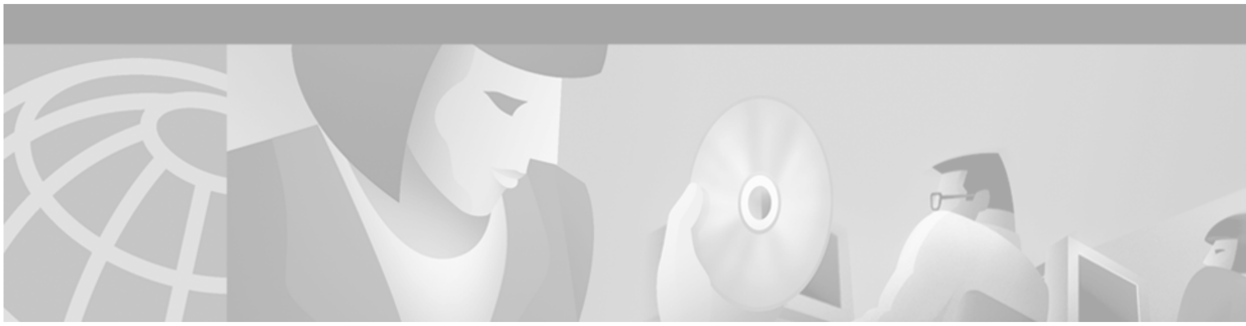

Preface

Objectives

The *Cisco VCO/4K Standard Programming Reference* describes how to design applications for the Cisco Systems VCO/4K open programmable switch in standard operational mode by configuring the associated commands and reports.

Audience

This guide is intended for all personnel designing applications for the VCO/4K switch. You should be familiar with the components of the switch as well as the system administrator master console. The master console is your access to the system administration functions.

Document Organization

This publication is organized as follows:

Chapter 1, "Switch Overview," provides an overview of the VCO/4K switch.

Chapter 2, "Inpulse and Outpulse Rules," provides a summary of inpulse and outpulse rules, focusing on the interaction between the rules and the system extended operational mode command and report set.

Chapter 3, "Message Structure Overview," provides an overview of the system message structure. Data between the system and the host computer is passed over one or more communications links. Regardless of the protocol chosen by the application designer, the structure of the message data transferred over the links remains the same.

Chapter 4, "System Commands," describes the extended operational mode system commands, which allow the host application program to control many configuration parameters and resources. These commands fall into five categories: configuration control, system status, system diagnostics, system maintenance, and resource control.

Chapter 5, "System Reports," describes the extended operational mode system reports, which communicate the operating and call processing status of the system to the host. These reports fall into three categories: configuration control, system status, and resource control.

Appendix A, "DTMF/MF Frequencies," lists the frequencies and hexadecimal values used for DTMF and MF inpulsing and outpulsing.

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Appendix B, "Decimal/Hexadecimal/Binary Conversion," provides reference tables to simplify the conversions required to construct and interpret extended mode system commands and reports.

Appendix C, "System Digitized Voice Card Prompts," lists the prompts available in Version 1.08 of the Digitized Voice Card (DVC) voice prompts diskette.

Appendix D, "Network Status Byte Definitions," defines the network status bytes encountered during the operation of the VCO/4K switch.

Appendix E, "Tone Values," lists the system tones and their corresponding decimal and hexadecimal values, and port addresses, for use with inpulse rules.

Appendix F, "Call Processing States," describes the system internal processing, which uses a simple state machine representation to track the current condition of all resources in the system—Major States (MStates) and Supplementary States (SStates).

Appendix G, "Integrated Prompt and Record Card Prompt Library," lists IPRC prompt numbers, in both decimal (for use in inpulse rules) and hexadecimal (for use in commands), and their corresponding messages.

Document Conventions

This guide provides the following consistent visual clues to identify text and important descriptions:

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

Tips Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful.

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. To see translated versions of the warning, refer to the *Regulatory Compliance and Safety* document that accompanied the device.**

Related Documentation

You may want to refer to the following documents that apply to your Cisco VCO/4K configuration:

- *Cisco VCO/4K System Software Version 5.n(n) Release Notes*
- *Cisco VCO/4K System Administrator's Guide*
- *Cisco VCO/4K System Messages*

- *Cisco VCO/4K Software Installation Guide*
- *Cisco VCO/4K Hardware Installation Guide*
- *Cisco VCO/4K Card Technical Descriptions*
- Product supplements for optional software, including:
  - *Cisco VCO/4K Management Information Base (MIB) Reference*
  - *Cisco VCO/4K ASIST Programming Reference*
  - *Cisco VCO/4K TeleRouter Reference Guide*
  - *Cisco VCO/4K ISDN Supplement*
  - *Cisco VCO/4K Ethernet Supplement*
  - *Cisco VCO/4K IPRC Supplement*
  - Applicable tone plan supplements

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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.

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CHAPTER 1

Switch Overview

Cisco Systems VCO/4K switch is an intelligent digital telecommunications peripheral that provides an interface to the public network. The unique functions and signaling requirements of that interface are handled by the system in much the same way a data switch handles the detailed requirements of its interface.

The system takes action based on: (1) events occurring on its switched network interfaces and (2) commands issued by a host computer. These actions and events are reported back to the host. No call routing decisions or call completions are made by the VCO/4K system software without direct host control.

This document provides information about the command and report structure the host uses to control the system. This overview introduces some of the software concepts you need to understand the interaction between the host and the system.

System Resources

The circuits that allow the system to function within the switched public network are called resources. System resources are divided into two types: port circuits, which are also called network interface circuits, and internal service circuits.

Network Interface Circuits

The system requires network interface circuits (ports), to connect to and interact with, the public telephone network, telecommunication peripherals, and voice storage/retrieval equipment. The type of circuit used depends upon the equipment to which the system is connected.

System network interface circuit cards include:

- SLIC-2 (Domestic) and SLIC-INT (International)
- DID-2 (Domestic) and DDI (International)
- UTC-2
- E+M and E+M (DC5) (UK only)
- T1 Interface (Domestic) and E1 Interface (International)
- T1-E (Japan only)
- Programmable Four Span T1 (Domestic) and Programmable Four Span E1 (International)
- PRI/N (Optional)

- E1-PRI (International)

Refer to the *Cisco VCO/4K Hardware Planning Guide* and *Cisco VCO/4K Card Technical Descriptions* for information on the physical characteristics of these cards.

Virtual Call Generation Ports

The system software can originate a call from the system without requiring a physical incoming port. This process makes use of an internal resource type called a Virtual Call Generation Port, or virtual port.

A virtual port is a logical entity maintained by system internal processing. There are 256 virtual ports, with a port address range of $80 00 through $80 FF. A single internal resource group, $FE, contains all virtual ports. No physical resources are associated with a virtual port; virtual port software addresses represent internal memory locations, and have a hardware address (R,L,S,P) of 0,0,0,xxx, where xxx is a port number from 1 to 256, inclusive. Physical operations such as seize, wink, and digit collections, are not allowed for virtual ports. Within these restrictions, the system can use a virtual port in place of a physical incoming port in most system commands.

Internal Service Circuits

For call processing to occur, the system must detect, interpret, and present tones. Additional requirements depend upon the type of calls, and can include presenting voice prompts or providing conferencing features. These functions are provided by internal service circuits, also called ports. System internal service circuit cards include:

- DTMF Receiver Card (DRC)
- DTMF Receiver Card 24/48 Ports (DRC 24/48)
- MF Receiver Card (MRC)
- MF Transceiver Card with Compelled R2 Signaling (MFCR2 Register)
- Digital Tone Generator (DTG)
- Digitized Voice Card (DVC)
- Integrated Prompt and Record Card (IPRC)
- Digital Conference Card (DCC)
- Call Progress Analyzer (CPA)

UTC-2, SLIC-2, and DID-2 cards are equipped with DTMF receivers on board, on a per port basis. Firmware on the SLIC-2 and DID-2 cards allows ports on these cards to interpret Dial Pulse (DP) digits. CPA cards detect call progress tone events such as dial tone, busy tone, reorder tone, special information tones (SIT), ring back presence/cessation and voice presence/cessation. Refer to the *Cisco VCO/4K Hardware Planning Guide* and the *Cisco VCO/4K Card Technical Descriptions* for information on the physical characteristics of these cards.

General Call Flow

A typical call involves a switched connection between two network interface circuits. One or more internal service circuit types receive or transmit information necessary to complete this connection. This general call flow is illustrated in Figure 1-1 and is described in the following text.

When the system detects an incoming call, it checks its database to determine whether there are any actions it must perform before informing the host of the call. These actions are contained in an inpulse rule, a list of call processing instructions for use with ports. Application designers define the inpulse rules, which are then stored in the system. If the database points to an inpulse rule for a port, the instructions are executed by the system and the results reported to the host as defined by that rule. The system then waits for further instructions from the host. Inpulse rules are discussed in Chapter 2, “Inpulse and Outpulse Rules.”

If no inpulse rule is specified for the incoming port, the system reports the incoming change of state to the host, then waits for further instructions. Reports are discussed in Chapter 5, “System Reports.”

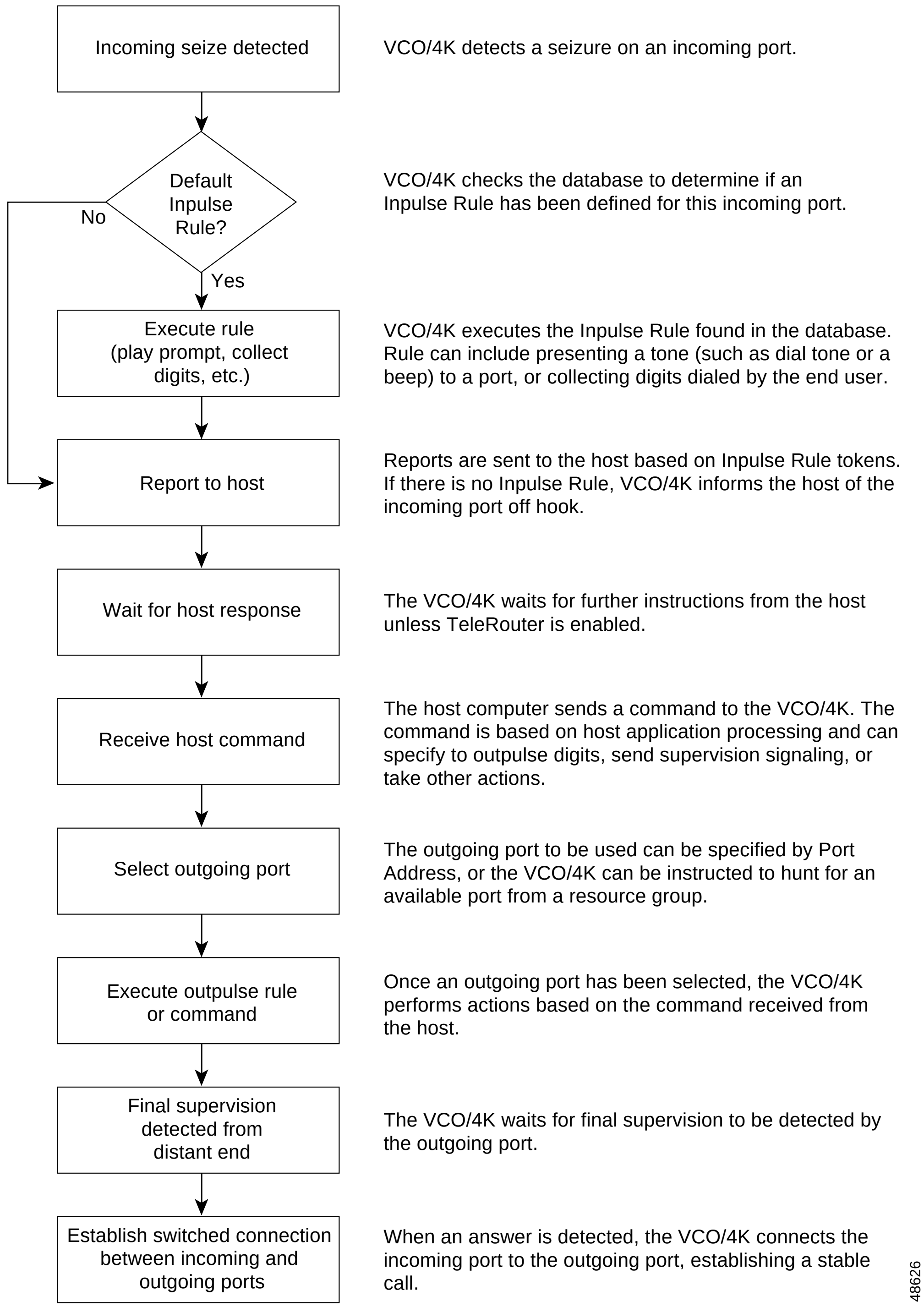
Based on these reports, the host decides the action to take next and sends instructions to the system. These instructions, called commands, direct the system to perform the functions necessary to complete the call. A command may also call an inpulse rule or a similar list of instructions, called outpulse rules. Outpulse rules are discussed in Chapter 2, “Inpulse and Outpulse Rules.” Command description are described in Chapter 4, “System Commands.”

Other factors that affect call processing include hardware characteristics such as the physical interface type, and system database entries, such as class of service (COS) and resource grouping.

Note Calls that use the conferencing features of the Digital Conference Card (DCC) differ from the general call flow in several important areas. For a discussion of the conferencing call flow, refer to the *Cisco VCO/4K Conferencing Guide*.

Figure 1-1 shows the general call flow.

Figure 1-1 General Call Flow



Resource Control

The system reacts to information it receives from outside the switch. The source and content of this information play a major role in determining the resources it selects to participate in a call.

The system call processing has two methods of identifying system resources: by port address and by resource group.

Port Address

A port address is a logical identifier assigned to every network interface and internal service circuit. This hexadecimal number corresponds to the PCM transmit time slot, and has no relationship to the physical location of the resource. With the exception of the system tones and outpulse channels provided by the DTG, port addresses are assigned dynamically by the system controller when a card is entered into the system database. The system controller uses the first contiguous block of available addresses.

A table of port addresses and physical locations is maintained by the system database. Use the Request Resource Allocation ($80) command and Hardware Allocation ($81) reports to transfer this information to the host.

Tone, outpulse channel, and virtual port addresses are fixed. Virtual ports are assigned port addresses $80 00 through $80 FF. Refer to Appendix E, “Tone Values,” for the port addresses of available tones.

Resource Group

A resource group is a collection of like ports defined by application designers. Each group consists of a name, number, hunt type, and a list of resources. You can define up to 63 resource groups, each containing up to 999 members (ports).

The following system resources must be grouped (only one group per resource type):

- DTMF receiver ports
- MF receiver ports
- MFCR2 transceiver ports
- DVC ports
- IPRC ports
- DCC ports
- CPA ports

The following resources should be grouped for optimum system performance and to allow resource allocation and reporting:

- SLIC-2 ports and SLIC-INT
- DID-2 ports and DDI
- UTC-2 ports and ETC/LTC
- T1 channels and 4xT1 channels
- E1 channels and 4xE1 channels
- PRI/N B-channels
- E+M ports

The characteristics that help determine resource grouping include:

- Resource type
- Physical interface
- Type and location of connected equipment
- Class of Service (COS)
- Default inpulse rule assignment
- Purpose within the application
- Outpulse channels and virtual ports are already grouped internally by the system; these groups cannot be modified. System tones cannot be grouped.

Class of Service (COS)

Class of Service (COS) is a set of operating characteristics the application designer assigns to a network interface circuit (line/trunk port). Once the COS mark is entered into the database, the system can determine how a port is used in a call. Table 1-1 summarizes the COS marks supported by the system.

Table 1-1 Class of Service Options

COS	Description
O	Originating—Calls originating from the system; outgoing calls initiated by host command.
T	Terminating—Calls terminating at the system; incoming calls initiated by actions outside the system.
2	2-Way—Calls originating from the system or calls terminating at the system; outgoing calls initiated by host command, incoming calls initiated by outside actions.
AO	Always Off Hook and Originating—Calls originating from the system, port goes off hook at system reset and remains off hook; outgoing calls initiated by host command.
AT	Always Off Hook and Terminating—Calls terminating at the system, port goes off hook at system reset and remains off hook; incoming calls initiated by outside actions or forced by host command.
A2	Always Off Hook and 2-Way—Calls originating from the system or calls terminating at the system, port goes off hook at system reset and remains off hook; outgoing calls initiated by host command, incoming calls initiated by outside actions or forced by host command.

The system call processing also uses internal COS marks for ports designated as 2-way, ports involved in a call using a virtual port, or any line/trunk port involved in a conference. These internal COS marks are summarized in Table 1-2.

Table 1-2 Internal Class of Service Options

Internal COS	Description
U	2-way trunk used for an outgoing call; assumes all characteristics of COS = O for duration of call.
T	2-way trunk used for incoming call; assumes all characteristics of COS = T for duration of call.

Table 1-2 Internal Class of Service Options (continued)

Internal COS	Description
C	Any trunk currently involved in an active conference; trunk maintains COS characteristics as defined by database.
P	Virtual port or any outgoing line/trunk port used in a call with a virtual port.

Resource Allocation, Links, and Voice Paths

The resources the system allocates to a call are determined in one of the following ways:

- An autonomous event outside the system, such as an incoming seize detected on a network interface circuit
- A command request for a resource with a specific port address
- A command or rule request specifying to use a resource from a specific group

When a resource is allocated, it is linked into a resource chain for a call. In a nonconference call, a resource chain is a serially linked list of ports that begins with the incoming port and includes all ports and channels involved in a call. The following resources can be linked:

- Outpulse channels
- DRC ports
- MRC ports
- MFCR2 ports
- DVC ports
- IPRC ports
- DCC ports
- CPA ports
- SLIC-2 ports and SLIC-INT
- DID-2 ports and DID
- UTC-2 ports and ETC/LTC
- T1 channels and 4xT1 channels
- E1 channels and 4xE1 channels
- PRI B-channels
- E+M ports
- Virtual ports

Conference calls have several resource chains. One chain includes all DCC ports for that conference. Each DCC port also has a chain linking it to the associated line/trunk port(s).

While a resource is linked into a call's resource chain, it cannot be used for any other call. Call processing determines when a resource is dropped from a chain and made available for the next call.

A resource can be linked but not actively participating. A resource is actively participating in a call if a voice path exists (resource actively sending or receiving in-band signaling), the port is sourcing out-of-band supervision signaling, or the port is waiting for out-of-band supervision. A voice path is a physical, system-switched connection that allows the transfer of MF digits, DTMF digits, tones, prompts, or voice information. The system cannot use virtual ports to transfer information; therefore, a voice path cannot be established for a virtual port.

Call processing divides system resources into two categories: senders and receivers. Senders originate voice and in-band signaling information; receivers listen to information. Table 1-3 shows the valid senders and receivers.

Table 1-3 Valid System Resource Senders and Receivers

Senders	Receivers	Senders and Receivers
Outpulse channels	DRC ports	SLIC-2 ports and SLIC-INT
DVC ports	MRC ports	DID-2 ports and DID
IPRC ports	MFCR2 ports	UTC-2 ports and ETC/LTC
—	CPA ports	T1 channels and 4xT1 channels
—	—	E1 channels and 4XE1 channels
—	—	E+M ports
—	—	DCC ports
—	—	PRI/N B-channels

Figure 1-2 shows system voice paths. Each of these switched connections is explained in the text that follows.

Note Virtual ports are actually memory locations which originate outgoing calls without a physical incoming port. Because of their nature, they are a resource capable of being linked, but no voice path is established when they are added to a call. For this reason, they are not represented in Figure 1-2.

Figure 1-2 System Voice Paths

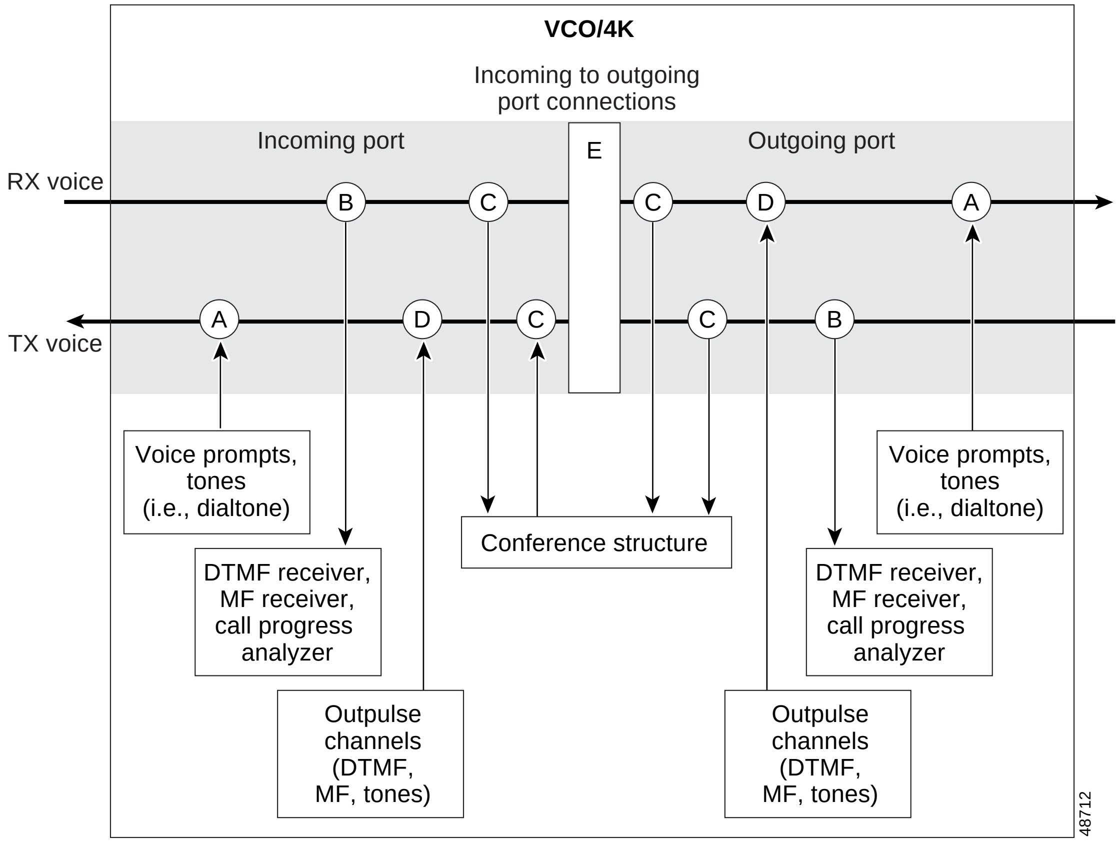


Table 1-4 Legend for Figure 1-2 Callouts

Voice Path	Description
A	Voice prompts and tones (such as dial tone or quiet) are presented to an incoming or outgoing port. The voice path is between the outpulse channel, IPRC or DVC port (sender), and the incoming port (receiver). The path is one-way only.
B	In-band signaling, such as call progress tones or DTMF, MF, or spoken (0 to 9, yes, no) digits—sent over the incoming or outgoing port are detected and interpreted by a receiver port. The voice path is between the incoming or outgoing port (sender) and the DTMF Receiver port, MF Receiver port, or CPA port (receiver). The path is one-way only.
C	Voice information is passed between an incoming or outgoing port and a conference structure. The voice path of this structure is between one to seven senders and an unlimited number of receivers. The path may be one-way or two-way.
D	DTMF digits, MF digits, or tones are presented to an incoming or outgoing port. The voice path is between the outpulse channel (sender) and the outgoing or incoming port (receiver). The path is one-way only.
E	Voice information is passed between an incoming port and an outgoing port (normal call in progress). The voice path is between the incoming port (sender and/or receiver) and the outgoing port (sender and/or receiver). The path is normally two-way but can be altered by host via the Voice Path Control ($66) command.

