethernet and Telerouter (for V5.1(2) or lower) or the Optional Software diskette. This will bring you to the Installation Utilities screen (see Figure C-2).

Step 1 Insert Generic floppy diskette #1, or any of the optional software diskettes into the side of the system that has the CPU license update. Press the appropriate button on the AAC card to reset that side. The following output appears on the local console screen:

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test

COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C

SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
Loading file A:/boot/install.exe
Hard disk mounted successfully
Hard disk dismounted successfully
```

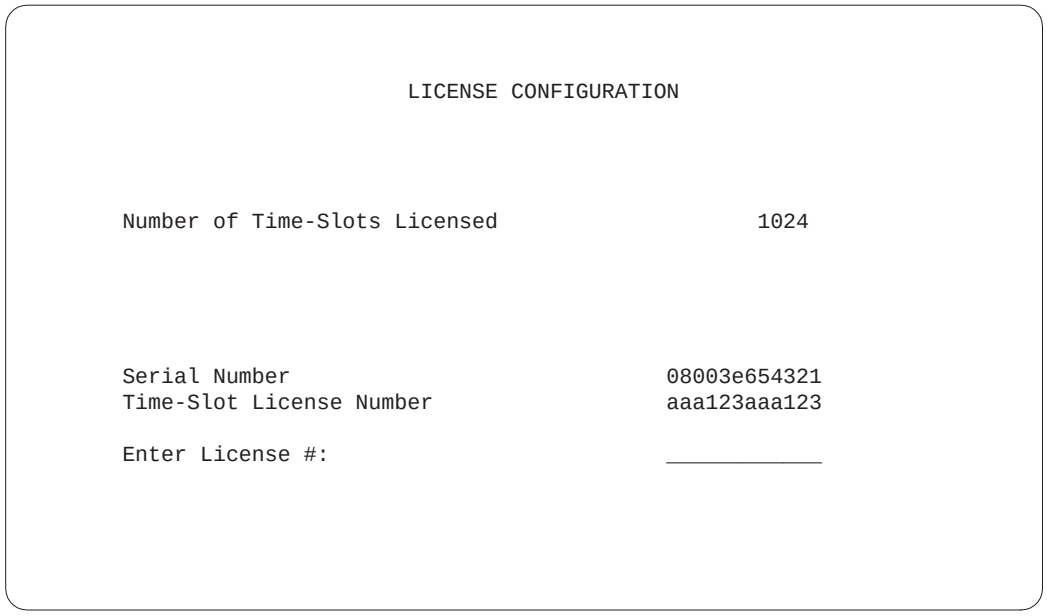
Figure C-2 Installation Utilities Screen



Note Line (4) appears as "`Install Optional Software Package`" for Generic V5.1(3) and higher.

Step 2 Type **6** and press **Return** to get to the License Configuration screen (see Figure C-3).

Figure C-3 License Configuration Screen, 1024 Time Slots



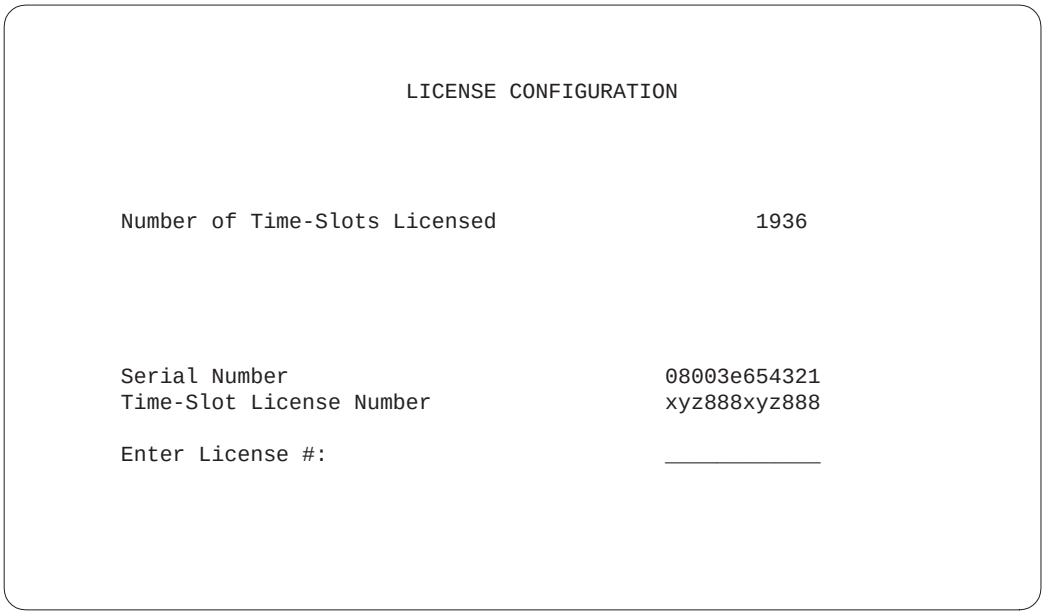
Note Serial numbers and license numbers shown are fictitious and are used only for illustrative purposes.

Step 3 Type the new license number.

Example

If you entered a license number for 3960 time slots (the email from Cisco TAC would say that this is a license number for 4088 time slots), then you would see the output shown in Figure C-4.

Figure C-4 License Configuration Screen, 1936 Time Slots



Note Serial numbers and license numbers shown are fictitious and are used only for illustrative purposes.

There is a display bug in the Installation Utilities / License Configuration screen. When you enter a license number that equates to 2096, 2632, 3168, 3704, or 3960 time slots (the email from Cisco TAC would say that the license number for 3960 time slots is a license number for 4088 time slots), the "Number of Time-Slots Licensed" field always displays 1936. When you enter a license number that equates to 1024, or 1560 time slots, the "Number of Time-Slots Licensed" field displays correctly.

Step 4 To return to the Installation Utilities screen after entering the license number, press **Return**. Type **x** to terminate the Installation Utilities screen, then press **Return**. The following prompt appears:

