

Corrective Maintenance—Service Circuits

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, speech recognition, and call progress tone detection. This chapter reviews general troubleshooting procedures for the VCO/4K service circuit cards. For detailed information about specific circuit cards, refer to the *Cisco VCO/4K Card Technical Descriptions*.

Overview

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).

Eight, 24, or 48 tone receivers with separately assigned PAs are contained on pooled receiver cards, including DRC and MRC cards. Receiver cards can be placed in any available slot starting with slot 7.



Note

SLIC-2, DID-2 and UTC-2 cards incorporate dedicated DTMF receivers for each circuit on the card. T1 and E+M services require pooled receivers for DTMF signaling applications. If MF signaling must be decoded, pooled MF receivers are required for all line/trunk card types.

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

Call Progress Analyzer (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.

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Digital Tone Generator-2 (DTG-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; 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 that in two cases listed above (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.

Receiver Cards

Depending on the application, DRCs and MRCs may be required, such as for incoming T1 service. Receiver cards can be mounted in any slot in the port subrack. A minimum of eight receiver ports are contained on each receiver card. The number of receiver cards required for a configuration is based on anticipated traffic and desired grade of service performance.

**Note**

All receiver cards must be placed into a single resource groups of the same type.

Failure of a single receiver 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.

Integrated Prompt/Record Cards (IPRCs)

The IPRC is designed to play and record digitized voice prompt information. The card is available in the following port configurations:

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

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- 128 playback/32 record ports

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.

Digital Conference Cards (DCCs)

Each DCC 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 DCC is capable of maintaining 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.

**Note**

All DCCs must be placed into a single resource group.

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

Call Progress Analyzer Cards (CPA)

The CPA card detects the presence of dial tone, busy, reorder, SIT tones, and pager cue tones, as well as the presence or cessation of audible ringback and voice. Each CPA is equipped with 24 circuits and mounts in any port card slot. A CPA port is allocated and released during a call as specified by outpulse rule processing. Answer supervision templates are used with outpulse rules to configure VCO/4K call processing, timing, reporting, outgoing port answerback, and error processing for signaling and supervision scenarios.

The CPA application is downloaded from hard disk to the CPA via the VCO/4K communication bus. Downloads are simultaneously broadcast to all configured CPA cards whenever a system is reinitialized (rebooted) from hard disk, or a directed download takes place when a CPA is reset and the download file on the hard disk is different than that stored in the CPA's RAM.

**Note**

All CPAs must be placed into a single resource group.

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

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Service Circuit Card Problems

DTG-2s, IPRCs, DRCs, MRCs, DCCs, SRCs, and CPAs have three status LEDs on their front panels. All LEDs are off when the card is operating normally. A label on the top handle of the card identifies the card type.

- *Red (top) LED*—Indicates a failure of the card to pass a self-test. The card is out of service and must be replaced if it does not respond to basic corrective card maintenance procedures. If the red LED illuminates during a reboot of the system, remove and reseat the card in the backplane. If this condition persists, replace the card.
- *Yellow (center) LED*—Indicates that the NBC3 has been unable to communicate with this card and therefore, has stopped polling it. The inability to communicate with the card can be due to a card or a communication bus failure. The yellow LED flashes while the NBC3 is establishing communication.
- *Green (bottom) LED*—Illuminates when the card is in standby status (DTG-2) or when it is removed from service using the Card Maintenance menu under the Maintenance Menu. The green LED flashes during card downloads.



Note

When a service circuit card is reset, either by the NBC3 following a system controller reboot or because the card has been marked Active via the Master Console, all three front panel LEDs simultaneously turn on and then off. If the LEDs remain illuminated, a hardware fault has been detected. Check all socketed components for proper seating. If seated properly and a fault is detected, the card should be returned for repair.

System error messages appear on the master console screen whenever a major or minor alarm condition occurs. Each message includes the Rack-Level-Slot address of the suspect card. Messages are written to the system error log and output to the system printer. Refer to *Cisco VCO/4K System Messages* for details on the meaning of error messages.

Detecting and Correcting Service Circuit Card Problems

The VCO/4K supports three types of tools for detecting service circuit problems—status LEDs, error messages, and Diagnostic Menus.

Status LEDs

Front Panel LEDs and system error messages provide quick indications of card status. Factors which cause major alarm indications (red LED illuminated) include:

- Failure of internal communications bus testing (card self test)
- A DTG-2 associated major alarm, when it has failed a 1-kHz (Continuous) Tone Test

Minor alarm indications (yellow LED illuminated) occur when:

- Period between communication bus interrupts is greater than 2.5 seconds, indicating a communication bus failure

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If the yellow LED illuminates on a service circuit card during normal system operation, use the Card Maintenance Menu to reset the card with the Change Status command (refer to the *Cisco VCO/4K System Administrator's Guide*). If the Change Status command fails, remove the card from the backplane and reseal it. If the red LED illuminates, remove and replace the card (refer to the *Cisco VCO/4K Card Technical Descriptions*).

If a service circuit card has been mounted in the wrong slot or has not been configured in the database, the card's green LED is illuminated, and the system log contains error messages indicating a wrong card.

System Log—Error and Status Messages

The system log contains a record of all error and status messages generated by the master controller and displayed on the master console and printer during system operation. Messages are time stamped by day of week (according to the setting of the system clock/calendar), and by the system controller who generated the message.

In addition to illuminating appropriate status LEDs, all system and card alarm conditions are appropriately identified in the log, such as CARD ALRM SET, CARD ALRM CLRD, MIN ALARM SET, MIN ALRM CLRD.

Chapter 3, “Corrective Maintenance” explains how to use system logs to isolate problems in a VCO/4K. Refer to the *Cisco VCO/4K System Messages* for a complete list of error log messages and meanings.

Test Service Circuits

From the Diagnostics Menu, you can use the Service Circuits Test Utility screen to perform port tests on specified DRC, MRC and CPA cards.



Note

Use the Card Maintenance menu from 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.

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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* and to the “Digital Tone Generator-2 (DTG-2)” section on page 7-2 for additional information on the DTG-2 card and its active/standby status in relation to the NBC3.

Service Card Configuration

Card configuration refers to 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. 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 *Cisco VCO/4K System Software Release Notes*. If the wrong version of firmware is installed, the system will not operate properly.

Troubleshooting

Refer to the *Cisco VCO/4K Card Technical Descriptions* and the *Cisco VCO/4K Troubleshooting Guide* for detailed information on repairing and replacing VCO/4K Service Circuit cards.



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).



Caution

Observe antistatic precautions when handling service circuit cards to avoid damaging sensitive CMOS devices.