Use the system administration Port Display screen to monitor the current links and voice paths for an individual port. Refer to the *Cisco VCO/4K System Administrator's Guide*. System tones cannot be linked because they are a shared resource. A voice path can be established between a tone and a receiver without a link.

CHAPTER 2

Inpulse and Outpulse Rules

Processing a call on a system network interface circuit requires a number of signaling and supervision actions. These actions are often common among many call types and are performed in the same sequence. After you have defined these sequences, the system stores them and uses them as needed in the form of inpulse and outpulse rules.

Define inpulse and outpulse rules through the system Data Base Administration Menu (refer to the *Cisco VCO/4K System Administrator's Guide)*. Actions are represented by tokens; you can use up to 16 tokens in each inpulse and outpulse rule you define.

Rules can be “called” like subroutines in a command or, in the case of inpulse rules, executed by default when an incoming port seizes inward. Because rule processing takes place on the system, the amount of processing overhead for the host computer and the communications links is decreased.

This section presents a summary of inpulse and outpulse rules, focusing on the interaction between rules and the system command/report set. Detailed information on defining and using rules is contained in the *Cisco VCO/4K System Administrator's Guide*.

Inpulse Rules

An inpulse rule consists of up to 16 tokens. The tokens can be used to condition a trunk to wait for supervision events, collect MF, DTMF, or Dial Pulse (DP) digits, and store received digit fields in an internal system call record. You can define up to 30 inpulse rules.

The system can execute inpulse rules for any line or trunk, regardless of its class of service (COS). An inpulse rule can also specify to execute an outpulse rule. When the outpulse rule has been completed, the original inpulse rule processing continues.

Inpulse rule tokens available in the basic system software are listed in Table 2-1. Available system tones are listed in Appendix E, “Tone Values” (use the decimal values with inpulse rules). The column [xx] indicates if additional data is required to complete a token. Additional tokens for optional system software (TeleRouter, ISDN and ISDN with NFAS) packages are detailed in the documentation that accompanies those options. For a more detailed description of each of the inpulse rules, refer to the *Cisco VCO/4K System Administrator’s Guide*.

Inpulse rule tokens are functionally divided into six groups:

- Reporting Control—Determines when change of state and address signaling for an incoming port are reported to the host.
- Signaling Mode—Indicates incoming digits for collection are either MF, DTMF, or DP.
- Digit Collection Setup—Defines the conditions for digit collection.

- Digit Collection—Enables the appropriate receiver (as indicated by the Signaling Mode token) and specifies the digit field in which digits are stored.
- Supervision Control—Presents in-band or out-of-band signaling to the distant end (i.e., answer, wink, tone, voice prompt) or waits a specified length of time before continuing rule processing.
- Processing Control—Allows construction of rules with more than 16 tokens for processing outpulse rules.
- Prompt/Record Control—Prompt and record control for the IPRC.

Table 2-1 Inpulse Rule Token and [xx] Choices

Token	Type	Definition	[xx]
ANSWER	Supervision Control	Seize incoming port (not applicable to SLIC).	—
APEND ANI [xx][1]	Digit Collection	Collect the number of ANI digits specified in field [xx] and append them to the digits in the call record; [xx] not required for MF.	1 to 40
APEND FLD [xx][1]	Digit Collection	Append the incoming digits to the call record field specified in field [xx].	1 to 4
CLR CHAR1 [xx]	Digit Collection Setup	For DTMF processing, discard collected digits and restart collection when characters specified in field [xx] are detected.	0 to 9, *, #
		When “4th Column DTMF” is enabled, valid entry includes A to F.	0 to 9, *, #, A to F
		For MFCR2 processing, set the backward supervision tone to send.	0 to 15
CLR CHAR2 [xx]	Digit Collection Setup	For DTMF processing, discard collected digits and restart collection when characters specified in field [xx] are detected.	0 to 9, *, #
		When “4th Column DTMF” is enabled, valid entry includes A to F.	0 to 9, *, #, A to F
CONT NREP	Digit Collection Setup	Continue rule processing if a DTMF/DP first digit, interdigit, or field timeout occurs. Do not report timeout to host. Any digits collected at the end of the rule are reported unless overwritten by subsequent collection.	—
CONT REP	Digit Collection Setup	Continue rule processing if a DTMF/DP first digit, interdigit, or field timeout occurs. Report timeout and all digits collected to host.	—
DIGITS [xx]	Digit Collection Setup	Collect number of digits specified in field [xx]; DTMF, DP, and MFCR2 only.	1 to 40
DO IRULE [xx]	Processing Control	Execute inpulse rule specified in field [xx] and return to next token in this rule.	1 to 30
DO ORULE [xx]	Processing Control	Execute outpulse rule specified in field [xx] and return to next token in this rule.	1 to 30
DTMF	Signaling Mode	Attach DTMF receiver; for DID and SLIC, can be either DTMF or DP collection.	—

Table 2-1 Inpulse Rule Token and [xx] Choices (continued)

Token	Type	Definition	[xx]
DTMF4	Signaling Mode	Allows END CHARx and CLR CHARx tokens data fields to accept fourth column DTMF digits. System feature flag, "Enable 4th Column DTMF" must be enabled to use this token.	—
END CHAR1 [xx]	Digit Collection Setup	For DTMF processing, single end digit collection when characters specified in field [xx] are detected.	0 to 9, *, #
		When "4th Column DTMF" is enabled, valid entry includes A to F.	0 to 9, *, #, A to F
		For MFCR2 processing, set backward supervision tone after digit collection is complete.	0 to 15
END CHAR2 [xx]	Digit Collection Setup	For DTMF processing, double end digit collection when characters in specified field [xx] are detected.	0 to 9, *, #
		When "4th Column DTMF" is enabled, valid entry include A to F.	0 to 9, *, #, A to F
GLARE [xx]	Processing Control	Execute a specified inpulse rule when an ISDN glare condition occurs.	1 to 30
GOTO RULE [xx]	Processing Control	Execute an inpulse rule specified in field [xx] without returning to this rule.	1 to 30
IP ANI [xx][1]	Digit Collection	Collect the number of ANI digits specified in field [xx] and store in call record; [xx] not required for MF.	1 to 40
IP CAT2	Digit Collection	Allows for a single category digit collection.	—
IP FIELD [xx][1]	Digit Collection	Store incoming digits in the call record field specified in field [xx].	1 to 4
ISDN RX	Supervision Control	Use an ISDN message template during rule processing.	1 to 96
ISDN TX	Supervision Control	Specify which ISDN message template to use to construct an outgoing D-channel message.	1 to 96
LIBRARY [xx]	Prompt/Record Control	The system supports 16 prompt libraries. Hunt for an IPRC port from the announcement resource group that supports the specified prompt library.	0 to 16 or TMP
LOOP ALL	Prompt/Record Control	Instruct the IPRC to continually loop the prompt list being played. Continue until a subsequent inpulse rule or host command terminates the operation or the IPRC playing the prompt list is removed from the call.	—
LOOP LAST	Prompt/Record Control	Instruct the IPRC to continually loop the last prompt in a list of prompts being played. Continue until a subsequent inpulse rule or host command terminates the operation, or the IPRC port playing the prompt list is removed from the call.	—
MAX REC [xx]	Prompt/Record Control	Define an upper limit in seconds for recording a particular prompt. Default value is 0, meaning no limit.	0 to 255

Table 2-1 Inpulse Rule Token and [xx] Choices (continued)

Token	Type	Definition	[xx]
MF	Signaling Mode	Attach MF receiver.	—
MFCR2	Signaling Mode	Attach MFCR2 transceiver.	—
NO HOST [xx]	Processing Control	Execute a specified inpulse rule setup timer. If no host command is received in that time, the system executes the inpulse rule indicated in the NO HOST [xx] token data field.	1 to 30
NO REP	Reporting Control	Suppress end of rule reporting; no effect on REP EACH or REP NEXT tokens.	—
RECORD [xx]	Prompt/Record Control	Hunt an IPRC containing default or previously defined prompt library. Erase the prompt specified by ID, and begin recording new prompt from the line/trunk port executing the inpulse rule.	1 to 255
RELEASE [xx]	Resource Control	Remove the specified resource type from the call.	IPRC, MRC, DRC, DTG, CPA, or MCR. Data must be typed (case sensitive); it is not selectable.
REP EACH	Reporting Control	Report all inpulsing events to host when they occur.	—
REP END	Reporting Control	Report collected digits, end of rule, and any errors to host when inpulsing is completed (default).	—
REP NEXT	Reporting Control	Report the next inpulsing event to the host, then revert to previous Report Control mode.	—
RETAIN [xx]	Resource Control	Hold on to the specified resource type from the call.	IPRC, DTMF, MCR, and DRC. Data must be typed (case sensitive); it is not selectable.
ROUTE (Tx)	Processing Control	Provides call routing based on the digit stored in the specified digit field. Must be the last token defined in an inpulse rule.	For T: A to J For x: 0 to 5
SPEAK [xx][1]	Prompt/Record Control	Speak voice prompt specified in field [xx].	1 to 255
STOP VOIC	Prompt/Record Control	Terminate playback or record operation.	—
TIM FDIG [xx]	Digit Collection Setup	Wait the number of seconds specified in field [xx] for the first digit to be received (max. time between receiver enabled and first digit); DTMF, DP only.	1 to 30
TIM FIELD [xx]	Digit Collection Setup	Wait the number of seconds specified in field [xx] for the number of digits minus one specified in DIGITS [xx] to be received; default value is 20, DTMF, DP only.	1 to 60
TIM INTER [xx]	Digit Collection Setup	Wait the number of seconds specfied in field [xx] for another digit after one is received (max. time between digits); default value is 6, DTMF, DP only.	1 to 10

Table 2-1 Inpulse Rule Token and [xx] Choices (continued)

Token	Type	Definition	[xx]
TONE CLR [xx]	Digit Collection Setup	Send tone specified in field [xx] when CLR CHAR is detected.	0 to 1, 3 to 7, 9 to 63[2]
TONE ENAB [xx]	Digit Collection Setup	Send tone specified in field [xx] when receiver is enabled.	0 to 1, 3 to 7, 9 to 63[2]
TONE END [xx]	Digit Collection Setup	Send tone specified in field [xx] when END CHAR is detected.	0 to 1, 3 to 7, 9 to 63[2]
TONE FDIG [xx]	Digit Collection Setup	Send tone specified in field [xx] when first digit is detected by receiver; DTMF, DP only	0 to 1, 3 to 7, 9 to 63[2]
TONE NOW [xx]	Supervision Control	Send tone specified in field [xx].	0 to 63[2]
WAIT TIME [xx][1]	Supervision Control	Wait the number of seconds specified in field [xx] before continuing rule processing.	1 to 10
WINK ENAB	Digit Collection Setup	Wink trunk when receiver is enabled.	—
WINK NOW	Supervision Control	Condition trunk circuit to Busy for 250 ms (T1, E+M, DID only) or hookflash for 500 ms (UTC only).	—

1. Refer to the "Recursive (Looping) Rules" section on page 2-10 for information on the use of these tokens in recursive rules.
2. Refer to Appendix E, "Tone Values," for decimal tone values and their corresponding tones.

Beginning Inpulse Rule Processing

Inpulse rule processing can begin in one of the following ways:

- Ordered by a host command—An inpulse rule can be started by the host with an Outgoing Port Control ($69) or Incoming Port Control ($6A) command. The port for which the rule is specified must be off hook. Refer to Chapter 4, "System Commands," for more information.
- Started by an autonomous event—An inpulse rule can be specified as the default rule for an incoming port. When an off hook (seize) is detected on a port with a default rule, inpulse rule processing begins.
- Started by an outpulse rule DO IRULE token—An inpulse rule can be started by a DO IRULE token in an outpulse rule.

Ending Inpulse Rule Processing

Inpulse rule processing ends normally when all instructions in the rule (or rules if GOTO RULE or DO IRULE/ORULE tokens are used) have been executed. Processing is aborted in the following cases:

- Ordered by host command—A resource control command is received that specifies the port involved in inpulse rule processing as the controlling port.
- Aborted by error condition—An MF/DTMF receiver or voice port was not available when required by rule processing, garbled MF digits were received or an MF timer expired, an outpulse channel or CPA port was not available (outpulse rule processing via DO ORULE token), or DTMF/DP timer expired (no CONT REP or CONT NREP token in rule).

Reports Produced by Inpulse Rule Processing

The following reports are produced by inpulse rule processing:

- MF Digit ($D0)—Contains any MF digits collected for a single digit field. Multiple $D0 reports can be produced by a single inpulse rule. This report shows if digit collection was successful; if unsuccessful, provides reason for failure. The report is produced if a digit collection token is preceded by a REP NEXT token or a REP EACH token has been processed in the rule.
- DTMF Digit ($D1)—Contains any DTMF or DP digits collected for a single digit field. Multiple $D1 reports can be produced by a single inpulse rule. This report shows if digit collection was successful; if unsuccessful, provides reason for failure and any digits correctly received up to that point. The report is produced if a digit collection token is preceded by a REP NEXT token or a REP EACH token has been processed in the rule, or a digit timer expired and CONT REP was used in collection setup.
- Resource Limitation ($D6)—Indicates an MF/DTMF receiver or IPRC port was not available when required for rule processing.
- Incoming Port Change of State ($DB)—Indicates the incoming port identified in the report has gone off hook. Report produced if a REP EACH token has been processed in the rule.
- Inpulse Rule Complete ($DD)—Indicates rule processing has ended for the port identified in the report. This report is a macro report that can contain MF Digit, DTMF Digit, and Incoming Port Change of State report segments. Content is based on the Reporting Control token used. If no Reporting Control token is used, this report contains all reports produced by the rule and not already reported.
- Voice Port Status ($DE)—Indicates that all voice prompts specified in a Voice Port Control ($6C) command have completed. This report is produced if a REP EACH token has been processed in the rule.

Outpulse Rules

An outpulse rule is a listing of tokens defined by an application designer or system administrator. You can use up to 16 tokens to condition a trunk to wait for supervision events, and outpulse MF/DTMF digits. Up to 30 outpulse rules can be defined.

Outpulse rules can be executed for any line or trunk in the system, regardless of its class of service (COS). An outpulse rule can also specify to execute an inpulse rule as part of outpulse rule processing; when the inpulse rule has been completed, the original outpulse rule processing continues.

Available outpulse rule tokens and available system tones are listed in Table 2-2 and Table 2-3. The column [xx] indicates if additional data is required to complete a token. Additional tokens for optional system software (TeleRouter, ISDN, and ISDN with NFAS software packages) are detailed in the documentation that accompanies those options.

Outpulse rule tokens are functionally divided into the following groups:

- Reporting control—Notifies the host of supervision events detected on an outgoing or incoming port.

  Reporting for individual signaling events specified by WAIT SUP is controlled by either an intermediate answer supervision template, if preceded by an ANS SUP [xx] token, or controlled by an ISDN supervision template, if preceded by an ISDN SUP [xx] token.

Reporting for individual signaling events specified by FINAL SUP is controlled by either a final answer supervision template, if preceded by an ANS SUP [xx] token, or controlled by an ISDN supervision template, if preceded by an ISDN SUP [xx] token.

- Signaling Mode—Determines the type of outpulse signaling used; DTMF, MF, or TONE mode with OP DIGIT.
- Supervision Control—Conditions the port to detect and respond to answer supervision events before continuing with rule processing. Indicates which configurable answer supervision template or preconfigured template to use for supervision.
- Digit Field—Determines when and what digits or tones are outpulsed.
- Processing Control—Allows construction of rules with more than 16 tokens for processing an inpulse rule.

Table 2-2 Outpulse Rule Token and [xx] Choices

Token	Type	Definition	[xx]
ANS SUP [xx]	Supervision Control	Calls the template. WAIT SUP or FINAL SUP following ANS SUP causes Intermediate FINAL.	1 to 24
DO IRULE [xx]	Processing Control	Execute inpulse rule specified in field [xx] and return to next token in this rule.	1 to 30
DO ORULE [xx]	Processing Control	Execute outpulse rule specified in field [xx] and return to next token in this rule.	1 to 30
FINAL SUP[1]	Supervision Control	Execute supervision template specified during wait for final supervision.	Answer supervision template: 1 to 24, or A
GOTO RULE [xx]	Processing Control	Execute outpulse rule specified in field [xx] without returning to this rule.	1 to 30
ISDN RX	Supervision Control	Specify to use an ISDN message template during rule processing.	1 to 96
ISDN SUP	Supervision Control	Specify which ISDN supervision template is used during outpulse rule processing.	1 to 24
ISDN TX	Supervision Control	Specify which ISDN message template to use to construct an outgoing D-channel message.	1 to 96
NOHOST [xx]	Processing Control	Execute a specified inpulse rule upon the expiration of the host setup timer. If no host command is received in that time, the system executes the inpulse rule indicated in the NO HOST [xx] token data field.	1 to 30
OP ANI[1]	Digit Field	Outpulse the digits stored in the call record ANI field.	—
OP CAT [xx]	Digit Field	For MFCR2 only. Outpulse the calling party category.	0 to 15
OP CAT2	Digit Field	For MFCR2 only. Outpulse different category digits from within a $69 command.	—

Table 2-2 Outpulse Rule Token and [xx] Choices (continued)

Token	Type	Definition	[xx]
OP DIGIT [xx][1]	Digit Field	Outpulse digit or tone specified in field [xx]. The token data field accepts fourth-column DTMF digits when "Enable 4th Column DTMF" feature flag is enabled.	DTMF mode: 0 to 9, *, #, A to F (*, E and #, F are interchangeable. MF mode: 0 to 9, KP, ST, S1, S2, S3. Tone mode: 0 to 8[2].
OP DTMF	Signaling Mode	Outpulse in DTMF mode.	—
OP FIELD [xx][1]	Digit Field	Outpulse the digits stored in the call record field specified in field [xx].	1 to 4
OP MF	Signaling Mode	Outpulse in MF mode.	—
OP MFCR2	Signaling Mode	Outpulse in MFCR2 mode.	—
OP PULSE	Signaling Mode	Sets the outpulse mode to dial pulse.	—
OP TONE	Signaling Mode	Outpulse in tone mode.	—
RELEASE [xx]	Resource Control	Remove the specified resource type from the call.	IPRC, MRC, DRC, DTG, CPA, or MCR. Data must be typed (case sensitive); it is not selectable.
REP END	Reporting Control	Report the end of outpulse rule processing.	—
REP NEXT	Reporting Control	Used as outpulse rule in MFCR2 processing only. Causes final backward supervision tone to be reported to the host in Outgoing Port Change of State report ($DA).	—
RETAIN [xx]	Reporting Control	Hold on to the specified resource type from the call.	IPRC, DTMF, MCR, and DRC. Data must be typed (case sensitive); it is not selectable.
SEIZE	Supervision Control	Perform outward seizure on outgoing trunk.	—
TIME SUP [xx][1]	Supervision Control	Wait the number of seconds to receive expected supervision.	1 to 60
WAIT SUP[1]	Supervision Control	Treat ANS SUP [xx] as WAIT intermediate.	Answer supervision template: 1 to 24, A, or W
WAIT TIME [xx][1]	Supervision Control	Wait the number of 250ms intervals specified in field [xx].	1 to 10

1. Refer to the "Recursive (Looping) Rules" section on page 2-10 for information on the use of these tokens in recursive rules.
2. Refer to Table 2-3 for decimal tone values and their corresponding tones.

Table 2-3 OP DIGIT Values for OP TONE Mode

Tone	Value
Quiet Tone	0
Dial Tone	1
Ring Back Tone	2
Busy Tone	3
380 Hz Tone	4
440 Hz Tone	5
480 Hz Tone	6
1400 Hz Tone	7
913.8 Hz SIT	8

Beginning Outpulse Rule Processing

Outpulse rule processing can begin in one of the following ways:

- Ordered by host command—An outpulse rule can be started by the host using an Outgoing Port Control ($69) or an Incoming Port Control ($6A) command with an Outgoing Port Control segment. Refer to Chapter 4, "System Commands," for more information.
- Started by an inpulse rule DO ORULE token—An outpulse rule can be started by a DO ORULE token in an inpulse rule.

Ending Outpulse Rule Processing

Outpulse rule processing ends normally when all instructions in the rule (or rules if GOTO RULE or DO IRULE/ORULE tokens are used) have been executed. Processing is aborted when a supervision or resource allocation error occurs.

Reports Produced by Outpulse Rule Processing

The following reports can be produced by outpulse rule processing:

- Outgoing Port Change of State ($DA)—In MF and DTMF processing, this report indicates the answer supervision template that was executed, and the individual supervision events detected. The report is generated only if a WAIT SUP [xx] or FINAL SUP [xx] supervision control token is used in the rule. If REP END token is used, a $DA report is produced to indicate outpulse rule processing has completed.