```
Terminate Installation Utility (Y/N) =N?
```

Step 5 Type **Y** and press **Return**.

```
Remove Installation Diskette NOW!
Suspending Installation Process...
Rebooting.....................
Reset System NOW!
```

Note The message Reset System NOW! may not appear. If it does, press the appropriate button on the ACC card.

Step 6 Remove the Installation Diskette. The following will display:

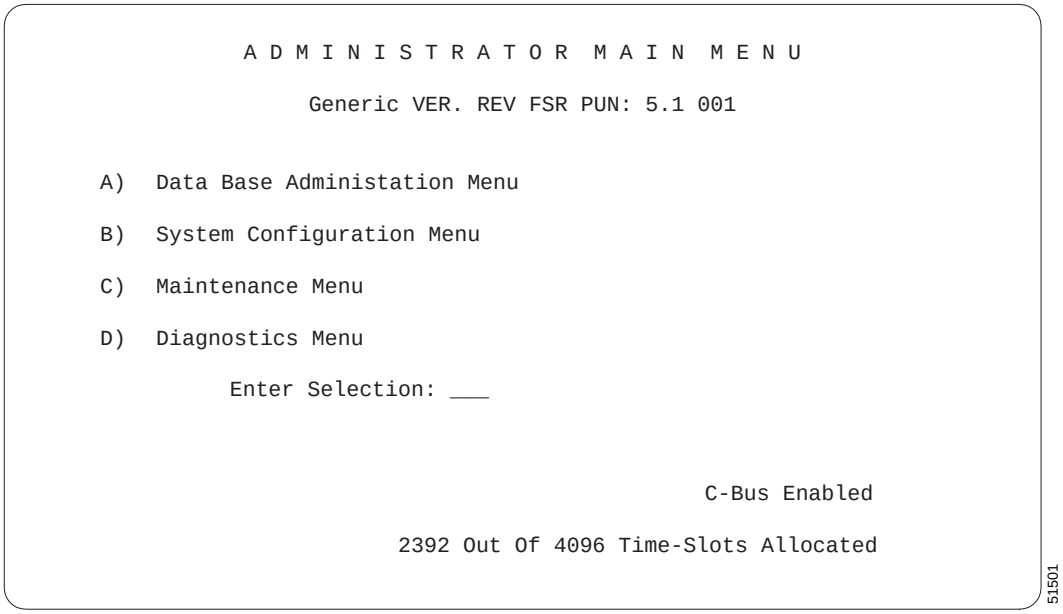
```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test

COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C


SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully

A: drive has no floppy or Unreadable/Unformatted Floppy
Trying C drive
Reading boot file from disk device C:/boot/boot.sds
Loading file C:/boot/globals.exe
Loading file C:/boot/syswd.exe
Loading file C:/boot/hostmgr.exe
Loading file C:/boot/redmgr.exe
Loading file C:/boot/netmgr.exe
Loading file C:/boot/permgr.exe
Loading file C:/boot/snmp.exe
SW version loaded - Ver.Rev FSR : 5.1 001
Hard disk mounted successfully
Hard disk dismounted successfully