  In MFCR2 processing, the $DA report includes the backward signaling codes. When REP NEXT is used in the outpulse rule template, the final backward supervision signaling code is reported to the host in the report.
- Incoming Port Change of State ($DB)—Indicates the answer supervision template executed, and the individual supervision events detected. The report is generated only if a WAIT SUP [xx] or FINAL SUP [xx] supervision control token is used in the rule. If a REP END token is used, a $DB report is produced to indicate outpulse rule processing has completed.

Recursive (Looping) Rules

You can use processing control tokens to create recursive rules, or rules for which processing eventually returns to the original rule. To create these “looping” rules use the DO IRULE, DO ORULE, and GOTO RULE tokens and continue until one of the following conditions occurs:

- An external event, such as a host command or a port on hook, is detected.
- Forty tokens are processed without any of the following tokens being encountered:
  - Inpulse rule tokens—IP ANI, IP FIELD, WAIT TIME, SPEAK.
  - Outpulse rule tokens—WAIT SUP [xx], FINAL SUP [xx], TIME SUP [xx], WAIT TIME, OP DIGIT, OP ANI, OP FIELD.

Looping allows single digit collection in inpulse rules, such as that employed when a user is prompted (by a Voice Response Unit or similar peripheral equipment) to answer questions by pressing a button on their phone. The inpulse rule below could be used for that purpose.

REP EACH	
DTMF	
DIGITS	1
IP FIELD	1
GOTO RULE	1

Null Outpulse Rule

In addition to user-defined outpulse rules, a predefined Null Outpulse Rule (rule 0) exists in the VCO/4K system software. This rule is not accessible by system administration and cannot be altered. The Null Outpulse Rule is defined as shown below:

SEIZE	
TIME SUP	30
FINAL SUP	A

The rule performs an outward seizure, starts a 30-second grace timer and waits for final answer. When the Null rule is specified in an Outgoing Port Control ($69) command executed for an outgoing port, the port is considered answered if either true answer is detected or the grace timer expires.

Answer Supervision Templates

Supervision processing is performed by a combination of supervision control outpulse rule tokens and answer supervision templates. The outpulse rule tokens WAIT SUP [xx] and FINAL SUP [xx] are used for intermediate supervision and final supervision, respectively. During outpulse rule processing, these tokens “call” specific answer supervision templates like subroutines. The templates indicate which signaling events must be detected and the system response to each event. When an event is detected, the system response specified in the template is performed; the supervision control outpulse rule token is satisfied and rule processing continues.

Call progress tone events detected during template processing include:

- Dial
- Busy
- Fast Busy (Reorder)
- Special Information Tone (SIT)
- Audible Ringback
- Ringback Cessation
- Presence of Voice
- Voice Cessation
- Pager Cue

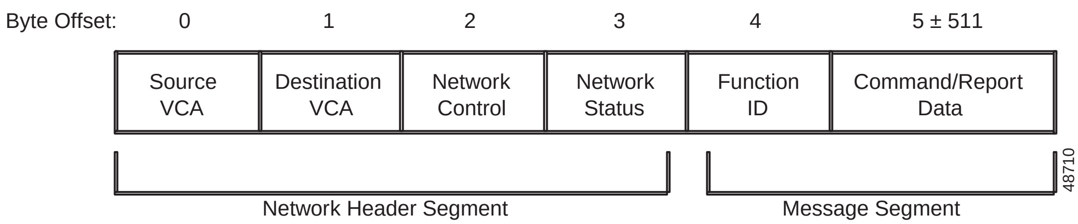
Answer supervision templates accessed via system administration allow users to specify system actions for particular signaling events. Signaling events include the events listed above, plus wink, true answer, supervision timing and hook flash. Condition tokens assigned to each type of signaling event determine system action when these events are detected. Preconfigured templates corresponding to the outpulse rule tokens WAIT SUP A, WAIT SUP W and FINAL SUP A exist for simple wink and answer supervision scenarios. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information on answer supervision templates.

Message Structure Overview

Data between the system and the host computer is passed over one or more communications links. Regardless of the protocol chosen by the application designer, the format of the message data transferred over the links remains the same. This section provides an overview of the system message structure.

A system message can consist of as few as 6 and as many as 512 bytes of information, depending on the command or report type. In spite of this variation in length, the message structure is consistent, as shown in Figure 3-1.

Figure 3-1 System Message Structure



Each message consists of a Network Header Segment and a Message Segment. The sections that follow explain the bytes contained in the Network Header Segment. The Message Segment (Function ID and Command/Report Data) is discussed in Chapter 4, “System Commands,” and Chapter 5, “System Reports.”

Source VCA (Byte Offset 0)

The Source Virtual Communications Address (VCA) is the hex representation of the logical identifier assigned to the equipment that originated the message. This address is independent of any station identifiers required by the protocol.

Source VCA: System

Messages sourced by the system use the global VCA $DF unless that value has been changed by the receipt of a Configure VCA/Set System Clock ($C0 00) command. The new VCA remains set through system reset and power-down cycles.

Source VCA: Host

Messages that originate from the host computer should have a source VCA different from any that has been assigned to the system.

Destination VCA (Byte Offset 1)

The destination virtual communications address (VCA) is the hex representation of the logical identifier assigned to the equipment to which the message is sent. This address is independent of any station identifiers required by the protocol.

Destination VCA: System

A received message is not processed unless the Destination VCA matches the VCA assigned to that particular system. Every system responds to the global VCA $DF, regardless of any address assignments.

Destination VCA: Host

The system assigns a Destination VCA to messages to the host. This address, which is determined by the report type, is summarized in Table 3-1. Host network layer processing can use the destination VCA to route reports to specific tasks.

In systems that use more than one link between the system and the host, the system network layer chooses the links over which the message is broadcast based on report type and call status. The three options—requesting link, controlling link, and all links—are described below. The applicable reports are shown in Table 3-1.

- Requesting (R)—The report is sent back to the link from which the request for information was received (generally allocation or statistics). Also returned to the requesting port are commands with a Network Control Message Return setting of Return All (all commands returned to requesting port) or Return Error Only (commands returned to requesting port if error detected).
- Controlling (C)—When Enable Host Control of Call Load feature is set to Y, report (resource control) is sent to the link that was first to respond to initial call report (considered the controlling link). If there is no controlling link (feature is set to N), the report is sent to all active links. Refer to the *Cisco VCO/4K System Administrator's Guide* for instructions on enabling and disabling system features.
- All (A)—The report is sent to all active links. Includes system status reports indicating an error condition and resource control reports with no controlling link.

Table 3-1 Destination VCAs for System Reports

Report	VCA	Link
Resource Allocation ($80)	Variable[1]	R
Hardware Allocation ($81)	Variable[1]	R
MF Digit Report ($D0)	$40	C
DTMF Digit Report ($D1)	$40	C
Permanent Signal Condition ($D2)	$44	A

Table 3-1 Destination VCAs for System Reports (continued)

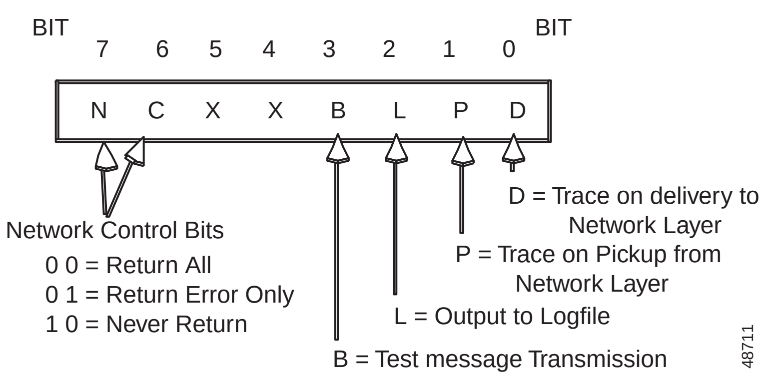
Report	VCA	Link
System Port Status ($D3)	$40	A
Spoken Digit ($D4)	$40	C
Resource Limitation ($D6)	$44	A
System Card Status ($D9)	$40	A
Outgoing Port Change of State ($DA)	$40	C
Incoming Port Change of State ($DB)	$40	C
Active/Standby Mode ($DC)	$40	A
Inpulse Rule Complete ($DD)	$40	C
Voice Port Status ($DE)	$40	C
Alarm Condition ($F0)	$44	A

1. The destination VCA for these reports is the same as the source VCA in the command requesting the report.

Network Control (Byte Offset 2)

Use the Network Control byte to debug and fine-tune system operation. Figure 3-2 shows assignments for this byte.

Figure 3-2 Network Control Byte Bit Assignments



Message Return (Bits 7 and 6)

Use the Message Return bits to specify when a command sent to the system is returned to the host. When a message is returned, the network status byte indicates whether the command was processed successfully. Bit settings have the following effects:

- NC = 00—Return All. All messages sent to the system are returned to the host. This setting is recommended when a command specifies that a resource should be chosen by hunting a resource group; the port address of the resource selected is returned to the host (refer to Chapter 4, “System Commands,” for more information). The network status byte indicates successful processing or an error condition.

- NC = 01—Return Error Only. The message sent to the system is returned to the host only if the command cannot be processed. The network status byte indicates the error condition. This setting is recommended for effective tracking of system status; the host application should include error recovery routines that interpret the network status byte and take appropriate action (error messaging, logging, etc.).
- NC = 10—Never Return. The message sent to the system is never returned to the host, regardless of whether it was processed.

Test Message Transmission (Bit 3)

Use the Test Message Transmission bit to verify that the system is receiving commands over the network. If you set this bit to 1, the system returns the command without processing it.

Output to Logfile (Bit 2)

Use the Output to Logfile bit in conjunction with either the Trace on Pickup from Network Layer or Trace on Delivery to Network Layer bit. If you set both the Output to Logfile and one of the trace bits to 1, the entire message to/from the system is saved to the day's logfile on the system disk, and output to the system printer. This bit is useful for initial system debugging and diagnostic purposes only. For information on accessing and using the system logfile, refer to the *Cisco VCO/4K System Administrator's Guide*.

Trace on Pickup from Network Layer (Bit 1)

If you set the Trace on Pickup from Network Layer bit to 1, a message from the host to the system is output to the system printer when it is received by the system.

An additional trace facility allows tracing of all messages between the host and the system. Contact the Cisco Systems Customer Response Center for more information.

Trace on Delivery to Network Layer (Bit 0)

If you set the Trace on Delivery to Network Layer bit to 1, a message marked Return All (Message Return bits = 00) is output to the system printer when it is returned by the system. The message is also output to the system printer if it cannot be processed (Network Status byte not equal to $00) and the message is marked Return Error Only (Message Return bits = 01) or Return All (Message Return bits = 00).

Network Status (Byte Offset 3)

The Network Status byte indicates the processing status of a message from the system. All event reports from the system (such as an Inpulse Rule Complete report) have a Network Status byte = $00. This value should also be used in any command sent by the host to the system.

Network Status bytes are the only way for the system to alert the host of a processing error for a specific command. All commands processed by the system set the Network Status byte. When the system returns a command to the host, the host interprets this byte to determine how a command was processed. To use this error indication effectively, commands from the host should have the Message Return bits set to Return All (00) or Return Error Only (01). Refer to Appendix D, “Network Status Byte Definitions,” for a list of the network status byte values and a description of each.

CHAPTER 4

System Commands

System commands allow host application program control of many configuration parameters and resources. These commands fall into five types: configuration control, system status, system diagnostics, system maintenance, and resource control.

System commands consist of a string of bytes immediately following the Network Header—refer to Chapter 3, "Message Structure Overview." Although the format of the commands vary, they all begin with a Function Identifier. Table 4-1 shows the command type and Function ID for each system command.

Table 4-1 System Reports and Function Identifiers

Function ID	Command Name	Command Type
$49	ISDN Port Control	Resource Control
$65	Subrate Path Control	Resource Control
$66	Voice Path Control	System Diagnostics
$67	DTMF Collection Control (Standard)	Resource Control
$67	DTMF Collection Control (Enhanced)	Resource Control
$68	MF Collection Control	Resource Control
$69	Outgoing Port Control	Resource Control
$6A	Incoming Port Control	Resource Control
$6C	Voice Port Control (Standard)	Resource Control
$6C	Voice Port Control (Enhanced)	Resource Control
$6D	Conference Control	Resource Control
$6E	Speech Collection Control	Resource Control
$70	Port Hook State Control	Resource Control
$72	Port Supervision Control	System Diagnostics
$80	Request Resource Allocation	System Status
$81	Request Hardware Allocation	System Status
$82	Card Status	System Status
$83	Port Status	System Status
$90	Change Port Status	System Maintenance
$91	Voice Prompt Maintenance	System Maintenance

Table 4-1 System Reports and Function Identifiers (continued)

Function ID	Command Name	Command Type
$C0 00	Configure VCA/Set System Clock	Configuration Control
$C0 01	Change Active Controllers	Configuration Control
$C0 02	T1 Synchronization Control	Configuration Control
$C0 03	Set/Reset Host Alarms	Configuration Control
$C0 04	Host Load Control	Configuration Control
$C0 05	Host Assume/Relinquish Port Control	Configuration Control

The sections that follow describe each command. The sections are arranged in hexadecimal numerical order according to the command's Function ID.

The description for each command contains the following information:

- Command type—Identifies the command as a Configuration Control, System Status, System Diagnostics, System Maintenance, or Resource Control command.
- Description—Contains a brief overview of the types of actions the command does.
- Usage guidelines—Lists the general rules for using this command.
- Format—Shows an example of the command and describes each byte offset.
- System response—Lists applicable reports or messages the command returns to the host.
- Examples—Shows sample commands with a byte-by-byte analysis.

Each byte in a command is a hexadecimal (base 16) number. Most commands require you to convert this hexadecimal number into binary (base 2) or decimal (base 10) numbers to interpret the byte. A decimal-hexadecimal-binary conversion table is provided in Appendix B, "Decimal/Hexadecimal/Binary Conversion." Users should set all undefined bits and bytes to zero within the present commands to allow for future enhancements.

Byte offset values under the Format heading are counted from the initial byte of the Network Header (byte offset 0 to 3). Interpret these values according to the list below.

Byte Offset	Meaning
a	Description applies to that single byte.
a and b	Description applies to the two consecutive bytes.
a to c	Description applies to all bytes a through c, inclusive.
a/b	Description applies to the second nibble of byte a and all of byte b.
a/n	Description applies to a variable number of consecutive bytes between a and n.
n + 1	Description applies to a byte that follows a variable number of bytes (a to n).

Note Unless otherwise stated, the MF processing described in this chapter applies to both MF and MFCR2 processing.

ISDN Port Control ($49) Command

Command Type

Resource Control

Description

Use the ISDN Port Control ($49) command for all call control functions for an ISDN call, including the following:

- Connecting an incoming and outgoing port.
- Forcing ISDN call origination.
- Beginning an inpulse or outpulse rule.
- Overwriting a digit field.
- Transmitting IEs.

Use the $49 command to control ISDN B-channels and non-ISDN network interface ports.

This command also supports the control of disconnect at call tear down and the receipt of an ISDN Port Change of State ($EA) report. Refer to Chapter 5, “System Reports,” for information on system reports.

Usage Guidelines

Total command length cannot exceed 250 bytes.

Specify the controlling port by either B-channel port address or D-channel port address and Call ID.

Choose the associated (outgoing) port in one of two ways: specify the port address, or specify the resource group for the system to reference.

The selected Call ID and B-channel is returned to the host if Return All is set in the Network Header. The returned command is truncated to report only through byte offset 14.

In interworking scenarios, either the controlling or associated port can be a non-ISDN port.

The call is controlled by the D-channel address and Call ID (if a B-channel has been selected, this address would be used instead). D-channel address and Call ID are reported to the host via the ISDN Inpulse Rule Complete ($ED) and ISDN Port Change of State ($EA) reports.

If you specify IEs, code them as they would appear in a D-channel message. IEs specified in the command are included in the next D-channel message transmission.

You can specify the following number of bytes of information for call record digit fields:

- Up to 35 bytes for Fields 1 through 3
- Up to 84 bytes for Field 4
- Up to 24 for ANI

For this information, use standard system digit strings, IA5 (ASCII) digits, an IE header, or a complete IE. The information is contained in an Outpulse Control segment; use one segment per field. The Outpulse Control Code byte specifies the format of information contained in the segment. This format corresponds to the FLD, I FLD, and D FLD designations used in the ISDN Message Templates. In addition, you can specify individual IEs to be transmitted without storing the data into a digit field.

Connection of an ISDN incoming port to another ISDN incoming port or ISDN outgoing port to another ISDN outgoing port is supported, provided both ports are in the ACTIVE (answered) state.

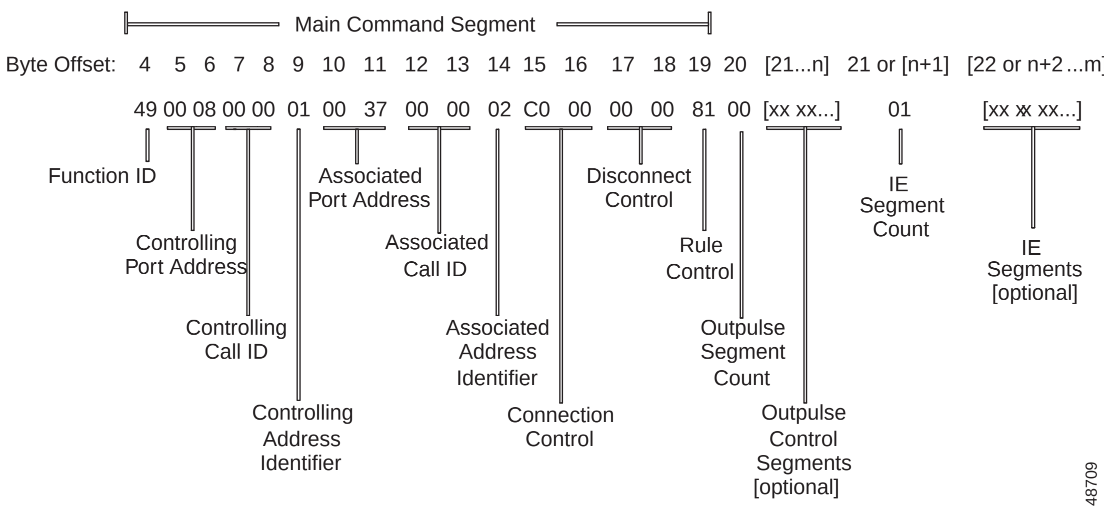
Main Command Segment

The Main Command segment is composed of byte offsets 4 through 19 and must be included in its entirety. Disconnect Control and Rule Control bytes are included in the Main Command segment. Components of the Main Command segment are defined in the next section.

Format

Figure 4-1 shows the byte formatting for this command.

Figure 4-1 $49 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the controlling port circuit address for which the command is sent. If the Controlling Address Identifier (byte offset 9) is $01, these bytes represent the specific B-channel assigned to the call or a non-ISDN port.

Note If the host is to perform B-channel selection, the port address of the target channel should be specified along with the Controlling Call ID (byte offsets 7 and 8).

Controlling Call ID (byte offsets 7 and 8)—Specifies the ISDN Call ID for the controlling port. If the host is to perform B-channel selection, specify the port address of the target channel along with the Controlling Call ID; set the Controlling Address Identifier (byte offset 9) to $01.

Note You should set the Controlling Call ID value to zero ($00) and let the system assign the appropriate value when the command is processed.

Controlling Address Identifier (byte offset 9)—Specifies whether the controlling port is identified by Call ID or by B-channel/non-ISDN port. If the host is to perform B-channel selection, specify the port address of the target channel along with the Call ID and set this byte to $01. Specify the byte according to the following list:

01—Controlling port specified by B-channel or non-ISDN port address.

02—Controlling port specified by D-channel (Call ID, byte offsets 7 and 8, cannot be 0).

Associated Port Address (byte offsets 10 and 11)—Hexadecimal representation of the associated (outgoing) port circuit address for which the command is sent, or the resource group number from which to select the outgoing port. You must set the Associated Address Identifier (byte offset 14) to $01. Byte offsets 10 and 11 represent the specific B-channel to be used, a non-ISDN port, or the resource group number (byte offset 11) from which to select the port; select resource group by setting the P bit in the Connection Control bytes (byte offsets 15 and 16). For a new call, the D-channel designates the interface that carries the call. The actual channel selection depends upon the coding of the Channel ID IE. This IE can be host-specified or system-generated via the ISDN Transmit Message Template.

Associated Call ID (byte offsets 12 and 13)—Specifies the ISDN Call ID for the associated (outgoing) port. When the command is returned to the host, these bytes indicate the Call ID assigned to the call. These bytes must be set to $00 00.

Associated Address Identifier (byte offset 14)—Specifies that the associated (outgoing) port is identified by B-channel/non-ISDN port/resource group. Specify the byte according to the following list:

- 00—No associated address used in command.
- 01—Associated port specified by B-channel, non-ISDN port address, or resource group number; Call ID = 00 00.

Connection Control (byte offsets 15 and 16)—Specifies the switching, attaching, hunting, and voice path control options when this command is used to connect a call. Byte offset 16 is reserved for future enhancements and must be set to $00. Construct byte offset 15 according to the following descriptions, then convert to hexadecimal for use in the command.

```
SAPVV000
```

S—Specifies if switching action is required

S = 0—No switching action required; the A bit is ignored and should be set to 0.

S = 1—Switching action required.

A—Specifies whether to link or remove a resource

A = 0—If S = 1, remove resource from call; if S = 0, no meaning.

A = 1—If S = 1, link resource to call; if S = 0, no meaning.

P—Specifies whether to use a specific outgoing circuit or to select any outgoing circuit from a resource group; port address or group number is specified in Associated Port Address bytes.

P = 0—For S = 0 or 1, use port specified in Associated Port Address bytes; port could be either D-channel or B-channel.

P = 1—For S = 1, select port from resource group specified in Associated Port Address bytes; the port address of the selected channel is specified in the command returned to the host.

VV—Specifies additional speech path control functions performed as part of this command. For outgoing circuits, these functions are shown below:

VV = 00—(Default) defer two-way speech path between incoming port and outgoing port until end of outpulse rule processing.

VV = 01—Defer two-way speech path between incoming port and outgoing port until outgoing port answers.

VV = 10—Cut two-way speech path between incoming port and outgoing port immediately, before starting outpulse rule.

Disconnect Control Bytes

The Disconnect Control bytes are always included in the command. You can only define byte offset 17 at this time. Byte offset 17 specifies the disposition of ports when the call is torn down, and the reporting that occurs for DISCONNECT messages, RELEASE messages, and on hook conditions. Byte offset 18 is reserved for future enhancements and should be set to $00.

Bit settings in byte offset 17 are overridden if any of the following commands are processed for either port in the $49 command:

- Another ISDN Port Control ($49)
- Outgoing Port Control ($69)
- Incoming Port Control ($6A)
- Change Incoming Port ($6B)
- Conference Control ($6D)

The definition of this byte varies slightly for each case as described in the following text.

Attaching

If you want to attach an outgoing port (S and A = 1 in byte offset 15 and 16), define the Disconnect Control byte as follows.

Disconnect Control (byte offsets 17 and 18)—Determines what actions to take on a port when the opposite end releases. This byte is ignored when used to attach to a virtual port. Specify values for the Disconnect Control byte, set byte offset 18 to 00. Construct the byte in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
0DRTICU0
```

D—Specifies whether to suppress the $EA report indicating DISCONNECT received on the incoming port. The DISCONNECT (request to disconnect) message may precede the RELEASE (B-channel has been released) message. Valid for ISDN channels only.

D = 0—$EA report indicating DISCONNECT received on the incoming port is suppressed (applicable only if the incoming port is an ISDN port).

D = 1—$EA report indicating DISCONNECT received on the incoming port is not suppressed (applicable only if the incoming port is an ISDN port).

R—Specifies whether to suppress the $EA report indicating DISCONNECT received on the outgoing port. The DISCONNECT (request to disconnect) message may precede the RELEASE (B-channel has been released) message. Valid for ISDN channels only.

R = 0—$EA report indicating DISCONNECT received on the outgoing port is suppressed (applicable only if the outgoing port is an ISDN port).

R = 1—$EA report indicating DISCONNECT received on the outgoing port is not suppressed (applicable only if the outgoing port is an ISDN port).

T—Specifies whether to suppress the $EA report indicating RELEASE received on the incoming port.

T = 0—$EA report indicating RELEASE was received is generated when the incoming port releases if it is an ISDN port. For a non-ISDN port, a $DB report is generated.

T = 1—Suppress $EA or $DB reports.

I—Specifies whether to return the incoming port to CP_SETUP state when the outgoing port releases.

I = 0—Force incoming to idle; physical release and begin Permanent Signal processing.

I = 1—Set incoming to setup state upon outgoing disconnect.

C—Specifies whether to suppress the $EA report indicating RELEASE received on the outgoing port.

C = 0—$EA report indicating RELEASE was received is generated when the outgoing port releases if it is an ISDN port. For a non-ISDN port, a $DA report is generated.

C = 1—Suppress $EA or $DA reports.

U—Specifies whether to return the outgoing port to CP_SETUP state when the incoming port releases.

U = 0—Force outgoing to idle; physical release and begin Permanent Signal processing.

U = 1—Set outgoing to setup state upon incoming disconnect.

Detaching

If you want to detach an outgoing port (S = 1 and A = 0 in byte offset 15), define the Disconnect Control byte as follows.

Disconnect Control (byte offset 17)—Determines what actions to take on the outgoing port when it is detached via this command. The outgoing port may be connected to a virtual port. If you specify values for the Disconnect Control byte, you must set byte offset 18 to 00. Construct the byte in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
0DRTICU0
```

D—Specifies whether to suppress the $EA report indicating DISCONNECT received on the incoming port. The DISCONNECT (request to disconnect) message may precede the RELEASE (B-channel has been released) message. Valid for ISDN channels only.

D = 0—$EA report indicating DISCONNECT received on the incoming port is suppressed (applicable only if the incoming port is an ISDN port).

D = 1—$EA report indicating DISCONNECT received on the incoming port is not suppressed (applicable only if the incoming port is an ISDN port).

R—Specifies whether to suppress the $EA report indicating DISCONNECT received on the outgoing port. The DISCONNECT (request to disconnect) message may precede the RELEASE (B-channel has been released) message. Valid for ISDN channels only.

R = 0—$EA report indicating DISCONNECT received on the outgoing port is suppressed (applicable only if the outgoing port is an ISDN port).

R = 1—$EA report indicating DISCONNECT received on the outgoing port is not suppressed (applicable only if the outgoing port is an ISDN port).

T—Specifies whether to suppress the $EA report indicating RELEASE received on the incoming port.

T = 0—$EA report indicating RELEASE was received is generated when the incoming port releases if it is an ISDN port. For a non-ISDN port, a $DB report is generated.

T = 1—Suppress $EA or $DB reports.

I—Specifies whether to return the incoming port to CP_SETUP state when the outgoing port releases.

I = 0—Force incoming to idle; physical release and begin Permanent Signal processing.

I = 1—Set incoming to setup state upon outgoing disconnect.

C—Specifies whether to suppress the $EA report indicating RELEASE received on the outgoing port.

C = 0—$EA report indicating RELEASE was received is generated when the outgoing port releases if it is an ISDN port. For a non-ISDN port, a $DA report is generated.

C = 1—Suppress $EA or $DA reports.

U—Specifies whether to return the outgoing port to CP_SETUP state when this command is processed.

U = 0—Force outgoing to idle; physical release and begin Permanent Signal processing.

U = 1—Set outgoing to setup state.

Rule Control Byte

The Rule Control byte is always included in the command, and specifies rule processing. The null outpulse rule (outgoing port seized then transition immediately into wait for final answer – CP_WTFSUP MState) is not supported for ISDN ports. Therefore, if you set this byte to $00, it has no affect on the outcome of the $49 command.

Rule Control (byte offset 19)—Specifies whether an outpulse or inpulse rule is used in this command and the rule number, if any. Construct the byte in binary according to the descriptions that follow, then convert to hexadecimal for use in the command.

```
X0IRRRRR
```

X—Specifies if an outpulse rule is used in this command.

X = 0—No outpulse rule.

X = 1—Execute outpulse rule specified in RRRRR; I must be 0.

I—Specifies if an inpulse rule is used in this command.

I = 0—No inpulse rule.

I = 1—Execute inpulse rule specified in RRRRR; X must be 0.

RRRRR — Specifies an inpulse rule from 1 to 30 or an outpulse rule from 1 to 30 inclusive; convert from decimal to binary for rule number. If I or X = 0, this value should also be 0.

Outpulse Segment Count Byte

The Outpulse Segment Count byte is always included and specifies how many Outpulse Control Segments are in the command. If you set this byte to $00, the IE Control byte follows in offset 21; otherwise, the IE Control byte follows the final Outpulse Control Segment.

Outpulse Segment Count (byte offset 20)—Specifies how many Outpulse Control Segments are included in the command. Convert from decimal to hexadecimal for use in the command. Valid values are from $00 to $05.

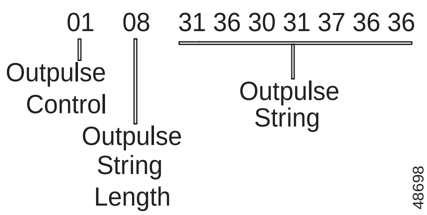
Outpulse Control Segment

An Outpulse Control segment is up to 86 bytes long and is optional. Each segment consists of an Outpulse Control byte, an Outpulse String Length byte, and one or more Outpulse String bytes.

You can use up to five Outpulse Control Segments in a single command. Specify the number of segments with the Outpulse Segment Count byte in byte (offset 20). You must specify a valid outpulse rule for any new originating call attempt which uses an ISDN B-channel. The null outpulse rule is not valid for ISDN B-channels.

Figure 4-2 defines the format and components of the Outpulse Control segment.

Figure 4-2 Outpulse Control Segment Components



Outpulse Control—Specifies the call record field in which to save the information that follows and the format in which the information is specified. This information can be in the standard system format (binary coded decimal), IA5 (ASCII digits), an intermediate ISDN IE (header only), or a complete ISDN IE. Information can be specified when executing either an inpulse or outpulse rule. The inpulse rule may contain a DO ORULE token. If information will pass to an outpulse rule, construct the byte in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
FFF000XX
```

FFF—Specifies the call record field to receive the digit string.

FFF = 001—Field 1

FFF = 010—Field 2

FFF = 011—Field 3

FFF = 100—Field 4

FFF = 000—ANI (originating number field)

XX—Specifies the format in which the information is specified:

XX = 00—Standard system (BCD) digit string.

XX = 01—IA5 (ASCII) digits; equivalent to D FLD.

XX = 10—A complete ISDN IE; equivalent to FLD.

XX = 11—An intermediate IE (header only); equivalent to I FLD.

Outpulse String Length—Specifies the number of bytes in the string. Valid values for the number of bytes is defined as follows:

- A number between 1 (no digits) and 35 is required for Fields 1 through 3.

- A number between 1 and 84 for Field 4.
- A number between 1 and 24 for the originating number (ANI) field.

Outpulse String—Specifies the information to be outpulsed or forwarded. Information must be in the format specified by the Outpulse Control xx bits.

IE Segment Count Byte

The IE Segment Count byte is used in all $49 commands to specify how many IEs are included in the command. If the Outpulse Segment count (byte offset 20) is set to $00, the IE Segment Count byte appears in offset 21. Otherwise, the IE Segment Count byte follows the final Outpulse Control Segment.

IE Segment Count (byte offset 21 or following final Outpulse Segment)—Specifies how many IEs are included in the command. Convert from decimal to hexadecimal for use in the command.

IE Segment

The IE Segment bytes contain IEs to be transmitted on the D-channel. The number of IEs contained in this segment appears in the IE Segment Count byte. The IEs to be transmitted on the D-channel must be coded exactly as they will appear in the D-channel message. Formats for IEs are contained in *Belcore SR-3338*.

System processing ensures proper IE ordering. It is assumed that the IEs received in the host command begin with Codeset 0. If you use a different Codeset, you must use the Codeset Shift in the IE count, and an IE segment with the Codeset Shift IE.

System Response

A $49 command returned by the system with a network status byte not equal to $01 indicates command was not processed. The following network status bytes may be returned: $03, $05, $0D, $0E, $0F, $11, $12, $15, $16, $17, $18, $1C, $1E, $1F, $20, $23, $24, $25, $26, $29, $2B, $35, $37, $38, $39, and $3C. Refer to Appendix D, “Network Status Byte Definitions,” for more information.

If Return All was specified in the Network Header, byte offsets 4 through 14 are returned to the host with the Associated address information included.

Subrate Path Control ($65) Command

Command Type

Resource Control

Description

Use the Subrate Path Control ($65) command to manage connections (paths) between subrate channels and to establish and maintain subrate connections. You can also use this command to remove a bearer channel connection from the Subrate Switching Card (SSC).

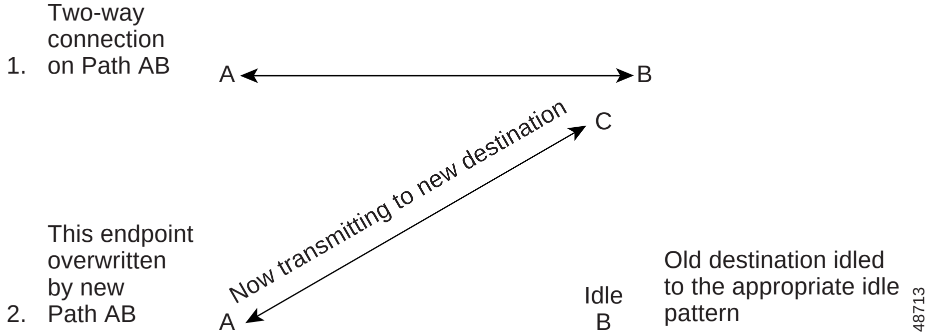
Types of Connections

You can establish one-way (listen-only) or two-way connections between subrate channels with this command. To establish multiple connections with a single command, use either of the following modes:

- Bulk switching mode, to establish multiple one-way or two-way connections on adjacent subrate channels.
- Broadcast mode, to establish multiple one-way connections from a single source for both adjacent and nonadjacent channels. Contiguous broadcast refers to the destination channels as being channels that are next to each other.

A two-way path that is overwritten by a new path at only one endpoint causes the old destination to be set to idle. Figure 4-3 shows how the same source is switched to transmit to a new destination.

Figure 4-3 Connections and Paths for the $65 Command



The $65 command allows you to connect or disconnect channels. When you disconnect a channel, you are setting it to listen to idle. When the SSC is brought into service, all paths are set to 8 kbps idle.

Usage Guidelines

Use this command to specify the subrate channels to be switched in terms of how you identify them—by subrate channel width, subrate channel offset, and bearer channel. For example, you may want to switch a subrate channel that is 3 bits wide beginning at offset three on bearer channel 20 of a T1 card. The following rules apply:

- The specified bearer channel must be a trunk port.
- The subrate channel width must be less than or equal to eight bits (a 64-kbps channel).
- The subrate channel may not cross a bearer channel boundary. For example, you cannot switch a 3-bit wide subrate channel that begins at bearer offset 6.

Attachment to the Subrate Switching Card

When the system receives a $65 command for subrate path establishment, it checks the destination bearer channels to see if they are already attached to the SSC. If they are not attached and are idle and if there are time slots available on the SSC to which the bearer channels can be attached, then processing for the $65 command automatically attaches the destination bearer channels to the SSC, and the path connection is made.

The following rules apply:

- All specified or implied bearer channels must be already attached to the SSC, or there must be available timeslots to which the bearers can be attached.
- The switch does not perform any partial command executions. It performs all or none of the switching actions for any given command (one-to-one, broadcast switching, or bulk switching).

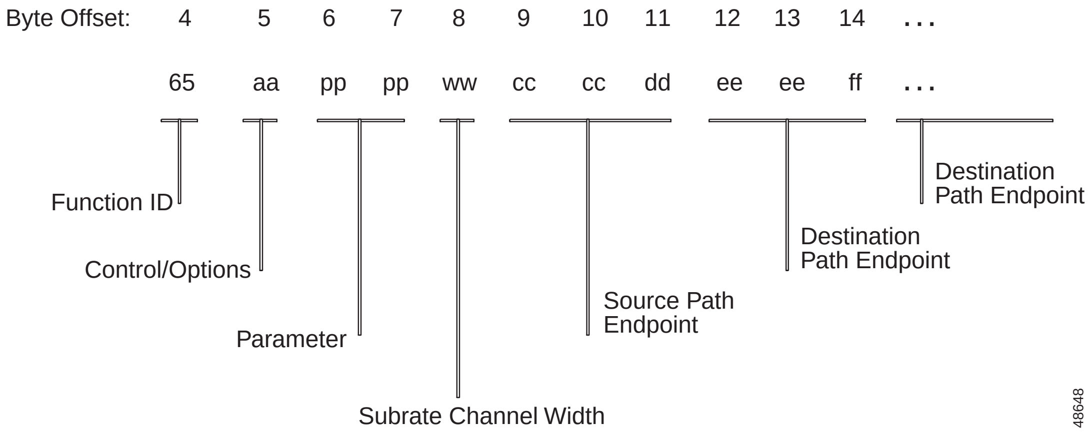
After Attachment

No subrate switching occurs until the system has determined that all specified destination bearer channels are attached to the Subrate Switching Card. Initial connection of a bearer channel to the SSC for subrate path establishment automatically sets the unaddressed, or unused, portion(s) of the bearer channel to listen to idle.

Format

Figure 4-4 shows the byte formatting for this command.

Figure 4-4 $65 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the VCO/4K system.

Control/Options (byte offset 5)—Sets up the conditions to be used for this command. Construct bytes in binary according to the descriptions that follow, then convert to hexadecimal for use in the command. All undefined bits must be set to zero.

```
D0MB0TPP
```

D—Detaches bearer channel.

D = 1—Forcibly detaches the port addressed in the source port address bytes from the SSC. All contained subrate channels are deleted. When D = 1, the only other pertinent data in the command are the bytes at offset 9 and 10—source timeslot address. The remaining control bits in this byte are ignored; the remaining command data bytes are “don’t care” values.

D = 0—Creates a path as specified by other bits in the command. Any bearer channels are automatically attached by the system.

M—Specifies multiple destination mode, that is, broadcast mode (one-to-many, source-to-destination channel switching). Use this mode to connect many listeners (destinations) to a single speaker (source). The parameter bytes (byte offset 6 and 7) specify the number of connections to make (the number of destination endpoints on the command).

M = 0—Disables multiple destination mode.

M = 1—Enables multiple destination mode. M = 1 is only valid if PP = 01 (one-way path establishment).

B—Specifies bulk switching mode (one-to-one, source-to-destination bulk channel switching). This mode switches the number of contiguous subrate channels specified in the parameter bytes (byte offset 6 and 7) originating at source endpoint and terminating on destination endpoint. The command allows only one destination endpoint specifier. Subsequent source and destination channels are computed based on channel width (byte offset 8). All subrate channels are of constant width, as defined in the subrate channel width byte (byte offset 8).

B = 0—Disables bulk switching.

B = 1—Specifies bulk switching action.

T—Removes a path (path teardown). You can use the T bit in conjunction with the M and B bits for multiple path teardowns.

T = 1—Removes a previously established one-way or two-way path.

T = 0—Leaves a previously established one-way or two-way path unchanged.

PP—Specifies path control modifier.

PP = 01—One-way connection (destination listens to source).

PP = 10—Two-way connection (destination listens to source, and source listens to destination).

If you want to do a contiguous broadcast, set PP to 01 and both M and B to 1. The number specified in the parameter bytes (byte offset 6 and 7) is the number of one-way paths that would be established and is interpreted according to the B control setting. These control settings form a hybrid of the multiple and bulk functions which is used to establish a number of one-way (listen-only) paths between the listener channels starting at destination endpoint and a single source. Only a single destination is specified. Subsequent destinations are computed based on channel width.

Parameter (byte offsets 6 and 7)—Parameter value, defined as follows:

If M = 1 in byte offset 5, this value specifies the number of destination path endpoints in the command.

If B = 1 in byte offset 5, this value specifies the number of subrate channels to switch in bulk.

Table 4-2 summarizes the interpretation of the M and B bits in the control options byte and their combined effects on the interpretation of the parameter byte (offsets 6 and 7).

Table 4-2 M and B Bits in the Control Options Byte

M	B	Comments
0	0	Parameter value is unused. One path is established between the source and the single destination channels (Source, Destination) or (S, D).
0	1	One-way or two-way contiguous channel bulk switch. P is the number of contiguous channels to switch in bulk. Source channels are switched one-to-one to destination channels. ‘P’ channels are switched as paths (S_1, D_1), (S_2, D_2),..., (S_P, D_P).
1	0	One-way noncontiguous channel broadcast. P is the number of destination channel identifiers included on command. The path control modifier must specify one-way. All destination channels are set to listen to the specified source channel (one-to-many source channel to destination channels). ‘P’ channels are switched as paths (S, D_1), (S, D_2),..., (S, D_P).
1	1	One-way contiguous channel broadcast. P is the number of contiguous destination channels to switch to listen to a single source (one-to-many source channel to destination channels). Path control modifier must specify one-way. All destination channels are set to listen to the specified source channel. ‘P’ channels are switched as paths (S, D_1), (S, D_2),..., (S, D_P).

Subrate Channel Width/Rate (byte offset 8)—Width or rate, in bits per second, of the subrate channel being established. Valid entries appear in Table 4-3.

Table 4-3 Subrate Channel Width/Rate Entries

Value	Path Rate
1	8 kbps
2	16 kbps
3	24 kbps
4	32 kbps
5	40 kbps
6	48 kbps
7	56 kbps
8	64 kbps

Source Path Endpoint (byte offsets 9 to 11)—Port address of the speaker bearer channel (byte offsets 9 and 10) and offset into that channel (in bits) for the start of the subrate channel (byte offset 11). Bit offset entries are 0 to 7 inclusive.

Destination Path Endpoint (byte offsets 12 to 14)—Port address of the listener bearer channel (byte offsets 12 and 13) and offset into that channel (in bits) for the start of the subrate channel (byte offset 14).

If M = 1 and B = 0 in byte offset 5, this three-byte destination endpoint identifier will appear as many times as the number specified in the parameter bytes (byte offsets 6 and 7).

In all other combinations of M and B, only a single destination endpoint identifier is given on the command.

System Response

Table 4-4 shows the status codes which may be returned by the $65 command.

Table 4-4 Subrate Path Control ($65) Command Status Codes

Return Code	Description
$01	Successful execution.
$03	Syntax error.
$06	Port specified in command is not idle.
$0F	Call or conference is not controlled by this host.
$12	Port is not line or trunk.
$23	Invalid port address (outside of hardware range).
$24	Port address is for a port or card that is not active.
$29	Could not be processed due to an internal memory allocation error.
$5F	Subrate channel width must be greater than zero and less than or equal to eight.
$60	Subrate channel crosses bearer channel boundary.
$56	Bearer channel is not attached to the SSC (received only when command specifies to detach bearer channel).
$57	Bearer channel cannot be attached to an SSC due to timeslot exhaustion.

Table 4-4 Subrate Path Control ($65) Command Status Codes (continued)

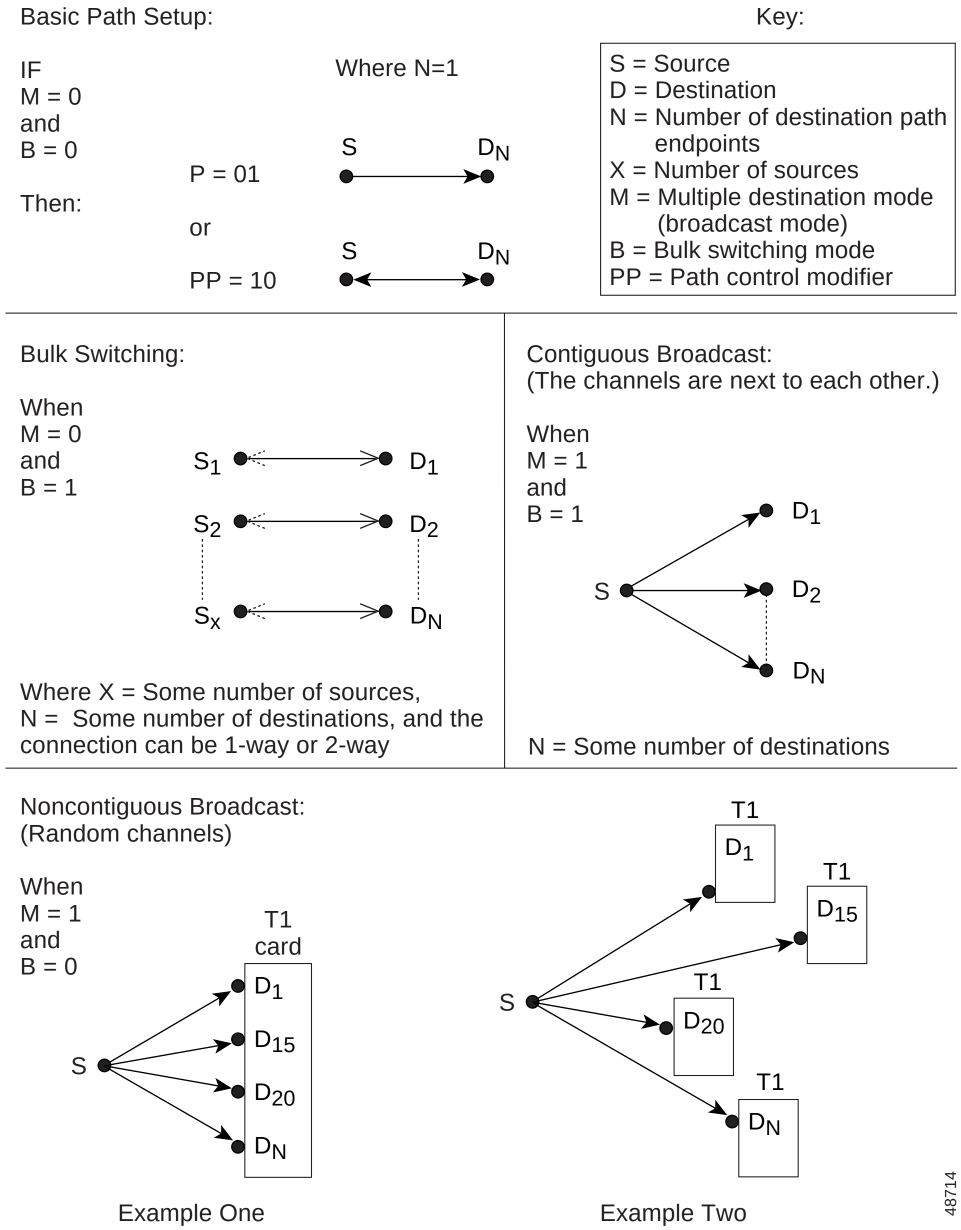
Return Code	Description
$58	Connection request rejected, no SSC in service.
$59	Connection request rejected, card redundancy switchover in process.
$5A	Connection request rejected, SSC source and destination bearer subchannel overlap.
$5B	Path removal failed, no such path exists.
$5D	Path removal failed; path is one-way when the host specified two-way, or two-way when the host specified one-way.

Note Bearer channels which are assigned by the $65 command cannot be used by any other host command. If this is necessary, detach the bearer channels with the $65 command before you use other host commands for the affected port.

Examples

Figure 4-5 provides a context for the examples that follow by illustrating the four types of switching available with the SSC in terms of the M, B, and PP bits in the control/options byte.

Figure 4-5 SSC Switching Types



Example 4-1 $65 Command

Assume no bearer channels are connected to the SSC—this is the first subrate switching function you are executing in a command. The following command instructs the system to establish a two-way three-bit wide (24 kbps) subrate channel between bearer channels at port addresses $0048 and $0128. The offset of the subrate channel is zero (0) on bearer $0048; offset five (5) on bearer $0128.