Loading File < syscnfg.TBL > ...
Loading File < card.TBL > ...
Loading File < port.TBL > ...
Loading File < hostcnfg.TBL > ...
Loading File < resgroup.TBL > ...
Loading File < supvtmpl.TBL > ...
Loading File < iprule.TBL > ...
Loading File < oprule.TBL > ...
Loading File < isdnsupv.TBL > ...
Loading File < isdnmsg.TBL > ...
Loading File < routesum.TBL > ...
Loading File < routetbl.TBL > ...
Loading File < exroute.TBL > ...
Loading File < nfascnfg.TBL > ...
Loading File < promptlb.TBL > ...
Loading File < subrate.TBL > ...
Loading File < motomap.TBL > ...
Loading File < license.TBL > ...
```

Step 7 The login screen appears. Log in.

License Update Procedure Output

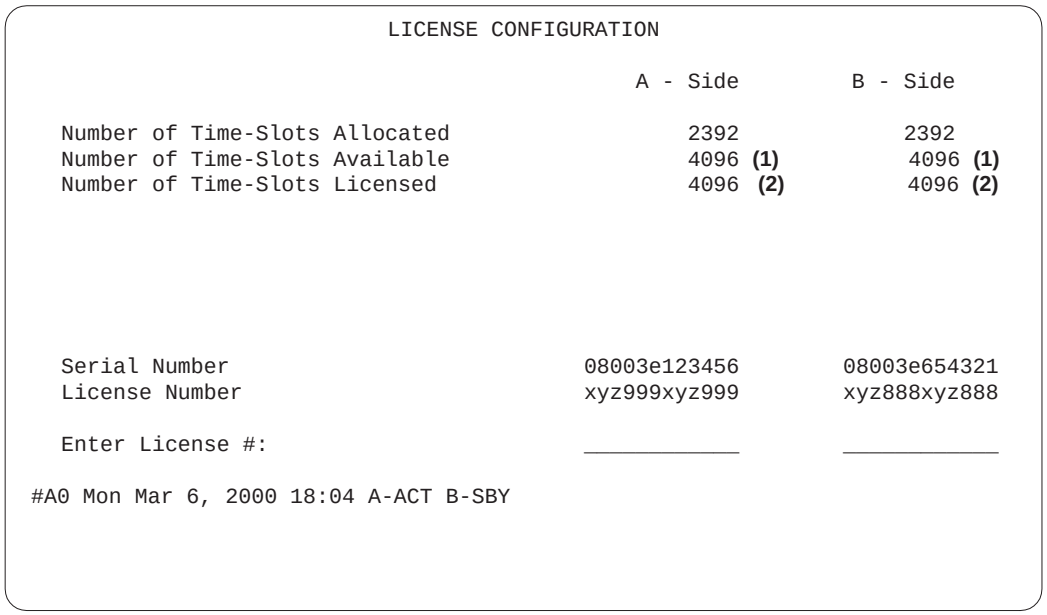
Applying Procedure #1, #2, or #3 will produce the results shown in Figure C-5, Figure C-6, or Figure C-7. The results shown are for licensing a CPU to 3960 time slots on a system with 2392 time slots allocated.

Figure C-5 Administrator Main Menu—After License Application



Note "2392 Out Of 4096 Time-Slots Allocated" should display as "2392 Time-Slots Allocated Out Of 4088 Time-slots Available" (3960 + 128 for the active DTG-2 card = 4088). This is a known display error scheduled for correction in a later release.

Figure C-6 License Configuration—A- and B-Side Allocations After License Application



Note Serial numbers and license numbers shown are fictitious and are used only for illustrative purposes.

(1) The correct number is 4088, the true maximum available for use.
(2) The correct number is 3960

These are known display errors scheduled for correction in a later release**.**

Figure C-7 Card Maintenance—ICC-E1 Cards

```
                    C A R D   M A I N T E N A N C E

             R L S      CARD TYPE               V.RV  S
             --------   ----------------------  ----- -
             1 1 1-1    Network Bus             1.02  A
             1 1 1-2    Tone Generator          1.25  A
             1 1 2-1    Network Bus             1.02  S
             1 1 2-2    Tone Generator          1.25  S
             1 1 7-1-1  ICC-E1                  5.08  A
             1 1 7-1-2  ICC-E1                  5.08  A
             1 1 7-1-3  ICC-E1                  5.08  A
             1 1 7-1-4  ICC-E1                  5.08  A
             1 1 7-2-1  ICC-E1                  5.08  A
             1 1 7-2-2  ICC-E1                  5.08  A
             1 1 7-2-4  ICC-E1                  5.08  A

ADD, DELETE, CHANGE STATUS (A,D,C,P): _   _ _ ____   ____________________  _
    AND PORT DEFINITION:               2392 Out Of 4088 Time-Slots Allocated
 1- 64 _______ _______ _______ _______ _______ _______ _______ _______
65-128 _______ _______ _______ _______ _______ _______ _______ _______