```
04 05 0607 08 091011 121314
65 02 0000 03 004800 012805
```

Function ID = 65 (Subrate Path Control)

Control/Options = 00000010 (= hexadecimal 02)

D = 0 (no detach of bearer from the SSC)

M = 0 (no multiple destination mode)

B = 0 (no bulk switching mode)

T = 0 (no path tear down)

PP = 10 (two-way connection)

Parameter = 00 00 (unused)

Subrate Channel Width = 03 (3 bits wide, a 24-kbps channel)

Source Path Endpoint = 00 48 00

Source timeslot (port) address = 00 48

Subrate channel offset within source timeslot = 00

Destination Path Endpoint = 01 28 05

Destination timeslot (port) address = 01 28

Subrate channel offset within destination timeslot = 05

Because this is the first subrate connection made with the respective bearer channels, the unaddressed portions of those bearers are set to listen to the idle pattern automatically by the system.

One subrate connection now exists—the two-way path as commanded. The unaddressed portions of the bearer channels are set to listen to the idle pattern. This path is shown below in triplet form (bearer channel, subrate channel width, offset).

(0048, 03, 00) two-way with (0128, 03, 05), the new two-way path.

Example 4-2 $65 Command

The following command will switch 16 one-bit wide subrate channels (8 kbps) in bulk as two-way connections. The source bearer channels are on adjacent bearer port addresses $0048 and $0049. The destination bearer channels are on adjacent bearer port addresses $0128 and $0129.

```
04 05 0607 08 091011 121314
65 12 0010 01 004800 012800
```

Function ID = 65 (Subrate Path Control)

Control/Options = 00010010 (= hexadecimal 02)

D = 0 (no detach of bearer from the SSC)

M = 0 (no multiple destination mode)

B = 1 (bulk switching mode)

T = 0 (no path tear down)

PP = 10 (two-way connection)

Parameter = 0010 (= hexadecimal 10, decimal 16)

Subrate Channel Width = 01 (one bit wide, an eight Kbps channel)

Source Path Endpoint = 00 48 00

Source timeslot (port) address = 00 48

Starting subrate channel offset within source timeslot = 00

Destination Path Endpoint = 01 28 00

Destination timeslot (port) address = 01 28

Starting subrate channel offset within destination timeslot = 00

A total of 16 two-way subrate connections now exist. These paths are shown below in triplet form (bearer channel, subrate channel width, offset).

(0048, 1, 0) two-way with (0128, 1, 0)

(0048, 1, 1) two-way with (0128, 1, 1)

(0048, 1, 2) two-way with (0128, 1, 2)

(0048, 1, 3) two-way with (0128, 1, 3)

(0048, 1, 4) two-way with (0128, 1, 4)

(0048, 1, 5) two-way with (0128, 1, 5)

(0048, 1, 6) two-way with (0128, 1, 6)

(0048, 1, 7) two-way with (0128, 1, 7)

(0049, 1, 0) two-way with (0129, 1, 0)

(0049, 1, 1) two-way with (0129, 1, 1)

(0049, 1, 2) two-way with (0129, 1, 2)

(0049, 1, 3) two-way with (0129, 1, 3)

(0049, 1, 4) two-way with (0129, 1, 4)

(0049, 1, 5) two-way with (0129, 1, 5)

(0049, 1, 6) two-way with (0129, 1, 6)

(0049, 1, 7) two-way with (0129, 1, 7)

Voice Path Control ($66) Command

Command Type

System Diagnostics

Description

Use the Voice Path Control ($66) command for immediate setup of voice paths between receivers (A) and senders (B). A receiver is any system resource capable of receiving a signal, and can be an incoming circuit, outgoing circuit, MF receiver, DTMF receiver, DCC port, or CPA port. A sender is any system resource capable of sending a signal, and can be an incoming circuit, outgoing circuit, system tones, voice announcement port (DVC or IPRC), or conference (DCC) port. The voice path remains established until it is torn down by the release of one of the circuits involved, a call processing action, an inpulse or outpulse rule, another $66 command, or a resource control command. You can tear down a two-way path in only one direction, converting it to a one-way path.

The $66 command can also be used to set a conference party to listen to quiet or to another tone. A second $66 command is used to send the party back to the conference.

Minimum command length for the $66 command is 10 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

This command establishes a voice path between the specified resources without doing any checking of call state. The command does not affect call state or linkages.

Virtual port addresses ($80 00 to $80 FF) cannot be used with this command.

Outpulse channels and voice ports (DVC and IPRC) cannot be used as receivers (A).

MF receiver, DTMF receiver, and CPA ports cannot be used as senders (B).

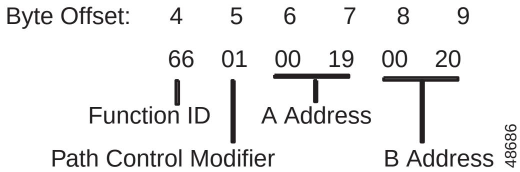
When the command is used to convert a two-way path into a one-way path, a $66 command is issued with the port to be removed from the two-way path specified as the A address and no B address specified in the command.

When the command is used to set a conference party to listen to a tone, a one-way path is specified with the conference party as the A address, and the tone as B. To return the party to the conference, a second command is sent to break the path; the conference party is specified as the A address and 0 (zero) is specified as the B address.

Format

Figure 4-6 shows the byte formatting for this command.

Figure 4-6 $66 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Path Control Modifier (byte offset 5)—Determines the type of voice path constructed. Specify this byte according to the following list:

> 00 = Break path. If two port addresses are specified, A listens to quiet or returns to conference, B listens to quiet (unless B is a tone or 0). If only one port address is specified, A listens to quiet or returns to conference.
>
> 01 = One-way connection; A listens to B.
>
> 02 = Two-way connection; A listens to B, B listens to A.

A Address (byte offset 6 and 7)—Port address of the receiver.

B Address (byte offset 8 and 9)—Port address of the sender. The port addresses reserved for tones are listed in Appendix E, “Tone Values.”

System Response

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. A command that is returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $18, $23, $3C, and $61. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Examples

Example 4-3 $66 Command

Assume there is an incoming circuit at address $20. The following command connects the incoming circuit (receiver – A) to dial tone (sender – B).

```
04 05 0607 0809
66 01 0020 04C2
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 01 (one-way path)

A Address = $0020

B Address = $04C2 (dial tone)

Example 4-4 $66 Command

Assume there is an outgoing circuit at address $21, and the voice path established in Example 4-3 is still connected. The following command converts the path from one-way to two-way:

```
04 05 0607 0809
66 02 0020 0021
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 02 (two-way connection)

A Address = $0020

B Address = $0021

Example 4-5 $66 Command

Assume the two-way path established in Example 4-4 is still connected (two-way path between $20 and $21). The following command converts the path into a one-way path so that $20 listens to $21, but $21 no longer listens to $20.

```
04 05 0607 0809
66 00 0021 0000
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 00 (break path)

A Address = $0021

B Address = $0000 (no B address specified)

Example 4-6 $66 Command

Assume the two-way path established in Example 4-4 is still connected (two-way path between $20 and $21). The following command breaks this path so that both ports listen to quiet.

```
04 05 0607 0809
66 00 0021 0020
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 00 (break path)

A Address = $0021

B Address = $0020

Example 4-7 $66 Command

Assume the circuit at address $25 is participating in a conference. The following command removes this port from the conference and sets it to listen to quiet.

```
04 05 0607 0809
66 01 0025 04C0
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 01 (one-way path)

A Address = $0025

B Address = $04C0 (quiet)

Example 4-8 $66 Command

Assume the circuit at address $25 is still listening to quiet as shown in Example 4-7. The following command returns this port to the conference in which is was participating.

```
04 05 0607 0809
66 00 0025 0000
```

Function ID = 66 (Voice Path Control)

Path Control Modifier = 00 (break path)

A Address = $0025

B Address = $0000 (no B address required)

DTMF Collection Control ($67) (Standard) Command

Command Type

Resource Control

Description

The DTMF Collection Control ($67) (Standard) command instructs the system to collect DTMF digits sent over any line or trunk circuit without an inpulse rule. It also collects dial pulse (DP) digits on a SLIC or DID circuit. DTMF digits include 1 to 9 inclusive, 0 ($A), and the special characters S ($B) and # ($C). DP digits include 1 to 9 and 0 ($A) only. Digits are sent to the host in the form of a DTMF Digit ($D1) report. The command also attaches or detaches DTMF receivers to or from a trunk. Digits to be used for reenter and end of string can be defined (DTMF only), and the use of beep tones for prompts is allowed. First digit and interdigit timing is set at 6 seconds; field timing, set in Collection Timeout byte, begins when first digit is received. Collection in progress can be terminated by this command; the digits collected until the termination order are returned to the host as a successful DTMF Digit ($D1) report.

An enhanced structure for this command provides control over first digit processing, timers, and internal storage of received digits. Refer to the “DTMF Collection Control ($67) (Enhanced) Command” section on page 4-31 for a description of the $67 (Enhanced) command structure.

The minimum command length for the $67 (Standard) command is 10 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

If this command is used to attach or detach a DTMF receiver, the DTMF Collection Control byte is set to $00, and the bytes following it are not included in the command.

The Controlling Port cannot be participating in a conference. If it is, the command is returned with a network status byte value of $1C.

All DTMF receiver ports must be members of a single resource group for the system to allocate them. It is not necessary to specify the group number in the command; the system determines the resource group from the database configuration.

A DTMF receiver can be attached to any incoming or outgoing T1 or E+M circuit for DTMF digit collection.

SLIC and DID circuits have an on-board DTMF receiver per port; DP digit detection is handled by the firmware resident on the card. UTC circuits have an on-board DTMF receiver per port. When sending a command for these port types, the receiver address should be $000. DTMF digit collections performed for a controlling port residing on a SLIC, DID, or UTC card always use the on-board receiver; a DTMF receiver cannot be allocated to the call.

DP digits can only be collected on a SLIC or DID circuit. Clear and reenter characters and their associated tones are not allowed for DP digit collection. DP digits are reported in a DTMF Digit ($D1) report; no differentiation is made between DP and DTMF digits in this report. The digit string must be all DTMF or all DP. The # and S characters are not supported in DP collection.

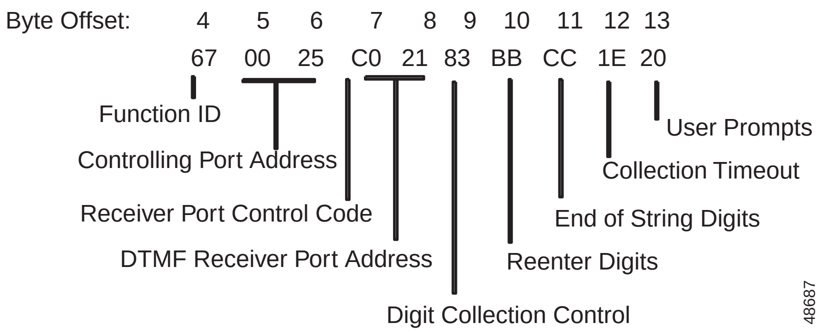
Timers specified in seconds can vary as much as one half second. This variation affects the $67 standard command and is most pronounced in values set to 1 or 2 seconds.

This command can be used for both DP and DTMF digit collection. In the descriptions that follow, the words **DTMF only** are used to indicate that the item described is not valid for DP collections and should be set to zero.

Format

Figure 4-7 shows the byte formatting for this command.

Figure 4-7 $67 (Standard) Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the circuit address to which the DTMF receiver is attached.

Receiver Port Control Code (byte offset 7)—Sets up the conditions used for this command. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. The CCC bits are part of the Receiver Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Receiver Port Control Code bits.

```
SAPR0CCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach receiver; if S = 0, no meaning.

A = 0—If S = 1, detach receiver.

A = 1—If S = 1, attach receiver.

P—Specifies whether to use a specific receiver circuit or to select any receiver circuit from a resource group; port address is specified in Receiver Port Address bytes.

P = 0—For S = 0 or 1, use port specified in Receiver Port Address bytes.

P = 1—For S = 0, use DTMF receiver already in call's resource chain; for S = 1, select port from DTMF receiver resource group.

R—Specifies additional control functions performed as part of this command. For receiver circuits, the actions are shown below.

R = 0—Retain DTMF receiver after report (will remain linked to the line/trunk but not enabled).

R = 1—Release DTMF receiver after report.

DTMF Receiver Port Address (byte offset 7 and 8)—Includes second digit of previous byte (Receiver Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the receiver port. If P = 1 or the controlling port resides on a SLIC, DID, or UTC, set to $000.

Digit Collection Control (byte offset 9)—Determines if DTMF receiver is to be enabled and the maximum number of digits that can be collected using this command. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
M0FFFFFF
```

M—Specifies whether to enable the DTMF receiver.

M = 0—Do not enable DTMF receiver.

M = 1—Enable DTMF receiver.

FFFF—Determines the maximum number of DTMF digits that can be collected using this command; convert binary to decimal for this number.

Reenter Digits (byte offset 10)—Determines if the caller is allowed to enter one or two DTMF digits as a reenter code that deletes the digits already entered and begins a new digit string. If only one digit is used, it appears in the first nibble of this byte; the second nibble must be $F. If two digits are used, they appear in the order in which they must be entered by the user. If End of String digits are specified, they must be different from the Reenter digits. In addition to digits 1 to 9, the digit 0 (hexadecimal A) and the characters S (hexadecimal B) and # (hexadecimal C) can be used. If reenter is not allowed, both nibbles must be $F. DTMF only.

End of String Digits (byte offset 11)—Determines if the caller is allowed to enter one or two DTMF digits as an end of string code that signals the end of the digits to be entered. If only one digit is used, it appears in the first nibble of this byte; the second nibble must be $F. If two digits are used, they appear in the order in which they must be entered by the user. If the end of string signal is not allowed, both nibbles must be $F (digits are collected until the total number of digits specified is received, the first digit timer expires, the interdigit timer expires, or the field timer expires). If Reenter digits are specified, they must be different from the End of String digits. In addition to digits 1 to 9, the digit 0 (hexadecimal A) and the characters S (hexadecimal B) and # (hexadecimal C) can be used. **DTMF only**.

Collection Timeout (byte offset 12)—Specifies the number of seconds, in hex, allowed for the user to enter the number of digits specified in the Digit Collection Control byte minus 1. This timer starts when the first digit is received; first digit timing is always 6 seconds. Valid values for the collection timer are 1 through 60 seconds decimal ($01 to $3C), inclusive, and 0 (timer is not set). Convert from decimal to hexadecimal for the correct value.

User Prompts (byte offset 13)—Determines if a beep tone is used to signal that: the user has entered the reenter code (if allowed); the user has entered the end of string code (if allowed); the DTMF receiver is enabled. Construct byte in binary according to the descriptions on the following page, then convert to hexadecimal for use in the command.

```
IJK00000
```

I—Determines if beep tone is heard when reenter code is detected; **DTMF only**.

I = 0—No beep tone for reenter code.

I = 1—Beep tone when reenter code is entered.

J—Determines if beep tone is heard when end of string code is detected; **DTMF only**.

J = 0—No beep tone for end of string.

J = 1—Beep tone when end of string code is detected.

K—Determines if beep tone is heard when DTMF receiver is enabled.

K = 0—No beep tone when DTMF receiver is enabled.

K = 1—Beep tone when DTMF receiver is enabled.

System Response

DTMF Digit ($D1) report.

A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $0A, $0E, $0F, $11, $12, $13, $16, $17, $18, $1C, $1F, $22, $24, $26, $2C, $33, $34, and $3C. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

For DRC/8, if Return All in the Network Header is used, the port address of the DTMF receiver requested by resource group number is returned in the port address bytes. For DRC24/48, the port address is not returned. Bytes 7 and 8 are set to 0 (zero). For SLIC, DID, and UTC ports, this address is the same as the controlling port address.

A command returned with a network status byte of $1F indicates that no DTMF receivers were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the DTMF resource group were busy (allocated or out of service). If no $D6 is sent, a DTMF resource group does not exist (no members). Refer to the “Resource Limitation ($D6) Report” section on page 5-45 for more information.

Examples

Example 4-9 $67 (Standard) Command

Assume there is a DTMF receiver at address $50, and an incoming T1 trunk at address $21. The following command attaches the DTMF receiver to the incoming trunk. Notice there are no digits collected, and the digit collection bytes have been omitted.

```
04 0506 07 0809 10 11
67 0021 05 0000 00 00
```

Function ID = 67 (DTMF Digit Collection Control)

Controlling Port Address = 0021

Receiver Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

R = 0 (retain DTMF receiver after report)

DTMF Receiver Port Address = $050

Digit Collection Control = 00000000

M = 0 (do not enable receiver)

FFFFFF = 0 (no digits)

The remainder of the digit collection bytes are unnecessary and omitted.

Example 4-10 $67 (Standard) Command

Assume there is an outgoing E+M trunk at address $21 and a DTMF receiver at address $51. The following command attaches the DTMF receiver to the port and enables it. When the receiver is enabled, the user hears a beep tone (beep tone when receiver enabled), and has 32 seconds to enter seven digits. The reenter code SS allows the user to erase any digits that have been entered and start over.

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18
67 0021 05 1000 01 11 BB FF 32 00 10 00 00
```

Function ID = 67 (DTMF Digit Collection Control)

Controlling Port Address = $0021

Receiver Port Control Code = 11010000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

R = 1 (release DTMF receiver after report)

DTMF Receiver Port Address = $051

Digit Collection Control = 10000111

M = 1 (enable digit collection)

FFFFFF =7 (7 digits)

Reenter Digits = $BB (SS on telephone)

End of String Digits = none ($FF)

Collection Timeout = 32 seconds

User Prompts = 00100000

I = 0 (no beep tone for reenter code)

J = 0 (no beep tone for end of string code)

K = 1 (beep tone when DTMF receiver is enabled)

Example 4-11 $67 (Standard) Command

Assume there is an incoming UTC circuit at address $108. The following command collects up to 10 digits in 30 seconds. When the on-board receiver is enabled, the user hears a beep tone (beep tone when receiver attached). The end of string code ## allows the user to indicate when all digits have been entered; when this code is received the user hears another beep tone (beep tone for end of string code).

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18 19
67 0108 00 0000 10 00 10 10 FF CC 01 10 00 00
```

Function ID = 67 (DTMF Digit Collection Control)

Controlling Port Address = $0108

Receiver Port Control Code = $00 (not required—use on-board receiver)

DTMF Receiver Port Address = $0000

Digit Collection Control = 10001010

M = 1 (enable digit collection)

FFFFFF = A (10 digits)

Reenter Digits = none ($FF)

End of String Digits = ## ($CC)

Collection Timeout = 30 seconds

User Prompts = 01100000

I = 0 (no beep tone for reenter code)

J = 1 (beep when end of string code is received)

K = 1 (beep tone when DTMF receiver is enabled)

DTMF Collection Control ($67) (Enhanced) Command

Command Type

Resource Control

Description

The DTMF Collection Control ($67) (Enhanced) command instructs the system to collect DTMF digits sent over any line or trunk circuit without an inpulse rule. It also collects dial pulse (DP) digits on a SLIC or DID circuit. DTMF digits include 1 to 9, 0 ($A), and the special characters * ($B) and # ($C). DP digits include 1 to 9 and 0 ($A) only. Digits are sent to the host in the form of a DTMF Digit ($D1) report.

This command also attaches or detaches DTMF receivers to or from a trunk. For DTMF applications, you can define Reenter and End Of String digits. Collection in progress can be terminated by this command; the digits collected until the termination order are returned to the host as a successful DTMF Digit ($D1) report. This command can also be used as a command segment in the Incoming Port Control ($6A) command.

Fourth column DTMF digits A, B, C, and D may be used with the $67 (Enhanced) command only when the system feature flag, “Enable 4th Column DTMF”, is enabled. (Refer to the *Cisco VCO/4K System Administrator's Guide* for more information.) A control bit in the $67 (Enhanced) command indicates the requirement to use a receiver resource which supports fourth column DTMF digits. Command processing verifies whether the fourth column DTMF system feature is enabled when this control bit is set to 1; an error code of $4F is returned if the control bit is set, but the system feature is not enabled.

The fourth column DTMF system feature flag affects the mapping of DTMF digits used in the Reenter/End of String segment of the command. Refer to the “Reenter Digits” and “End of String Digits” explanations which follow.

Features of this command not accessible with the $67 (Standard) command structure include:

- First digit reporting and supervision or tone upon receipt of first digit.
- Ability to specify first digit and interdigit timer values.
- Ability to wink upon receiver enable.
- Full access to system tones for signaling receiver enable, first digit detection, and detection of clear and End of String codes.
- Ability to store received digits in any of the controlling port's digit fields; any digits already in the field are overwritten.
- Ability to append received digits to those already in any of the controlling port's digit fields; digits are stored up to the field maximum, with all digits being reported to the host in the $D1 report.
- Ability to present up to 14 voice prompts as part of this command, then enable the receiver following completion of the final prompt.
- Ability to command the generation of fourth column DTMF digits from host computers via the Host Report Interface.

The minimum command length for the $67 (Enhanced) command is 10 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

The $67 (Enhanced) command has the format:

Main Command segment [optional segments...]

The Main Command segment is 8 bytes long (offsets 4 through 11) and must be included in its entirety every time the enhanced structure is used. If the command is used to attach or detach a receiver without further actions, no optional segments are required.

Timers, specified in seconds, may vary one-half second. This variation affects the $67 (Enhanced) command and is most pronounced in values set to 1 or 2 seconds.

Four optional segments are available for use with the enhanced $67 command structure.

- Collection Timers segment—Allows host control over first digit, interdigit, and field timers. If this segment is not included, the following default values are used:
  - First Digit—No first digit timing is performed.
  - Interdigit—6 seconds.
  - Field Collection—20 seconds.
- Reenter/End of String segment—Allows host control over reenter/End of String characters and system tone to be presented.
- First Digit segment—Allows host control over first digit processing, including reporting, generation of wink or tone, voice prompt interaction, and treatment of outgoing port.
- Enabling Options segment—Allows control over when receiver is enabled. Also allows host to specify up to 14 voice prompts to be presented before enabling receiver.

Each segment can be included only once in a single command. When more than one segment is used, they must appear in the following order—[Collection Timers] [Reenter/End of String] [First Digit] [Enabling Options].

If a segment is not to be included, it is omitted.

If the controlling port (port from which digits are collected) is an outgoing port, the detachment of the outgoing port upon receipt of the first digit cannot be specified in the command.

All DTMF receiver ports must be members of a single resource group for the system to allocate them. It is not necessary to specify the group number in the command; the system determines the resource group from the database configuration.

A DTMF receiver can be attached to any incoming or outgoing T1 or E+M circuit for DTMF digit collection.

SLIC and DID circuits have an on-board DTMF receiver per port; DP digit detection is handled by the firmware resident on the card. UTC circuits have an on-board DTMF receiver per port.

When sending a command for these port types, the receiver address should be $000. DTMF digit collections performed for a controlling port residing on a SLIC, DID, or UTC card always use the on-board receiver; a DTMF receiver cannot be allocated to the call.

Collected digits are reported to the host in a $D1 report and can be stored in any of the controlling port's five digit fields (ANI and Fields 1 through 4). Collected digits may also be appended to the string already contained in one of the digit fields; the field length restrictions of 20 digits for fields 1 through 4 and 12 digits for ANI still apply. Any appended digits in excess of the field limit are reported to the host, but not saved internally by the system.

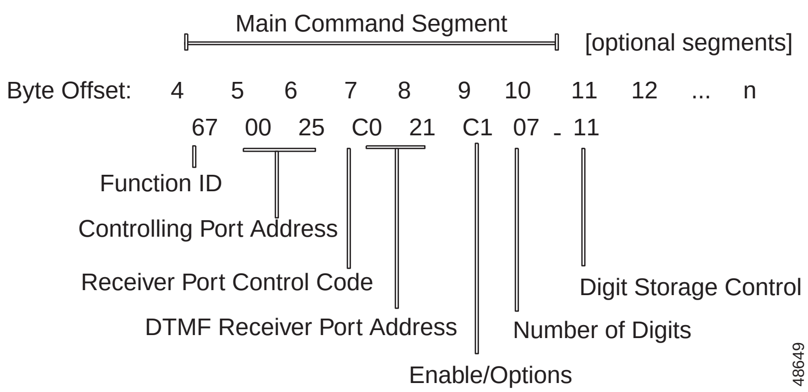
DP digits can only be collected on a SLIC or DID circuit. Clear and Reenter characters and their associated tones are not allowed for DP digit collection. DP digits are reported in a DTMF Digit ($D1) report; no differentiation is made between DP and DTMF digits in this report. The digit string must be all DTMF or all DP. The # and * characters are not supported in DP collection.

This command can be used for both DP and DTMF digit collection. In the descriptions that follow, the words **DTMF only** are used to indicate that the item described is not valid for DP collections and should be set to zero.

Format

Figure 4-8 shows the byte formatting for this command.

Figure 4-8 $67 (Enhanced) Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the circuit address to which the DTMF receiver is attached.

Receiver Port Control Code (byte offset 7)—Sets up the conditions used for this command. Construct the byte in binary according to the descriptions that follow, then convert to hexadecimal for use in the command. The CCC bits are part of the Receiver Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Receiver Port Control Code bits.

```
SAPR0CCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach receiver; if S = 0, no meaning.

A = 0—If S = 1, detach receiver (R must be 0).

A = 1—If S = 1, attach receiver.

P—Specifies whether to use a specific receiver circuit or to select any receiver circuit from the DTMF resource group.

P = 0—For S = 0 or 1, use port specified in Receiver Port Address bytes.

P = 1—For S = 0, use DTMF receiver already in call's resource chain; for S = 1, select port from DTMF receiver resource group.

R—Specifies additional control functions performed as part of this command. For receiver circuits, the actions are shown below.

R = 0—Retain DTMF receiver after report (will remain linked to the line/trunk but not enabled; if A = 0, then R must be 0).

R = 1—Release DTMF receiver after report.

DTMF Receiver Port Address (byte offsets 7 and 8)—Includes second digit of previous byte (Receiver Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the receiver port. If P = 1 or the controlling port resides on a SLIC, DID, or UTC, set to $000.

Enable/Options (byte offset 9)—Determines if DTMF receiver is to be enabled using this command and which optional segments (if any) are included. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
MND0TRFE
```

M—Specifies whether to enable the DTMF receiver when this command is processed.

M = 0—Do not enable DTMF receiver.

M = 1—Enable DTMF receiver.

N—Bit setting that determines if the $67 (Enhanced) command is being used; must be set to 1.

N = 0—Use standard command structure; refer to the “DTMF Collection Control ($67) (Standard) Command” section on page 4-25.

N = 1—Use enhanced command structure.

D—Bit setting that determines if fourth column DTMF digits are to be collected; determines whether a receiver resource which supports fourth column DTMF digit collection must be used.

D = 0—Allow use of DTMF receiver resource which does not support fourth column DTMF digits.

D = 1—Require the use of DTMF receiver resource which supports fourth column DTMF digits.

T—Specifies if a Collection Timers segment is attached.

T = 0—No Collection Timers segment attached; use standard default values.

T = 1—Collection Timers segment attached beginning with byte offset 12.

R—Specifies if a Reenter/End of String segment is attached.

R = 0—No Collection Reenter/End of String segment attached; Reenter/End of String characters not used.

R = 1—Collection Reenter/End of String segment attached.

F—Specifies if a First Digit Processing segment is attached.

F = 0—No First Digit Processing segment attached; first digit reporting/processing not used.

F = 1—First Digit Processing segment attached.

E—Specifies if an Enabling Options segment is attached.

E = 0—No Enabling Options segment attached.

E = 1—Enabling Options segment attached.

Number of Digits (byte offset 10)—Determines the number of digits to be collected using this command. When S and A = 0 in the Digit Storage Control byte, possible values are 1 to 40, inclusive. Otherwise, the value depends on the field number specified in the Digit Storage Control byte. Convert from decimal to hexadecimal for use in the command.

Digit Storage Control (byte offset 11)—Determines if collected digits are stored in or appended to one of the controlling port's digit collection fields (1 to 4, ANI). Up to 12 digits can be stored in the ANI field, and up to 20 digits in fields 1 through 4. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. If digits are not to be stored, this byte must be set to $00.

```
000SAFFF
```

S—Specifies whether to store collected digits in one of the controlling port's digit fields; digit field is specified in the FFF bits.

S = 0—Do not store digits.

S = 1—Store digits in field specified in FFF; A must be 0.

A—Specifies whether to append collected digits to one of the controlling port's digit fields; digit field is specified in the FFF bits.

A = 0—Do not append digits.

A = 1—Append digits to field specified in FFF; S must be 0.

FFF—Specifies the field in which digits are stored or appended; up to 20 digits can be stored in each of Fields 1 to 4, up to 12 in the ANI Field. Specify bits according to the following list:

000 = store/append digits in ANI Field

001 = store/append digits in Field 1

010 = store/append digits in Field 2

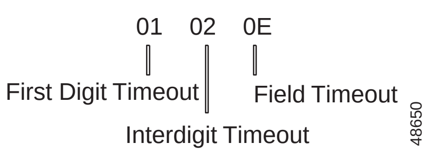
011 = store/append digits in Field 3

100 = store/append digits in Field 4.

Collection Timers Segment

The Collection Timers segment is an optional $67 segment that is three bytes in length and specified only when T = 1 in the Enable/Options byte (offset 9). If this condition is true, this segment must appear in byte offsets 12 through 14. Figure 4-9 defines the format and components of the Collection Timers segment.

Figure 4-9 Collection Timers Segment of the $67 (Enhanced) Command



First Digit Timeout—Specifies the number of seconds, in hex, allowed for the user to enter the first digit of the string. This timer starts when the DTMF receiver port is enabled. Allowed values are 1 to 30 seconds (decimal) or $01 to $1E (hexadecimal), and 0 (timer is not set). Convert from decimal to hexadecimal for the correct value.

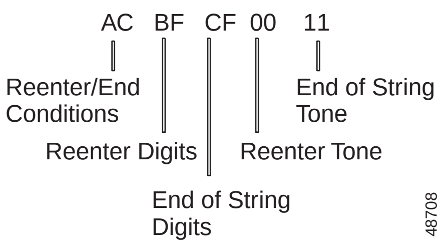
Interdigit Timeout—Specifies the number of seconds, in hexadecimal, allowed for the user to pause between entering digits. This timer starts when the first digit is received. Allowed values are 1 to 10 seconds (decimal) or $01 to $0A (hexadecimal), and 0 (timer is not set). Convert from decimal to hexadecimal for the correct value.

Field Timeout—Specifies the number of seconds, in hex, allowed for the user to enter the number of digits specified. This timer starts when the first digit is received. Allowed values are 1 to 60 seconds (decimal) or $01 to $3C (hexadecimal) inclusive, and 0 (timer is not set). Convert from decimal to hexadecimal for the correct value.

Reenter/End of String Segment

The Reenter/End of String segment is an optional $67 segment that is five bytes in length and specified only when R = 1 in the Enable/Options byte (byte offset 9). If a Collection Timers segment is included in the command, this segment immediately follows it; if not, this segment begins at byte offset 12. Figure 4-10 defines the format and components of the Reenter/End of String segment.

Figure 4-10 Reenter/End of String Segment of the $67 (Enhanced) Command



Reenter/End Conditions—Determines conditions for use of Reenter and End of String codes. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. **DTMF only**.

```
RSTUVW00
```

R—Specifies if the caller is allowed to enter one DTMF digit as a reenter code that deletes the digits already entered and begin a new digit string. Digit is specified in the Reenter Digits byte that follows.

R = 0—Single-digit reenter code not used.

R = 1—Single-digit reenter code used; S must be 0.

S—Specifies if the caller is allowed to enter two DTMF digits as a reenter code that deletes the digits already entered and begin a new digit string. Digits are specified in the Reenter Digits byte that follows.

S = 0—Two-digit reenter code not used.

S = 1—Two-digit reenter code used; R must be 0.

T—Specifies if the caller is allowed to enter one DTMF digit as an End of String code that indicates the end of digits to be entered. Digit is specified in the End of String Digits byte.

T = 0—Single-digit End of String code not used.

T = 1—Single-digit End of String code used; U must be 0.

U—Specifies if the caller is allowed to enter two DTMF digits as an End of String code that indicates the end of digits to be entered. Digits are specified in the End of String Digits byte.

U = 0—Two-digit End of String code not used.

U = 1—Two-digit End of String code used; T must be 0.

V—Specifies if a tone is presented upon detection of the reenter code. Tone is specified in the Reenter Tone byte.

V = 0—No tone if reenter code detected.

V = 1—Present tone if reenter code detected; R or S must be 1.

W—Specifies if a tone is presented upon detection of the End of String code. Tone is specified in the End of String Tone byte.

W = 0—No tone if End of String detected.

W = 1—Present tone if End of String code detected; T or U must be 1.

Reenter Digits—Determines the one or two DTMF digits recognized as the reenter code. If only one digit is used, it appears in the first nibble of this byte; the second nibble must be $F. If two digits are used, they must appear in the order in which they are to be entered by the user. If End of String digits are specified, they must be different from the Reenter digits. Either R or S must be set to 1 in the previous byte. If R and S are both 0 and the D bit in the Enable/Options byte (byte offset 9) is not set, set this byte to $FF. If R and S are both 0 and the D bit in the Enable/Options byte (byte offset 9) is set, set this byte to $00. In addition to digits 1 to 9, the digit 0 (hexadecimal A) and the characters * (hexadecimal B) and # (hexadecimal C) can be used.

If the D bit in the Enable/Options byte (byte offset 9) is set, the DTMF digits in this segment are remapped to utilize fourth-column DTMF digits. DTMF digits 0 to 9 (hexadecimal 0 to 9), A to D (hexadecimal A to D), and the characters * (hexadecimal E) and # (hexadecimal F) can be used.

End of String Digits—Determines the one or two DTMF digits to be recognized as the End of String code. If only one digit is used, it appears in the first nibble of this byte; the second nibble must be $F. If two digits are used, they must appear in the order in which they are to be entered by the user. If Reenter digits are specified, they must be different from the End of String digits. Either T or U must be set to 1 in the previous byte. If T and U are both 0 and the D bit in the Enable/Options byte (byte offset 9) is not set, set this byte to $FF. If T and U are both 0 and the D bit in the Enable/Options byte (byte offset 9) is set, set this byte to $00. In addition to digits 1 to 9, the digit 0 (hexadecimal A) and the characters * (hexadecimal B) and # (hexadecimal C) can be used.

If the D bit in the Enable/Options byte (byte offset 9) is set, the DTMF digits in this segment are re-mapped to utilize fourth-column DTMF digits. DTMF digits 0 to 9 (hexadecimal 0 to 9), A to D (hexadecimal A to D), and the characters * (hexadecimal E), and # (hexadecimal F) can be used.

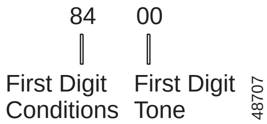
Reenter Tone—Determines the tone presented upon detection of the reenter code. Refer to Appendix E, “Tone Values,” for tones and their values and use the hexadecimal value in the command. Either R or S must be set to 1 in the previous byte. If R and S are both 0, set this byte to $00.

End of String Tone—Determines the tone presented upon detection of the End of String code. Refer to Appendix E, “Tone Values,” for tones and their values and use the hexadecimal value in the command. Either T or U must be set to 1 in the previous bit. If T and U are both 0, set this byte to $00.

First Digit Segment

The First Digit segment is an optional $67 (Enhanced) segment that is two bytes in length and specified only when F = 1 in the Enable/Options byte (offset 9). This segment must follow any Collection Timers or Reenter/End of String segments included in the command. Figure 4-11 defines the format and components of the First Digit segment.

Figure 4-11 First Digit Segment of the $67 (Enhanced) Command



First Digit Conditions—Determines conditions for use of first digit processing. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. **DTMF only**.

```
F000TWAR
```

F—Specifies if a DTMF Digit ($D1) report is sent to the host upon detection of the first digit; first digit is always reported in final $D1 report for the collection.

F = 0—No first digit reporting.

F = 1—Report first digit received to the host when received.

T—Specifies if a tone should be presented upon detection of the first digit; tone is specified in First Digit Tone byte that follows.

T = 0—No tone on first digit detection.

T = 1—Present specified tone on first digit detection.

W—Specifies if a wink (hookflash) should be presented to the attached line/trunk upon detection of the first digit.

W = 0—No wink on first digit detection.

W = 1—Wink on first digit detection.

A—Specifies if the voice prompt being presented should be aborted upon detection of first digit.

A = 0—Do not abort voice prompt.

A = 1—Abort voice prompt on first digit detection.

R—Specifies if the line/trunk attached to the controlling port should be detached upon detection of first digit.

R = 0—Do not detach outgoing port.

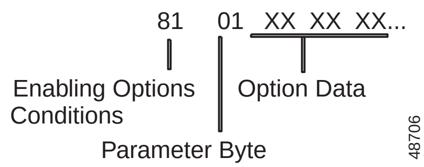
R = 1—Detach outgoing port.

First Digit Tone—Determines the tone presented upon detection of the first digit. Refer to Appendix E, "Tone Values," for tones and their values and use the hexadecimal value in the command. T must be set to 1 in the previous byte. If T is 0, set this byte to $00.

Enabling Options Segment

The Enabling Options segment is an optional $67 (Enhanced) segment that is up to 16 bytes in length and specified only when E = 1 in the Enable/Options byte (offset 9). This segment must follow any Collection Timers, Reenter/End of String, or First Digit segments included in the command. Figure 4-12 defines the format and components of the Enabling Options segment.

Figure 4-12 Enabling Options Segment of the $67 (Enhanced) Command



Enabling Options Conditions—Determines conditions for enabling of the DTMF receiver. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. **DTMF only**.

```
D0ATWPSV
```

D—Specifies whether to enable the receiver immediately or after the conditions in the P, S, or V bits have been satisfied. If D = 1, then at least one value of P, S, or V is 1. If P, S, and V all are 0, then the first digit timer is started and the actions specified in T and W are taken.

D = 0—Enable receiver immediately.

D = 1—Enable receiver after actions specified in P, S, or V bit have completed.

A—Specifies whether the play/record option is enabled.

A = 0—No play/record option.

A = 1—Play/record segment.

T—Specifies if the a tone is to be presented when the receiver is enabled; tone is specified in the Parameter byte that follows.

T = 0—No tone on receiver enable.

T = 1—Present specified tone on receiver enable; P, S, and V are all 0.

W—Specifies if a wink (hookflash if off hook) should be presented to the attached line/trunk when the receiver is enabled.

W = 0—No wink on receiver enable.

W = 1—Wink on receiver enable.

P—Specifies to pause before starting first digit timer, if any; if D = 1, receiver is enabled after pause is complete. Amount of time to pause is specified as the number of 0.1 second increments in the Parameter byte that follows.

P = 0—No pause used.

P = 1—Pause number of 0.1 second increments in Parameter byte before starting first digit timer (if any); enable receiver according to setting of D bit; T, S, and V are all 0.

S—Specifies to start the first digit timer after outpulse rule processing completes; if D = 1, receiver is enabled after rule processing completes.

S = 0—No wait for rule processing to complete.

S = 1—Wait for outpulse rule to complete before starting first digit timer (if any); enable receiver according to setting of D bit; T, P, and V are all 0.

V—Specifies to present up to 14 voice prompts before starting first digit timer (if any); if D = 1, receiver is enabled after prompts are completed. Number of voice prompts to play is specified in the Parameter byte that follows, with a listing of voice prompt numbers following that.

V = 0—No voice prompts.

V = 1—Present voice prompts specified before starting first digit timer (if any); enable receiver according to setting of D bit; T, P, and S are all 0.

Parameter Byte—Contents of this byte are determined by the setting of the Enabling Options byte as follows:

If A = 1—This byte is set to 00 (zero).

If T = 1—Specifies tone to present; refer to Appendix E, “Tone Values,” for tones and their values and use the hexadecimal value in the command. No further bytes required in command.

If P = 1—Specifies the number of seconds to pause; seconds specified in 0.1 second increments up to a maximum of 25.5 seconds. No further bytes required in command.

If V = 1—Specifies the number of voice prompts to present; allowed values are 1 through 14. Up to 14 additional bytes are required to specify the individual prompt numbers following this byte.

If S = 1—This byte is set to 00 (zero).

Option Data—Determined by the setting of the Enabling Options byte as follows:

If V = 1—String of from 1 to 14 bytes specifying the prompts to present; refer to Appendix C, “System Digitized Voice Card Prompts,” for a listing of prompts and their numbers.

If A = 1—Option data is enhanced $6C play/record segment, starting with byte offset 7 of Voice Port Control $6C (Enhanced) command.

System Response

DTMF Digit ($D1) report.