#A0 Tues Mar 14, 2000  1:35 A-ACT B-SBY
```

51503

Note Card layouts shown are fictitious and are used only for illustrative purposes.

"2392 Out Of 4088 Time-Slots Allocated" should display as "2392 Time-Slots Allocated Out Of 4088 Time-slots Available" **(**3960 + 128 for the active DTG-2 card = 4088).

Obtaining a New License from Cisco TAC

To obtain a new license, send email to nh-tech_sup@cisco.com as follows:

Step 1 Obtain the system serial number from the label on the rear of the chassis of the VCO/4K.

Step 2 Obtain the system serial number from the License Configuration screen. Log in to the active side of the system (record exactly what you see).

Note If you are replacing a CPU, first replace the CPU before recording this information.

If you are not replacing a CPU, then simply record the information that you see.

Number of Time-Slots Allocated, A-side:

Number of Time-Slots Allocated, B-side:

Number of Time-Slots Available, A-side:

Number of Time-Slots Available, B-side:

Number of Time-Slots Licensed, A-side:

Number of Time-Slots Licensed, B-side:

Serial Number, A-side:

Serial Number, B-side:

License Number, A-side:

License Number, B-side:

Step 3 Obtain the following information from your engineers:

How many time slots does the system need to be licensed for?

Number of time slots to increase to:

Increase the A-side (Y/N)?

Increase the B-side (Y/N)?

Reason for the time slot license:

Swapped out defective CPUs (Y/N)?

Upgraded from V4.x to V5.x (Y/N)?

Need to add more resources to the system (Y/N)?

> If you answered yes to "need to add more resources to the system", then first contact your Cisco Systems sales representative and purchase the additional time slots. Obtain the Cisco purchase order number from the sales representative and include it in this email along with the sales person's name, and email address.

Step 4 Obtain the following information from the Administrator Main Menu:

Generic VER.REV FSR PUN:

Time Slots Used by Each VCO/4K Resource

Table C-1 shows the number of time slots, within the licensed range of time slots or "licensed time slot pool," each VCO/4K resource uses.

Table C-1 Time Slot Use

Hardware Name	Card Maintenance Screen Name	Licensed Time Slots Used
DTG-2	Tone Generator	128 (1)(6)
IPRC8	8 Port Prompt/Record	008
IPRC64	64 Port Prompt/Record	064
IPRC128	128 Port Prompt/Record	128
SSC	Subrate Switch Card	varies/ programmable (2)
D+I	Drop and Insert Card	008
ICC	ICC-T1	024
ICC	ICC-E1	032

Table C-1 Time Slot Use (continued)

Hardware Name	Card Maintenance Screen Name	Licensed Time Slots Used
LTC-8	8-Line Test Card	008
ICC	ICC-T1 PRI/NI2	024
ICC	ICC-T1 PRI/5ESS	024
ICC	ICC-T1 PRI/4ESS	024
ICC	ICC-T1 PRI/NTI	024
ICC	ICC-T1 PRI/NTT	024
ICC	ICC-E1 PRI/NET5	032
ICC	ICC-E1 PRI/QSIG	032
ICC	ICC-E1 PRI/TS014	032
SPC	SPC-DTMF	none (3)
SPC	SPC-CPA	none (3)
SPC	SPC-MFR1	none (3)(4)
SPC	SPC-MFCR2	024
SPC	SPC-OUTP	064
SPC	SPC-CONF	032
-	virtual ports	none (3)(5)

1) Whether or not one or two DTG-2 cards are active, only 128 ports will be allocated by the system.

(2) Allocated by the system in increments of 8, depending how you first configure the Subrate Configuration screen. All increments allocated fall within the “licensed time slot pool”, not the “free time slot pool”.

(3) The resource indicated uses time slots from the “free time slot pool”, not the “licensed time-slot pool”.

(4) SPC-MFR1 is displayed to the user as SPC-MFRC.

(5) Virtual ports are an integral part of the system but are not displayed from the Card Maintenance screen nor can the user allocate them. Virtual ports can be viewed from the Diagnostic menu / Port Display screen.

(6) All resources listed below the DTG-2 card in this table, and which fall within the “licensed time slot pool”, can be added to the system provided that the total number of time slots added does not exceed 3960.

Table C-2 Summary of Time Slot Increments Available

Time Slot Increment Number	Time Slot Increment Increase	Number of Time Slots Licensed	Number of Time Slots Available(1)	Number of Time Slots Allocated(2)
0	–	1024	1152	-
1	536	1560	1688	-
2	536	2096(3)	2224	-
3(6)	536	2632	2760	-
4(6)	536	3168	3296	-

Table C-2 Summary of Time Slot Increments Available (continued)

Time Slot Increment Number	Time Slot Increment Increase	Number of Time Slots Licensed	Number of Time Slots Available[1]	Number of Time Slots Allocated[2]
5[6]	536	3704	3832	-
6[6]	256	3960[4]	4088[5]	-

[1] The Number of Time-Slots Available equals the Number of Time-Slots Licensed plus 128 time slots. The 128 time slots are for the active DTG-2 (Tone Generator).

[2] The minimum value for The Number of Time-Slots Allocated is 128 if one DTG-2 card is active and no resources (other than SPC-DTMF, SPC-CPA, and SPC-MFR1 (displays as SPC=MFRC)) are added to the system by the user. The Number of Time-Slots Allocated increases from 128, up to a maximum value of 4088, as resources are added to system from the Card Maintenance screen.

[3] The Number of Time-Slots Licensed value of 2096 is for systems with C-bus enabled (4K-mode systems). For systems with C-bus not enabled (2K-mode systems), the value for this time slot Increment is 1808. For systems with C-bus not enabled (2K-mode systems), the maximum value for Number of Time-Slots Available is 1936 (= 1808 + 128).

[4] 3960 displays as 4096 in the License Configuration screen.

[5] 4088 displays as 4096 in the License Configuration screen.

[6] These time slot Increments are not available for systems with C-bus not enabled (2K-mode systems).

SS7 Subsystem

Reinstalling EBS Drivers

If ECPT modules are not seen as loaded on EBS software installation or no blank line is seen for ecpt devices on EBS startup, then the ECPT drivers were not installed properly.

SS7 signaling links will not align even though EBS and cktint configured properly and started.

There are two instances described here:

Case 1: ECPT drivers are not installed during EBS software installation

Case 2: ECPT drivers are not loaded during ebs_start or start-ss7.sh

Case 1

When a system is upgraded to new software, a script, install_ebs.sh, installs EBS software. This script replaces previous AccessManager modules with new modules. During the loading of new modules, you must see ECPT drivers loaded, i.e., you must see the following lines:

```
CCTC module is now installed.
Installing TRMOD module ...
TRMOD module is now installed.
Installing ECPT module ...
ECPT module is now installed.
Installation of AccessMANAGER modules is now complete.
```

Case 2

When executing ebs_start or start-ss7.sh scripts, EBS is started first and you must see a blank line for ECPT drivers loaded. See ecpt 1 in the following example:

```
start-ss7.sh

This script will assist you in bringing up your Integrated
SS7 system in a controlled fashion.

Would you like to start the EBS stack [y/n]?y
Starting Signaling Point 0
Starting ebs_start...
Signalling Point Manager - Version 3.5.3
Copyright (c) 1991-1995, EBS
All Rights Reserved

Loading /dev/ecp0   - device does not exist
Loading /dev/ecp1   - device does not exist
Loading /dev/ecp2   - device does not exist
Loading /dev/ecp3   - device does not exist
Loading /dev/ecp4   - device does not exist
Loading /dev/ecp5   - device does not exist
Loading /dev/ecp6   - device does not exist
Loading /dev/ecp7   - device does not exist
Loading /dev/ecpt0  - device does not exist
****************************************
******* AccessALARM is in service *******
*****   Console Output is DISABLED  *****
****************************************
Loading /dev/ecpt1
Loading /dev/ecpt2  - device does not exist
Loading /dev/ecpt3  - device does not exist
Loading /dev/ecpt4  - device does not exist
Loading /dev/ecpt5  - device does not exist
Loading /dev/ecpt6  - device does not exist
Loading /dev/ecpt7  - device does not exist
AccessMANAGER Ready
Starting upmd...
```

Note In an 8-link SS7 system, you must see two blank lines for loaded drivers. Usually, ecpt0 and ecpt 1 represent 4-Link (SBUS ports) each.

Solution:

The following procedure describes how to reinstall ECPT drivers:

Step 1 Stop the SS7 stack completely and verify that no process is running. Type the following:

```
ebs_ps
```

Step 2 Type the following to change directories:

```
cd $EBSHOME/access/install
```

Step 3 Change user to SU (superuser).

Step 4 Type the following command to remove EBS drivers:

```
./rmEBSdrv
```

You will see all drivers and modules being removed one by one. Make sure everything is removed successfully. Focus on ECPT modules specifically.

For example:

```
# ./rmEBSdrv
You are about to remove the AccessMANAGER modules.
Do you wish to continue [y/n]?  y
Unloading CCTC module ...
CCTC module is now unloaded.
Unloading ANTC module ...
ANTC module is now unloaded.
Unloading SCCP module ...
SCCP module is now unloaded.
Unloading SNM module ...
SNM module is now unloaded.
Unloading UPM module ...
UPM module is now unloaded.
Unloading TRMOD module ...
TRMOD module is now unloaded.
Unloading ECPT module ...
ECPT module is now unloaded.
Unloading SPM module ...
SPM module is now unloaded.
Removing CCTC module ...
CCTC module is now removed.
Removing ANTC module ...
ANTC module is now removed.
Removing SCCP module ...
SCCP module is now removed.
Removing SNM module ...
SNM module is now removed.
Removing UPM module ...
UPM module is now removed.
Removing ECPT module ...
ECPT module is now removed.
Removing SPM module ...
SPM module is now removed.
Removing TRMOD module ...
TRMOD module is now removed.
All AccessMANAGER modules are now removed.
#
```

Step 5 Type **sync** a couple of times for files to synchronize the file system.

Step 6 Reboot the Sparc with the reboot command while you are in SU (superuser) mode.

Step 7 When the system is ready, log in as cktint and confirm that no process is running.

Step 8 Type the following to change directories:

```
cd $EBSHOME/access/install
```

Step 9 Change user to SU (superuser).

Step 10 Type the following command to set up EBS drivers:

```
./setupEBSdrv
```

You will see all drivers and modules loading one by one. Make sure everything is loaded successfully without any error. Focus on ECPT.