If a report upon receipt of first digit was specified (First Digit segment was included in command with proper bit settings), the first $D1 report received contains only one digit and the report indicates it is a first digit report. The full digit string, including the first digit, is reported in a second $D1 when digit collection ends. Refer to the “DTMF Digit ($D1) (Standard) Report” section on page 5-24 for more information.

A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $09, $0A, $0E, $0F, $11, $12, $13, $16, $17, $18, $1C, $1F, $22, $24, $26, $27, $2C, $2E, $2F, $30, $33, $34, $3C, $43, $44, $45, $46, $47 and $48. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

A network status byte value of $4F is returned if fourth-column DTMF digits are used (D bit set in byte offset 9) and the system feature, “Enable 4th Column DTMF”, is not enabled.

A network status byte value of $50 (feature semantics error) is returned if fourth-column DTMF digits are used in the Reenter Digits and End of String Digits segments, and the D bit is not set in byte offset 9.

For DRC/8, if Return All is used, the port address of the DTMF receiver requested by resource group number is returned in the port address bytes. For DRC24/48, the port address is not returned. For SLIC, DID, and UTC ports, this address is the same as the controlling port address.

A command returned with a network status byte of $1F indicates that no DTMF receivers were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the DTMF resource group were busy (allocated or out of service). If no $D6 is sent, a DTMF resource group does not exist (no members). Refer to the “Resource Limitation ($D6) Report” section on page 5-45 for more information on the $D6 report.

Examples

Example 4-12 $67 (Enhanced) Command

Assume there is a DTMF receiver at address $50, and an incoming T1 trunk at address $21. The following command attaches the DTMF receiver to the incoming trunk, sets up collection of 7 digits and places any collected digits into Field 1. The command also starts a 10-second first digit timer, a 6-second interdigit timer, and a 30-second field timer. Finally, the command sets ## as the End of String digits and ** as the Reenter String digits, and presents a beep if the End of String digit terminator is entered.

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18 19
67 0021 C0 50CC 07 11 0A 06 1E 54 BB CC 00 00
```

Function ID = 67 (DTMF Collection Control)

Controlling Port Address = $0021

Receiver Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

R = 0 (retain DTMF receiver after report)

DTMF Receiver Port Address = $050

Digit Collection Control = 11001100

M = 1 (enable receiver)

N = 1 (enhanced command structure)

0 (undefined)

0 (undefined)

T = 1 (collection timer segment attached)

R = 1 (Reenter/End of String segment attached)

F = 0 (First Digit Processing Segment not attached)

E = 0 (Enable Options Segment not attached)

Number of Digits To Collect = 07

Digit Storage Control = 00010001

S = 1 (store digits in field)

A = 0 (do not append digits in field)

FFF = 001 (field number 1)

The Collection Timers Segment is as follows:

First Digit Timeout = $0A (10)

Interdigit Timeout = $06 (6)

Field Timeout = $1E (30)

The Reenter/End of String Segment is as follows:

Reenter/End Conditions = 01010100

R = 0 (do not use single-digit reenter code)

S = 1 (use double-digit reenter code)

T = 0 (do not use single-digit End of String code)

U = 1 (use double-digit End of String code)

V = 0 (no tone for reenter digit string)

W = 1 (present tone if End of String digits entered)

Reenter Digits = $BB (** on telephone)

End of String Digits = $CC (##)

Reenter Tone = 0 (no tone - off due to V bit)

End of String Tone = 0 (beep on End of String code)

Example 4-13 $67 (Enhanced) Command

Assume there is a DTMF receiver at address $50, and an incoming T1 trunk at address $21. The following command attaches the DTMF receiver to the incoming trunk, sets up collection of 4 digits and appends any collected digits into Field 1. The command does not start a first digit timer, but it does set a 6-second interdigit timer and a 10-second field timer. Finally, the command aborts voice prompts when the first digit is entered, enables the receiver immediately, and plays two voice prompts (“Please dial the number you wish to reach” and “For assistance, dial...”) when the receiver is enabled.

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18 19 20
67 0021 C0 50CB 04 09 00 06 0A 02 00 81 02 11 38
```

Function ID = 67 (DTMF Collection Control)

Controlling Port Address = $0021

Receiver Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

R = 0 (retain DTMF receiver after report)

DTMF Receiver Port Address = $050

Digit Collection Control = 11001011

M = 1 (enable receiver)

N = 1 (enhanced command structure)

0 (undefined)

0 (undefined)

T = 1 (collection timer segment attached)

R = 0 (Reenter/End of String segment not attached)

F = 1 (First Digit Processing Segment attached)

E = 1 (Enable Options Segment attached)

Number of Digits To Collect = 04

Digit Storage Control = 00001001

S = 0 (do not store digits in field)

A = 1 (append digits in field)

FFF = 001 (field number 1)

The Collection Timers Segment is as follows:

First Digit Timeout = 0 (no first digit timing)

Interdigit Timeout = $06 (6)

Field Timeout = $0A (10)

The First Digit Segment is as follows:

First Digit Conditions = 00000010

F = 0 (no first digit report to host)

0 (undefined)

0 (undefined)

0 (undefined)

T = 0 (no tone of first digit detection)

W = 0 (no wink on first digit detection)

A = 1 (Abort voice prompt if digit entered)

R = 0 (do not detach outgoing port)

First Digit Tone = 0 (T = 0)

The Enabling Options Segment is as follows:

Enabling Options Conditions = 10000001

D = 0 (enable receiver immediately)

0 (undefined)

0 (undefined)

T = 0 (no tone on first digit detection)

W = 0 (no wink on receiver enable)

P = 0 (no pause on receiver enable)

S = 0 (no supervision for receiver enable)

V = 1 (play voice prompts on receiver enable)

Parameter Byte = 02 (number of voice prompts in command)

Prompt Bytes = $11 $38

Example 4-14 $67 (Enhanced) Command

Assume there is a DTMF receiver at address $50, and an incoming T1 trunk at address $21. The following command attaches the DTMF receiver to the incoming trunk, sets up collection of 10 digits and stores any collected digits into Field 3. The command starts a 15-second first digit timer, a 6-second interdigit timer and a 10-second field timer. It sets # as the End of String digit and * as the Reenter String digit, and presents a beep tone if # is entered and a dial tone if * is entered. Finally, the command reports the first digit to the host when detected and sends a wink to the outgoing port when the first digit is detected.

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
67 0021 F0 00CF 0A 13 0F 06 0A AC AC BF CF 03 00 84 00 82 02 20
```

Function ID = 67 (DTMF Collection Control)

Controlling Port Address = $0021

Receiver Port Control Code = 11110000

- S = 1 (switching action required)
- A = 1 (attach resource)
- P = 1 (obtain a receiver from the resource group)
- R = 1 (release DTMF receiver after report)

DTMF Receiver Port Address = $050

Digit Collection Control = 11001111

- M = 1 (enable receiver)
- N = 1 (enhanced command structure)
- 0 (undefined)
- 0 (undefined)
- T = 1 (collection timer segment attached)
- R = 1 (Reenter/End of String segment attached)
- F = 1 (First Digit Processing Segment attached)
- E = 1 (Enable Options Segment attached)

Number of Digits To Collect = $0A (10)

Digit Storage Control = 00010011

- S = 1 (store digits in field)
- A = 0 (do not append digits in field)
- FFF = 011 (field number 3)

Collection Timers Segment

- First Digit Timeout = $0F (first digit timing of 15 seconds)
- Interdigit Timeout = $06 (6)
- Field Timeout = $0A (10)

Reenter/End of String Segment

Reenter/End Conditions = 10101100

- R = 1 (use single-digit reenter code)
- S = 0 (do not use double-digit reenter code)
- T = 1 (use single-digit End of String code)
- U = 0 (do not use double-digit End of String code)
- V = 1 (present tone for reenter digit string)
- W = 1 (present tone if End of String digits entered)

Reenter Digits = $BF (* on telephone)

End of String Digits = $CF (# on telephone)

Reenter Tone = 3 (Dial tone)

End of String Tone = 0 (beep on End of String code)

The First Digit Segment is as follows:

First Digit Conditions = $84 (10000100)

F = 0 (report first digit to host)

0 (undefined)

0 (undefined)

0 (undefined)

T = 0 (no tone of first digit detection)

W = 1 (wink to outgoing port on first digit detection)

A = 0 (do not abort voice prompt if digit entered)

R = 0 (do not detach outgoing port)

First Digit Tone = 0 (T = 0)

The Enabling Options Segment is as follows:

Enabling Options Conditions = 10000010

D = 1 (enable receiver after action specified in P, S, or V bit)

0 (undefined)

0 (undefined)

T = 0 (no tone on first digit detection)

W = 0 (no wink on receiver enable)

P = 0 (no pause on receiver enable)

S = 1 (wait for supervision for receiver enable)

V = 0 (no voice prompts)

Parameter Byte = 02 (wait for supervision before starting first digit timer)

Prompt Bytes = $20 (wait 32 seconds for answer supervision)

MF Collection Control ($68) Command

Note Unless otherwise stated, the MF processing described in this section applies to both MF and MFCR2 processing.

Command Type

Resource Control

Description

The MF Collection Control ($68) command enables a host to collect the MF digits collection; sent over a trunk circuit. The collected digits are sent to the host in the form of an MF Digit ($D0) report. This command also attaches or detaches MF receivers or MFCR2 transceivers to or from a trunk. Up to 20 MF digits can be collected and stored in a 30-second period (via a single $68 command using one MF receiver port).

This command allows users the option of keeping a call in an active state when garbled digits are received or no KP or ST digits are detected. The default is to consider the error a call failure and tear down the call. Use this command as a command segment in the Incoming Port Control ($6A) command.

The minimum length for the $68 command is 11 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

All MF receiver ports must be members of a single resource group for the system to allocate them. Also, all MFCR2 transceiver ports must be members of a single resource group. It is not necessary to specify the group number in the command; the system determines the resource group from the database configuration.

The Controlling Port cannot be participating in a conference. If it is, the command is returned with a $1C network status byte.

For MF processing, digits received have KP, ST, STP, ST2P, and ST3P stripped from the MF Digit ($D0) report.

An MF receiver or MFCR2 transceiver can be attached to any incoming or outgoing trunk/line circuit.

The host has the option of tearing down the call upon collection error or keeping the call active. The following conditions are collection errors (call failures):

- No KP (frequency #1, 1100 Hz, frequency #2, 1700 Hz) detected within 15 seconds
- No ST (frequency #1, 1500 Hz, frequency #2, 1700 Hz) detected within 30 seconds
- Digit off time greater than 6 seconds
- A field collection timeout (30 seconds) during MFCR2 collection
- Receipt of garbled MF digit

A garbled MF digit is declared if one of the following conditions exists:

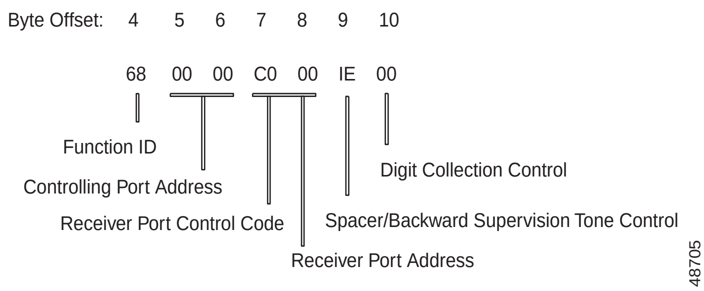
- Twist greater than 8 dB
- Presence of a single tone of the tone pair for all or part of the digit
- Presence of more than two tones

Upon error, the host can specify to either force the controlling port to idle (tear down the call), or place the port in CP_SETUP state to await further host action (such as connection to a live operator). If an error condition occurs, the $D0 report indicates the reason for the call failure and whether the controlling port has been left in CP_SETUP state or forced to idle.

Format

Figure 4-13 shows byte formatting for this command.

Figure 4-13 $68 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offset 5 and 6)—Hexadecimal representation of the circuit address to which the MF receiver is attached.

Receiver Port Control Code (offset byte 7)—Bits 7 to 3 (SPARE bits) set up the conditions used for this command. Construct byte in binary according to the descriptions that follow, then convert to hexadecimal for use in the command. Bits 2 to 0 (CCC bits) are part of the Receiver Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Receiver Port Control Code bits.

```
SAPRECCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach receiver; if S = 0, no meaning.

A = 0—If S = 1, detach receiver (R must be 0).

A = 1—If S = 1, attach receiver.

P—Specifies whether to use a specific receiver circuit or to select any receiver circuit from a resource group; port address is specified in Receiver Port Address byte.

P = 0—If S = 0 or 1, use port specified in Receiver Port Address bytes.

P = 1—Set Receiver Port Address to $000 for MF Receiver Cards. Then, if S = 0, use MF receiver already in call's resource chain; if S = 1, select port from MF receiver resource group.

R—Specifies additional control functions performed as part of this command. For receiver circuits, the actions are shown below.

R = 0—Retain MF receiver after report (remains linked to the line/trunk but not enabled; if A = 0, R must also be 0.

R = 1—Release MF receiver after report.

E—Specifies whether to tear down the call upon digit collection failure or to keep the call active; digit collection failure is defined as receipt of a garbled DTMF digit, no KP is detected within 15 seconds, no ST within 30 seconds, or digit off time > 6 seconds.

E = 0—Tear down call upon error.

E = 1—Keep call active upon error; return controlling port to CP_SETUP or previous state, if applicable.

Receiver Port Address (byte offsets 7 and 8)—Includes bits 0, 1, and 2 of byte 7. If P = 0, this three-digit number is the hexadecimal representation of the receiver port. If P = 1, set to $000.

Spacer Byte/Backward Supervision Tone (byte offset 9)—In MF processing, this byte is not used and is reserved for future enhancements; set to $00.

In MFCR2 processing, this byte determines the backward supervision tone and end-of-collection backward supervision tone to be used in controlling the collection process.

```
IIIIEEEE
```

IIII—Interdigit backward supervision tone; valid values are 0 to F.

IIII = 0000—The backward supervision tone A-4 is returned to indicate network congestion.

IIII = 0000—Refer to the appropriate national guidelines for information on the numbering and use of these tones.

EEEE—End-of-collection backward supervision tone; valid values are 0 to F.

EEEE = 0000—The backward supervision tone A-4 is returned to indicate network congestion.

EEEE = 0000—Refer to the appropriate national guidelines for information on the numbering and use of these tones.

Digit Collection Control (byte offset 10)—Determines if MF collection is enabled or not; specify the byte according to the list below.

```
EMNNNNNN
```

E—Enables/disables receiver.

E = 0—Do not enable receiver.

E = 1—Enable receiver.

M—Specifies MF or MFCR2 processing.

M = 0—MF processing.

M = 1—MFCR2 processing.

NNNNNN—Specifies the number of digits to collect.

Note Bits 0 to 5 are used for MFCR2 processing only.

System Response

MF Digit ($D0) report.

The report contains either valid digit report or error indicator. Possible errors include: KP not received within 15 seconds (timeout); ST not received within 30 seconds (timeout); digit off time > 6 seconds (timeout); and digit on time > 6 seconds (garbled digit). Refer to the "MF Digit ($D0) Report" section on page 5-20 for more information.

A command returned by the system with a network status byte not equal to $01 indicates command was not processed. The following network status bytes may be returned: $03, $0A, $0E, $0F, $11, $12, $14, $16, $17, $18, $1C, $1F, $22, $24, $26, and $3C. Refer to Chapter 3, "Message Structure Overview," or Appendix D, "Network Status Byte Definitions," for more information.

A command returned with a network status byte of $1F indicates no MF receivers were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the MF resource group were busy (allocated or out of service). If no $D6 report is sent, an MF resource group does not exist (no members). Refer to the "Resource Limitation ($D6) Report" section on page 5-45 for more information.

If Return All is used, the port address of the MF receiver requested by resource group number is returned in the port address bytes.

Examples

Example 4-15 $68 Command

Assume there is a trunk at address $19. The following command attaches an MF receiver from the MF resource group to the trunk, without enabling the receiver.

```
04 0506 07 0809 10
68 0019 E0 0000 00
```

Function ID = 68 (MF Collection Control)

Controlling Port Address = $0019

Receiver Port Control Code = 11100000

S = 1 (switching action required)

A = 1 (attach resource)

P = 1 (select from resource group)

R = 0 (retain MF receiver after report)

E = 0 (tear down call if errors detected)

MF Receiver Port Address = $000 (use MF receiver group)

Spacer Byte = 00

Digit Collection Control = 00 (do not enable receiver)

Example 4-16 $68 Command

Assume there is a trunk at address $18 and an MF receiver at address $60. The following command attaches the MF receiver to the trunk, enables the receiver, and collects a string of MF digits. After digit collection, the receiver is detached. If an error occurs, the controlling port is placed into CP_SETUP state until further host action.

```
04 0506 07 0809 10
68 0018 D8 6000 80
```

Function ID = 68 (MF Collection Control)

Controlling Port Address = $0018

Receiver Port Control Code = 11011000

- S = 1 (switching action required)
- A = 1 (attach resource)
- P = 0 (use address given)
- R = 1 (release MF receiver after report)
- E =1 (place controlling port in setup state if errors detected)

MF Receiver Port Address = $060

Spacer Byte = 00

Digit Collection Control = 80 (enable receiver)

Example 4-17 $68 Command

Assume there is a trunk at address $208. The following command hunts an MF receiver, attaches it to the trunk, enables the receiver, and collects a string of MF digits. After digit collection, the receiver is detached. If an error occurs, the controlling port is reordered through PST processing.

```
04 0506 07 0809 10
68 0208 E0 0000 80
```

Function ID = 68 (MF Collection Control)

Controlling Port Address = $0208

Receiver Port Control Code = 11011000

- S = 1 (switching action required)
- A = 1 (attach resource)
- P = 1 (select from resource group)
- R = 0 (retain MF receiver after report)
- E = 0 (tear down call if errors detected)

MF Receiver Port Address = $000 (use MF receiver group)

Spacer Byte = 00

Digit Collection Control = 80 (enable receiver)

Outgoing Port Control ($69) Command

Command Type

Resource Control

Description

Use the Outgoing Port Control ($69) command to link or remove outgoing circuits to or from a call's resource chain. This command also begins outpulse or inpulse rule processing for outgoing ports. Digit strings contained in call record fields can be overwritten and new digits supplied using this command. Control of disconnect at call teardown and receipt of on hook reports is also included. This command can be used as a command segment in the Incoming Port Control ($6A) command.

Use fourth-column DTMF digits with the $69 command only when the system feature flag, “Enable 4th Column DTMF” is enabled. No explicit indicator is used in the $69 command. The fourth-column DTMF system feature flag affects the mapping of DTMF digits used in the digit string portion of the command. Refer to the Digit String explanation below.

The minimum length for the $69 command is 11 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

The $69 command has the following format:

Main Command segment [optional Disconnect Control byte] Outpulse Control segment

Both the Main Command segment and the Outpulse Control segment must be included every time the command is used. At least one Outpulse Control segment is required in the command. Up to five Outpulse Control segments can be included in a single command.

Use of the optional Disconnect Control byte is determined by a bit setting in the Main Command segment. When used, it must appear in byte offset 10. One or more Outpulse Control segments must then follow it. When the command is constructed without the optional Disconnect Control, default settings are used so that when one end hangs up the other end is forced idle with Permanent Signal Timing and both on hooks are reported to the host.

Up to 20 digits can be specified for each field, up to 12 for ANI. These digits are contained in an Outpulse Control segment; one segment is used per field. This command can affect all aspects of call processing: voice paths, states, resource linkages, and supervision.

This command can use virtual ports as the controlling port. The Controlling and Outgoing Ports cannot participate in a conference. If either does, the command is returned with a $1C network status byte.

For outgoing SLIC ports and other ports that require only a seizure, the Rule Control byte can be set to $80. This calls the null outpulse rule that performs a seizure only.

DID ports are supported by this command as an incoming (controlling) port only.

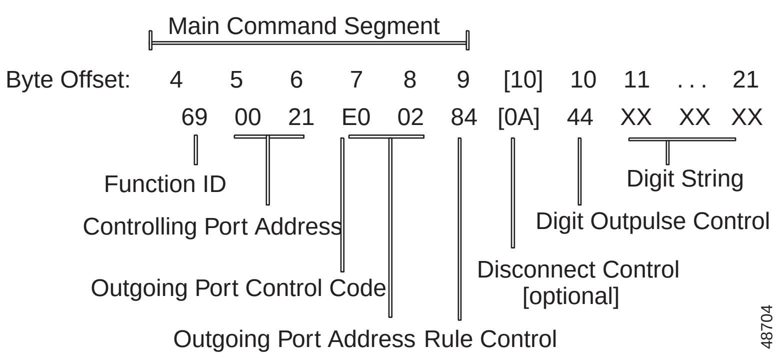
To execute an inpulse or outpulse rule on an already off hook outgoing port or to idle an outgoing port with no incoming port attached, the controlling port address can be set to $00 00. This allows rule execution on an outgoing port in CP_SETUP state that has been detached from a call or conference. If the controlling port address is set to $00 00 and no inpulse or outpulse rule is specified, the command will idle an outgoing port left in setup state with no incoming port attached, making the port available for allocation.

The $69 command operates in conjunction with the Auto Retry feature for outgoing ports. When hunting from an outgoing port resource group and a supervision error is detected for the outgoing port, call processing can rehunt the group and replace the outgoing port. This feature and the number of rehunts performed is configured using the system administration Resource Group Summary screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information.

Format

Figure 4-14 shows the byte formatting for this command.

Figure 4-14 $69 Command Format



Main Command Segment

The Main Command segment is composed of byte offsets 4 through 9 and must be included in its entirety. Components of the Main Command segment are defined as follows:

Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offset 5 and 6)—Hexadecimal representation of the incoming circuit address to which the outgoing port is or will be linked. When using this command to execute a rule on an outgoing port in CP_SETUP state (no incoming port attached), these bytes must be set to $00 00.