```
# ./setupEBSdrv
You are about to install the AccessMANAGER modules.
Do you wish to continue [y/n]?
Installing SPM module ...
SPM module is now installed.
Installing UPM module ...
UPM module is now installed.
Installing SNM module ...
SNM module is now installed.
Installing SCCP module ...
SCCP module is now installed.
Installing ANTC module ...
ANTC module is now installed.
Installing CCTC module ...
CCTC module is now installed.
Installing TRMOD module ...
TRMOD module is now installed.
Installing ECPT module ...
ECPT module is now installed.
Installation of AccessMANAGER modules is now complete.
#
```

If you don't see the message “ECPT module is now installed” or you still find difficulty in loading of ecpt drivers on startup, follow Steps 1 to 5. Then, instead of rebooting in Step 6, type **halt** or **shutdown**.

Power down the SS7. (On a redundant platform, only the side that is being upgraded).

Step 11 After powering down, wait for 30 seconds and power up the side again.

Once the system is ready, follow Steps 7 to 10.

4-link to 8-link Upgrade Procedure

Use the following procedure to upgrade existing Sparc 5 CPU with 4-link SBUS to 8-link SBUS to support a total of eight SS7 signaling links:

Step 1 Verify that the current /export/home/EBSkeyfile.dat is licensed for the support of eight SS7 links. (Or that it is a new EBS license diskette included with an upgrade package.)

Step 2 If the system is redundant, manually make the A-side active (via the Fallback/Selector/AB switch-box and VCO AAC) to start with an upgrade of the B-side (standby) first.

Step 3 Rename the existing EBSkeyfile.dat to (for example) EBSkeyfile.dat.old. This saves the existing file for possible later use or recovery.

Step 4 Ensure that you are using the correct diskette for the B-side license file.

Verify that the host ID on the diskette label is for the B-side Sparc. License files are different for A and B side Sparc systems.

Step 5 Copy the EBS license file, EBSkeyfile.dat (support for 8-links) from the diskette to the B-side /export/home directory.

The procedure for copying the files from diskette is given in the appropriate *VCO/4K Integrated SS7 System Supplement*.

Step 6 Stop the SS7 on the B-side and change the directory to $EBSHOME/access/install.

Step 7 Change user to SU (superuser).

Step 8 Type the following command to remove EBS drivers:

```
./rmEBSdrv
```

Step 9 Once drivers are removed, type:

```
halt
```

Step 10 If you are using a separate SS7 VME shelf with your VCO/4K system, power off the B-side SS7.

Step 11 Add the additional 4-link SBUS next to the existing SBUS on the Sparc CPU card.

Remove the serial/parallel card and put the new 4-link SBUS card in its place.

Step 12 Remove the power cable from the fallback switch.

Since fallback/selector/AB switch-box was manually selected to make the A-side active, all the links should stay aligned.

Step 13 Remove one of the existing slave cards.

Step 14 Set the dip switches on each new slave card to match the dip-switch settings of the card you removed.

Step 15 Exchange the existing slave cards with the new slave cards.

Step 16 Power up the fallback switch.

Step 17 Ensure that the system boots properly after the B-side SS7 is powered up.

Step 18 Log in as cktint.

Step 19 Change user to SU (superuser):

```
cd $EBSHOME/access/install
```

Step 20 Install the new drivers with the command:

```
./setupEBSdrv
```

Step 21 Modify the mtpmml file to include ports 5,6,7, and 8 for the additional 4-links.

Step 22 Recompile to update the database.

Any change in mml files requires re-creating or modifying the database files. Refer to the *Integrated SS7 Supplement* for help on mtp mml file configuration and re-creating or modifying the database.

Step 23 Start the SS7 stack and verify that the operation is normal.

Step 24 Initiate a switchover (manually select the B-side to be active) and ensure that the links are aligned and call processing is resumed.

Step 25 Upgrade the A-side.

Repeat the same procedure used for B-side except that you do not need to add or modify hardware (cards etc.).

Note For a nonredundant system, you need to power off the SS7 for hardware (SBUS) upgrade, therefore you can power off the fallback as well at the same time. The traffic/calls will drop because with a nonredundant system, powering off the SS7 will stop all traffic. This limitation for a nonredundant system must be clearly understood prior to the upgrade. The customer needs to provide a maintenance window for upgrade.

Recovering from Loss of Root Shell

All SS7 systems display a "#" prompt when you have logged in as root or have changed to superuser (su) with the root password. When you log in as cktint, the SS7 system displays a "%" prompt.

Occasionally (particularly during a new install or an upgrade) both the root and cktint logins have the "%" as prompt. As a result, users actually log in as root.

Thinking that they were logged in as cktint, users have deleted system files that have affected operations of the system.

It looks as if root has been defined or has been modified as for UNIX C-shell (csh) instead of standard shell (sh) /etc/passwd file.

Solution:

Step 1 Change to superuser. Type **su** and enter **abc123** as the password.

```
vi /etc/passwd
```

Step 2 The first line in the file might be like one below:

```
root:x:0:1:Super-User:/:/bin/csh
```

Step 3 If that is what you find, edit the file and correct it as follows:

```
root:x:0:1:Super-User:/:/sbin/sh
```

Step 4 Save the file.

The change will set the root prompt to "#."

Partitioning Hard Drives

Use this information to partition 1-GB (MSM-1000), 2-GB (MSM-2000), 4-GB (MSM-4000), and 9-GB (MSM-4000 Replacement) hard drives. Use this when reinstalling Solaris 2.6 and/or troubleshooting problems involving writing entries to SS7 log files.

During troubleshooting, this information can be verified by typing **df -k** and then pressing **Return**.

1-Gigabyte Drives:

Partitioning information for 1-Gigabyte drives is in Table C-3.

Table C-3 %df -k Output for 1-Gigabyte Drives

Slice	Partition (Mount)	Size (MB)
0	/	28
1	–	–
2	swap	85
3	/usr/openwin	260

Table C-3 %df -k Output for 1-Gigabyte Drives (continued)

Slice	Partition (Mount)	Size (MB)
4	/var	55
5	/opt	65
6	/usr	260
7	/export/home	256

2-Gigabyte Drives:

Partitioning information for 2-Gigabyte drives is in Table C-4.

Table C-4 %df -k Output for 2-Gigabyte Drives

File System	Size (MB)	Mount
/dev/dsk/cot3d0s0	24923	/
/dev/dsk/cot3d0s6	203415	/usr
.proc	0	/proc
fd	0	/dev/fd
/dev/dsk/cot3d0s4	480586	/var
/dev/dsk/cot3d0s7	871413	/export/home
/dev/dsk/cot3d0s5	166007	/opt
/dev/dsk/cot3d03	228707	/usr/openwin
swap	107104	/tmp

4-Gigabyte Drives:

Partitioning information for 4-Gigabyte drives is in Table C-5.

Table C-5 %df -k Output for 4-Gigabyte Drives

File System	Size (MB)	Mount
/dev/dsk/cot3d0s0	30859	/
/dev/dsk/cot3d0s3	480799	/usr
.proc	0	/proc
fd	0	/dev/fd
/dev/dsk/cot3d0s4	480799	/var
/dev/dsk/cot3d0s7	2430349	/export/home
/dev/dsk/cot3d0s5	480799	/opt
/dev/dsk/cot3d06	268897	/usr/openwin
swap	107868	/tmp

9-Gigabyte Drives (Replacements for 4-Gigabyte Drives):

Partitioning information for 9-Gigabyte drives is in Table C-6.

Table C-6 %df -k Output for 9-Gigabyte Drives

File System	Size (MB)	Mount
/dev/dsk/cot3d0s0	385007	/
/dev/dsk/cot3d0s6	481263	/usr
.proc	0	/proc
fd	0	/dev/fd
/dev/dsk/cot3d0s4	481263	/var
/dev/dsk/cot3d0s7	6494301	/export/home
/dev/dsk/cot3d0s5	481263	/opt
/dev/dsk/cot3d03	288751	/usr/openwin
swap	77204	/tmp

Dip Switch Settings for Master and Slave Cards

The following are the dip switch settings for Master and Slave Cards used for SS7 signaling links in Fallback/Selector/AB switch Selector Shelf Cards.

Slave Card

REV h - 4 closed, the rest open

REV g - 4 closed, the rest open

REV e - 4 closed, the rest open

REV f - 1 open, the rest closed

Master Card

REV g - 6 closed, the rest open

REV e - all closed

REV f - all closed

APPENDIX D

Expected Outputs

This appendix displays outputs for a system that is operating correctly. These known good system outputs serve as useful reference points when troubleshooting systems with problems.

VCO Subsystem

Boot

From C: drive

The following message output is the normal good output to the local console by the VCO CPU at 9.6 kBps upon system power up or reset *without* a floppy disk installed in the hard drive (i.e., booting off c:/). The local console must be set to "9600, N, 8, 1" in order to properly see this boot-up message sequence.

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test
COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C


SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully

A: drive has no floppy or Unreadable/Unformatted Floppy
Trying C drive
Reading boot file from disk device C:/boot/boot.sds
```

```
Loading file C:/boot/globals.exe
Loading file C:/boot/syswd.exe
Loading file C:/boot/hostmgr.exe
Loading file C:/boot/redmgr.exe
Loading file C:/boot/netmgr.exe
Loading file C:/boot/permgr.exe
Loading file C:/boot/snmp.exe
SW version loaded - Ver.Rev FSR : 5.1 002
Hard disk mounted successfully
Hard disk dismounted successfully

Loading File < syscnfg.TBL > ...
Loading File < card.TBL > ...
Loading File < port.TBL > ...
Loading File < hostcnfg.TBL > ...
Loading File < resgroup.TBL > ...
Loading File < supvtmpl.TBL > ...
Loading File < iprule.TBL > ...
Loading File < oprule.TBL > ...
Loading File < isdnsupv.TBL > ...
Loading File < isdnmsg.TBL > ...
Loading File < routesum.TBL > ...
Loading File < routetbl.TBL > ...
Loading File < exroute.TBL > ...
Loading File < nfascnfg.TBL > ...
Loading File < promptlb.TBL > ...
Loading File < subrate.TBL > ...
Loading File < motomap.TBL > ...
 Loading File < license.TBL > ...
```

Then the login screen appears.

Note The value for "`SW version loaded - Ver.Rev FSR :`" will vary according to the release that the system has installed on the hard drive.

The output shown above is standard for all 5.x Generic software versions.

There are a total of 19 .tbl files, but at boot-up, the file "`dbvers.tbl`" is not loaded into the CPU, by design. Only 18 .tbl files are loaded at time of boot-up. The file "`dbvers.tbl`" is only queried by the CPU at the time of a database conversion during manual and live upgrades.

From A: Drive with Generic Diskette #1 Installed

The following message output is the standard good output to the local console by the VCO CPU at 9.6 kBps upon system power up or reset *with* Generic floppy diskette 1 installed in the hard drive (i.e., booting from a:/). The local console must be set to "9600, N, 8, 1" in order to properly see this boot-up message sequence.

```
Copyright Motorola Inc. 1988 - 1997 All Rights Reserved

MVME147 Monitor/Debugger Release 2.44 - 8/7/97
CPU running at 33 MHz

FPC  passed test
MMU  passed test
```

```
COLD Start

Onboard  RAM start = $00000000,  stop = $00FFFFFF

147-Bug> Searching for ROM Boot

147-Bug>G FFA0002C
Effective address: FFA0002C


SDS Initializing...
Hard disk mounted successfully
Hard disk dismounted successfully
Reading boot file from disk device A:/boot/boot.sds
Loading file A:/boot/install.exe
Hard disk mounted successfully
Hard disk dismounted successfully


          I N S T A L L A T I O N  U T I L I T I E S


      1) Install/Configure Basic System Software
      2) Incremental Install of Basic System Software
      3) Disk Utilities
      4) Install Another Software Option
      5) Database Conversion
      6) License Configuration
      7) Set Extended Operational Mode
      8) Enable C-Bus Mode
      X) Terminate Installation


      Enter Selection:
```

Note Output line "`1) Install/Configure Basic System Software`" will vary according to the type of installation diskette installed. The system can also be booted from the ETHERNET diskette, the TELEROUTER diskette, or one of the ISDN diskettes.

SS7 Subsystem

EBS and cktint Processes

Type **px** to look at all the processes relative to cktint and EBS software.

When EBS and cktint software are not started, the px output will look like the following:

```
%px
UID     PID     CMD
%
```

When only EBS is started, the px output will look like the following:

```
UID     PID     CMD
cktint  9461    /export/home/EBS/access/bin/spmd
cktint  9467    /export/home/EBS/access/bin/AccessAlarm
cktint  9469    /export/home/EBS/access/bin/upmd 0
cktint  9471    /export/home/EBS/access/bin/snmd 0
cktint  9473    /export/home/EBS/access/bin/AccessRd
cktint  9477    /export/home/EBS/access/bin/AccessISUP 0
cktint  9479    /export/home/EBS/access/bin/tli
%
```

Note AccessRd and tli processes only exist in a redundant environment. In a nonredundant system, these are not started.

After cktint is started, the following additional processes are started:

```
cktint  9510    _logger /export/home/cktint/sys/CktintAnEnv/log/cktint
cktint  9511    cktint
cktint  9513    _tcprcvclnt 16 1
cktint  9514    _tcptxsrvclnt 16 1
cktint  9522    _ssisan 16 2
cktint  9523    _ssisan 16 2
%
```

Note When cktint dies of unknown reason, then these cktint processes will disappear.

Once the host opens a socket connection to cktint (host is connected), the following additional processes are started:

```
%px
cktint  9538    _tcprcvsrv 16 3
cktint  9543    _tcptxsrvclnt 16 3
cktint  9544    _tcprcvclnt 16 1
```

When px is typed after the starting of EBS, cktint and the host connection is complete.

This is how the processes should look like in a redundant environment:

```
UID     PID     CMD
cktint  9461    /export/home/EBS/access/bin/spmd
cktint  9467    /export/home/EBS/access/bin/AccessAlarm
cktint  9469    /export/home/EBS/access/bin/upmd 0
cktint  9471    /export/home/EBS/access/bin/snmd 0
cktint  9473    /export/home/EBS/access/bin/AccessRd
cktint  9477    /export/home/EBS/access/bin/AccessISUP 0
cktint  9479    /export/home/EBS/access/bin/tli
cktint  9510    _logger /export/home/cktint/sys/CktintAnEnv/log/cktint
cktint  9511    cktint
cktint  9522    _ssisan 16 2
cktint  9523    _ssisan 16 2
cktint  9538    _tcprcvsrv 16 3
cktint  9543    _tcptxsrvclnt 16 3
cktint  9544    _tcprcvclnt 16 1
```

Note When cktint dies (cores), cktint process will disappear from the above list or sometimes you will observe <defunc> as follows:

```
UID     PID     CMD
cktint  9461    /export/home/EBS/access/bin/spmd
cktint  9467    /export/home/EBS/access/bin/AccessAlarm
cktint  9469    /export/home/EBS/access/bin/upmd 0
cktint  9471    /export/home/EBS/access/bin/snmd 0
cktint  9473    /export/home/EBS/access/bin/AccessRd
cktint  9477    /export/home/EBS/access/bin/AccessISUP 0
cktint  9479    /export/home/EBS/access/bin/tli
cktint  9510    _logger /export/home/cktint/sys/CktintAnEnv/log/cktint
cktint  9511    <defunc>
cktint  9522    _ssisan 16 2
cktint  9523    _ssisan 16 2
cktint  9538    _tcprcvsrv 16 3
cktint  9543    _tcptxsrvclnt 16 3
cktint  9544    _tcprcvclnt 16 1
```

When the host is disconnected, the processes _tcptxsrvclnt 16 3 and _tcprcvclnt 16 1 will disappear from the above list.