Outgoing Port Control Code (byte offset 7)—Sets up the conditions for this command. Construct byte in binary according to the following description, then convert to hexadecimal for use in the command. The CCC bits (see next page) are part of the Outgoing Port Address and are included in the conversion from hexadecimal to binary to provide the proper spacing to interpret the Outgoing Port Control Code bits.

```
SAPVVCCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to link or remove a resource.

A = 0—If S = 1, remove resource from call; if S = 0, no meaning.

A = 1—If S = 1, link resource to call; if S = 0, no meaning.

P—Specifies whether to use a specific outgoing circuit or to select any outgoing circuit from a resource group; port address or group number is specified in Outgoing Port Address bytes.

P = 0—For S = 0 or 1, use port specified in Outgoing Port Address bytes.

P = 1—For S = 0, use outgoing port already in call's resource chain; for S = 1, select port from resource group specified in Outgoing Port Address byte.

VV—Specifies additional speech path control functions performed as part of this command. For outgoing circuits, these functions are shown below.

VV = 00—Default. Defer two-way speech path between incoming port and outgoing port until end of outpulse rule processing.

VV = 01—Defer two-way speech path between incoming port and outgoing port until outgoing port answers.

VV = 1—Cut two-way speech path between incoming port and outgoing port immediately, before starting outpulse rule.

Outgoing Port Address (byte offset 7 and 8)—Includes second digit of previous byte (Outgoing Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the outgoing circuit. If P = 1, this three-digit number is the hexadecimal representation of the resource group to hunt for an available circuit; convert decimal to hexadecimal for the group number.

Rule Control (byte offset 9)—Determines if an outpulse or inpulse rule is used in this command and the rule number, if any. Also includes bit setting that determines if the command is compatible with V2.01 applications (if bit N = 1 the command is not compatible with V2.01). Construct the byte in binary according to the descriptions that follow, then convert to hexadecimal for use in the command.

```
XNIRRRRR
```

X—Specifies if an outpulse rule is used in this macro command.

X = 0—No outpulse rule.

X = 1—Execute outpulse rule specified in RRRRR; I must be 0.

N—Bit setting that determines if the Disconnect Control byte is included in this command; indicates a disconnect control option is specified.

N = 0—No Disconnect Control byte included; continue command with Digit Outpulse Control byte.

N = 1—Disconnect Control byte contained in byte offset 10.

I—Specifies if an inpulse rule is used in this macro command.

I = 0—No inpulse rule.

I = 1—Execute inpulse rule specified in RRRRR; X must be 0.

RRRRR—Specifies an inpulse rule from 1 to 30 or an outpulse rule from 0 to 30 inclusive, where 0 is the null outpulse rule (outgoing port seized then transition immediately into wait for final answer D CP_WTFSUP MState); convert from decimal to binary for rule number.

Disconnect Control Byte

The Disconnect Control byte is used only when N = 1 in the Rule Control byte (offset 9). In addition to determining the disposition of ports when the call is torn down, this byte also specifies the reporting that occurs for on hook conditions. When N = 1 in byte offset 9, the Disconnect Control byte appears in byte offset 10.

This byte is processed by the system in the following two cases:

- Outgoing port is being attached; S and A = 1 in Outgoing Port Control Code (byte offset 7)
- Outgoing port is being detached; S = 1 and A = 0 in Outgoing Port Control Code (byte offset 7)

The Disconnect Control byte is ignored when the outgoing port is being attached to a virtual incoming port. Also, bit settings in this byte are overridden if any of the following commands are processed for either port in this $69 command:

- Another $69 command
- Incoming Port Control ($6A)
- Change Incoming Port ($6B)
- Conference Control ($6D)

The definition of this byte varies slightly for each case as described in the text that follows.

Attaching

When attaching an outgoing port (S and A = 1 in byte offset 7), the Disconnect Control byte is defined as follows.

Disconnect Control (byte offset 10)—Included only if N = 1 in the Rule Control byte. This byte determines what actions to take on a port when the opposite end goes on hook. It is ignored when used to attach to a virtual port. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
000TICU0
```

T—Valid only when I = 0 (port forced to idle and not CP_SETUP). This bit specifies whether to suppress the incoming on hook report ($DB) if the outgoing port to which it is attached goes on hook first. If the incoming port goes on hook first, the $DB report is always generated. This bit has no effect on Permanent Signal ($D2) reporting for the incoming port. If I = 1, set this bit to 0.

T = 0—If I = 0, on hook ($DB) reports always generated when incoming port goes on hook; ignored if I = 1.

T = 1—If I = 0, suppress on hook ($DB) reports for the incoming port if the outgoing port goes on hook first; ignored if I = 1.

I—Specifies whether to return the incoming port to CP_SETUP state when the outgoing port goes on hook.

I = 0—Force incoming to idle; physical release and begin Permanent Signal processing.

I = 1—Set incoming to setup state upon outgoing disconnect; T must be 0.

C—Valid only when U = 0 (port forced to idle and not CP_SETUP); specifies whether to suppress the outgoing on hook report ($DA) if the incoming port to which it is attached goes on hook first. If the outgoing port goes on hook first, the $DA report is always generated. This bit has no effect on Permanent Signal ($D2) reporting for the outgoing port. If U = 1, set this bit to 0.

C = 0—If U = 0, on hook ($DA) reports are always generated when outgoing port goes on hook; ignored if U = 1.

C = 1—If U= 0, suppress on hook ($DA) reports for the outgoing port if the incoming port goes on hook first; ignored if U = 1.

U—Specifies whether to return the outgoing port to CP_SETUP state when the incoming port goes on hook.

U = 0—Force outgoing to idle; physical release and begin Permanent Signal processing.

U = 1—Set outgoing to setup state upon incoming disconnect; C must be 0.

Detaching

When detaching an outgoing port (S = 1 and A = 0 in byte offset 7), the Disconnect Control byte is defined as follows.

Disconnect Control (byte offset 10)—Included only if N = 1 in the Rule Control byte. Determines what actions to take on the outgoing port when it is detached via this command. The outgoing port may be connected to a virtual port. Construct the byte in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
000TICU0
```

T—Bit unused when detaching outgoing; set to 0.

I—Bit unused when detaching outgoing; set to 0.

C—Valid only when U = 0 (port forced to idle and not CP_SETUP); specifies whether to suppress the outgoing on hook report ($DA). This bit has no effect on Permanent Signal ($D2) reporting for the outgoing port. If U = 1, set this bit to 0.

C = 0—If U = 0, on hook ($DA) reports always generated when outgoing port goes on hook; ignored if U = 1.

C = 1—If U= 0, suppress on hook ($DA) reports for the outgoing port; ignored if U = 1.

U—Specifies whether to return the outgoing port to CP_SETUP state when this command is processed. If a previous $69 command was used to attach a specified U = 1, it must be specified again when detaching.

U = 0—Force outgoing to idle; physical release and begin Permanent Signal processing.

U = 1—Set outgoing to setup state; C must be 0.

Outpulse Control Segment

The Outpulse Control segment is up to 11 bytes long and it is used in all $69 commands. Always use a single-byte Outpulse Control segment of $00 to terminate this command. You can use up to five Outpulse Control segments in a single command. When a Disconnect Control byte is used, the first Outpulse Control segment begins at byte offset 11; otherwise the first segment begins at byte offset 10. The Outpulse Control segment is defined as follows.

Digit Outpulse Control—Specifies the call record field into which the digit string that follows is to be saved, and the number of digits in the string. The final byte of this command must always be a Digit Outpulse Control Byte = $00 to signal that there are no further digits to be outpulsed. If the digit string contained in a field is to be replaced by a new digit string, the field number and string are specified here. Only the field specified here is replaced; digit strings in any other field contained in the outpulse rule remain unchanged and are processed. Digit strings can be specified when executing either an inpulse or outpulse rule; the inpulse rule may contain a DO ORULE token. If a digit string is to be passed to an outpulse rule, construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
FFFNNNNN
```

FFF—Specifies the call record field to receive the digit string.

FFF = 001—Field 1

FFF = 010—Field 2

FFF = 011—Field 3

FFF = 100—Field 4

FFF = 000—ANI (originating number field)

NNNNN—Specifies the number of digits in the string; a number between 0 (no digits) and 20 is required (between 0 and 12 for the originating number (ANI) field.) Convert from decimal to binary for string length.

Digit String—The digit string contains half as many bytes as specified in the NNNNN bits. Each nibble in the hexadecimal byte represents a single digit; digits represented are from 1 to 9 inclusive, 0 ($A), plus the special characters * ($E) and # ($F). If there is an odd number of digits in the string, the second digit of the final byte should be 0. Up to 20 digits can be specified (up to 12 for ANI).

If the system feature “Enable 4th Column DTMF” is set, the DTMF digits in this string are remapped to utilize fourth-column DTMF digits. DTMF digits 0 to 9 (hexadecimal 0 to 9), A to D (hexadecimal A to D), and the characters * ($E), and # ($F) can be used.

Note The special characters * and # are represented differently in DTMF Digit ($D1) reports and $69 command outpulse segments. In $D1 reports, * and # are indicated by the hexadecimal characters $B and $C, respectively.

If the system feature “Enable 4th Column DTMF” is set, the DTMF Digit ($D1) report indicates * and # with the hexadecimal characters $E and $F, respectively.

System Response

No response from the system upon successful completion unless Return All has been set in the Network Header. A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $0D, $0E, $0F, $11, $12, $15, $16, $17, $18, $1C, $1F, $20, $22, $23, $24, $25, $26, $2B, $35, $37, $3A and $3C. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

A network status byte value of $4F is returned if fourth-column DTMF digits are used and the system feature “Enable 4th Column DTMF” is not enabled.

A $DA report is generated when any supervision error is detected, or a supervision event occurs for which a REP or ANSREP condition token has been specified in the answer supervision template called by the outpulse rule, or a REP END is used in an outpulse rule.

If more than 20 digits are specified for a single digit string, the command is processed without error return, but only the first 20 digits of the string are stored and outpulsed.

A command returned with a network status byte of $1F indicates that no outgoing ports were available in the resource group and is followed by a Resource Limitation ($D6) report. A network status byte of $25 indicates that the command could not be processed because all outpulsing channels are busy, but is not followed by a $D6 report. Refer to the "Resource Limitation ($D6) Report" section on page 5-45 for more information.

If Return All is used, the port address of any resource that was requested by resource group number is returned in place of the group number.

When the incoming port is on a T1, E+M, or UTC, answer supervision is passed back to the incoming when the call goes stable.

Examples

Example 4-18 $69 Command

Assume there is a nonidle incoming circuit at address $0018. The following command attaches an idle outgoing circuit from resource group 2 to the incoming circuit, begins outpulse rule 4, and passes it three digits to be placed in call field 2, and seven digits to be placed in call field 4.

```
04 0506 07 0809 10 11 12 131415161718
69 0018 E0 0284 43 6A 30 875551234000
```

The Main Command Segment is as follows:

Function ID = 69 (Outgoing Port Control)

Controlling Port Address = $0018

Outgoing Port Control Code = 11100000

- S = 1 (switching action required)
- A = 1 (attach resource)
- P = 1 (select from resource group)
- VV = 00 (cut through path after rule completion)

Outgoing Port Address = resource group 2 ($002)

Rule Control = 10000100

- X = 1 (execute outpulse rule)
- N = 0 (no Disconnect Control byte)
- I = 0 (no inpulse rule)
- RRRRR = 4 (outpulse rule 4)

The Outpulse Control Segment 1 is as follows:

Digit Outpulse Control = 01000011

- FFF = 010 (field 2)
- NNNNNN = 3 (3 digits in string)

Digit String = 603 (final 0 is ignored)

The Outpulse Control Segment 2 is as follows:

Digit Outpulse Control = 10000111

FFF = 100 (field 4)

NNNNNN = 7 (7 digits in string)

Digit String = 5551234 (final 0 is ignored)

The Outpulse Control Segment 3 is as follows:

Digit Outpulse Control = 00 (no further digits in command)

Example 4-19 $69 Command

The following command attaches the idle outgoing circuit at address $20 to the nonidle incoming circuit at address $18. No outpulsing is specified, and no digits are sent, so the digit string is omitted.

```
04 0506 07 0809 10
69 0018 C0 2000 00
```

Function ID = 69 (Outgoing Port Control)

Controlling Port Address = $0018

Outgoing Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

VV = 00 (cut through path after rule completion)

Outgoing Port Address = $20

Rule Control = 00000000

X = 0 (no outpulse rule)

N = 0 (no Disconnect Control byte)

I = 0 (no inpulse rule)

RRRRR = 0 (bit ignored)

The Outpulse Control Segment is as follows:

Digit Outpulse Control = 00 (no further digits in command)

Example 4-20 $69 Command

Assume the circuit at $10F is an incoming port with a COS = AT and in a setup state (CP_SETUP). Also assume that the circuit at $45 is an outgoing port that was first in a stable call, then participating in a conference, and finally removed from the conference (currently in CP_SETUP). The following command places these two ports into a stable call.

```
04 0506 07 0809 10
69 010F D0 4500 00
```

Function ID = 69 (Outgoing Port Control)

Controlling Port Address = $010F

Outgoing Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

VV = 00 (cut through path immediately)

Outgoing Port Address = $45

Rule Control = 00000000

X = 0 (no outpulse rule)

N = 0 (no Disconnect Control byte)

I = 0 (no inpulse rule)

RRRRR = 0 (bit ignored)

The Outpulse Control Segment is as follows:

Digit Outpulse Control = 00 (no further digits in command)

Example 4-21 $69 Command

Assume the circuit at $256 is an incoming T1 port that has gone off hook and is awaiting host action. Resource group 10 contains SLIC ports with COS = O. The command below hunts group 10 for an idle SLIC port, executes the null outpulse rule (seize only), then places both ports into a wait for answer state (CP_WANS for the incoming, CP_WTFSUP for the outgoing). When the SLIC port goes off hook, answer supervision is returned to the incoming T1 port. When the outgoing SLIC goes on hook, the incoming T1 is returned to CP_SETUP to await further action (Disconnect Control byte included in command at byte offset 10).

```
04 0506 07 0809 10 11
69 0256 E8 0AC0 08 00
```

Function ID = 69 (Outgoing Port Control)

Controlling Port Address = $0256

Outgoing Port Control Code = 11101000

S = 1 (switching action required)

A = 1 (attach resource)

P = 1 (hunt from group)

VV = 01 (cut through path after outgoing answers)

Outgoing Port Address = resource group 10 ($A)

Rule Control = 11000000

X = 1 (execute outpulse rule)

N = 1 (Disconnect Control byte)

I = 0 (no inpulse rule)

RRRR = 0 (null rule – seize only)

Disconnect Control Byte = 00001000

T = 0 (undefined)

I = 1 (place incoming in CP_SETUP on outgoing on hook)

C = 0 (on hook and PSC clear reported for outgoing)

U = 0 (force outgoing to idle on incoming on hook)

The Outpulse Control Segment is as follows:

Digit Outpulse Control = 00 (no further digits in command)

Example 4-22 $69 Command

Assume the outgoing circuit at $11F has been attached to the virtual call generation incoming port $8012, an outpulse rule was executed and the port has answered. The following command detaches the outgoing port from the virtual so that further action can be taken (prompts played, connection made to another call, etc.).

```
04 0506 07 0809 10 11
69 8012 81 1F40 02 00
```

Function ID = 69 (Outgoing Port Control)

Controlling Port Address = $8012

Outgoing Port Control Code = 10000001

S = 1 (switching action required)

A = 0 (remove resource)

P = 0 (use address given)

VV = 00 (cut through path after rule completion)

Outgoing Port Address = resource group 10 ($A)

Rule Control = 01000000

X = 0 (no outpulse rule)

N = 1 (Disconnect Control byte)

I = 0 (no inpulse rule)

RRRR = 0 (null rule – seize only)

Disconnect Control Byte = 00000010

T = 0 (undefined)

I = 0 (force incoming port to idle; begin PST processing)

C = 0 (on hook and PSC clear reported for outgoing)

U = 1 (set outgoing port to setup state upon outgoing disconnect)

The Outpulse Control Segment is as follows:

Digit Outpulse Control = 00 (no further digits in command)

Incoming Port Control (Macro) ($6A) Command

Command Type

Resource Control

Description

Use the Incoming Port Control (Macro) ($6A) command to instruct the system to force call origination or disconnect, begin an inpulse or outpulse rule, or execute one of the following commands or segments:

- Port Supervision Control ($72) command
- DTMF Collection Control ($67) (standard or enhanced) commands
- MF Collection Control ($68) command
- Outgoing Port Control ($69) command
- Voice Port Control ($6C) (standard or enhanced) commands
- Speech Collection Control ($6E) command
- Outpulse Control segment—when executing an outpulse rule or inpulse rule

Specify only one inpulse rule, outpulse rule, or command segment in a single command. Up to five Outpulse Control segments can be included in a single command when an outpulse or inpulse rule is specified for an incoming port. Command segments follow the general format for their command, but the Function ID, any trailing Spacer Bytes, and Controlling Port Address, are omitted. Spacer Bytes in the MF Collection Control ($68) command segment must be included whenever it is used.

Control of disconnect at call tear down and receipt of Permanent Signal Condition/on hook reports are also included in this command.

The minimum length for the $6A command is 12 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

The $6A command has the format:

Main Command segment [optional segment(s)...]

Use only one command segment in a single command. Up to five Outpulse Control segments can be included.

This command can be used with virtual call generation ports. Specify the virtual port by either address, or as a hunt from resource group $FE.

When a physical port is used as the Incoming (Controlling) port, it must be off hook and in a nonidle state in order for this command to be processed, except in the case of forced origination. For forced origination, port must have a COS = A and be off hook and idle, or a virtual port.

If an inpulse or outpulse rule is specified in the command, no command segments can be attached.

Call origination can be forced by setting S = 1 and A = 1 in the Incoming Port Control Code byte. The port specified in the Controlling Port Address bytes must be either a physical port with COS = A and be off hook and idle, or a virtual port. An inpulse rule or command segment can also be specified.

Because the incoming port must be off hook, a $72 command segment can only be used to unseize an incoming port or for T1 or UTC hookflash. Refer to the “Port Supervision Control ($72) Command” section on page 4-107 for more information.

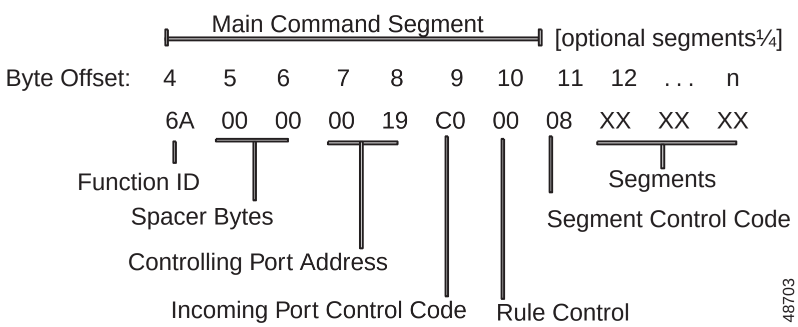
DID ports are supported by this command as an incoming (controlling) port only.

This command can be used to transfer an incoming port by causing a disconnect while maintaining the port in setup state, and then including a $69 segment that attaches a new outgoing port.

Format

Figure 4-15 shows the byte formatting for this command.

Figure 4-15 $6A Command Format



Main Command Segment

The Main Command segment is composed of byte offsets 4 to 11 and must be included in its entirety. Components of the Main Command segment are defined as follows.

Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Spacer bytes (byte offsets 5 and 6)—The lower byte and a half are reserved for referencing or “naming” a call; the remaining bytes are reserved for future enhancements.

Controlling Port Address (byte offsets 7 and 8)—If P = 0 (below), hexadecimal representation of the incoming circuit. If P = 1, this number is the hexadecimal representation of the resource group number to hunt for an available circuit.

Incoming Port Control Code (byte offset 9)—Sets up the conditions used for this macro command. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
SAPTICU0
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to originate a call or disconnect a call.

A = 0—If S = 1, forced disconnect from incoming port (tears down a call); if S = 0, no meaning.

A = 1—If S = 1, forced origination from incoming port (begins a call); if S = 0, no meaning.

P—Specifies whether to use a specific incoming circuit or, if forcing an origination, to select any incoming circuit from a resource group; port address or group number is specified in Controlling Port Address bytes.

P = 0—If S = 1 and A = 1, initiate a call using port specified in Controlling Port Address byte to start a call; otherwise use that port to perform the action specified (such as begin inpulse rule processing or present a voice prompt).

P = 1—If S = 1 and A = 1, initiate a call by selecting a port from resource group specified in Controlling Port Address byte.

T—Specifies whether on hooks are reported for the incoming port ($DB reporting). Valid only when S = 1, A = 0, and I = 0. If I = 1, this bit has no meaning (port not forced to idle at the end of the call) and should be set to 0. This bit has no effect on Permanent Signal ($D2) reporting.

T = 0—If I = 0, on hook ($DB) reports generated when incoming port goes on hook.

T = 1—If I = 0, no on hook ($DB) reports generated for this port.

I—Specifies whether to return the incoming port to CP_SETUP state when performing a forced disconnect. Valid only when S = 1 and A = 0.

I = 0—Force incoming to idle; physical release and begin Permanent Signal processing (only if COS is not A).

I = 1—Set incoming to setup state when command is processed.

C—Specifies whether on hooks are reported for the outgoing port ($DA reporting). Valid only when S = 1 and A = 0. If U = 1, this bit has no meaning (port not forced to idle at the end of the call) and should be set to 0. This bit has no effect on Permanent Signal ($D2) reporting.

C = 0—If U = 0, on hook ($DA) reports generated when outgoing goes on hook.

C = 1—If U = 0, no on hook ($DA) reports generated for this port.

U—Specifies whether to return the outgoing port to CP_SETUP state when this command is received. Valid only when S = 1 and A = 0 (incoming port detached).

U = 0—Force outgoing to idle; physical release and begin Permanent Signal processing (only if COS is not A).

U = 1—Set outgoing to setup state upon receipt of command.

Rule Control (byte offset 10)—Determines if an inpulse or outpulse rule is used in this macro command, and the rule number, if any. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
I0URRRRR
```

I—Specifies if an inpulse rule is used in this macro command.

I = 0—No inpulse rule specified; RRRRR bits ignored.

I = 1—Execute inpulse rule specified in RRRRR; digit strings may appear in the Outpulse Control segment at the end of this command if DO ORULE token is used in the inpulse rule specified (U must be 0).

U—Specifies whether an outpulse rule is used in this macro command.

U = 0—No outpulse rule specified; RRRRR bits ignored.

U = 1—Execute outpulse rule specified in RRRRR; digit strings to be outpulsed may appear in the Outpulse Control segment at the end of command (I must be zero).

RRRRR—Specifies an inpulse rule from 1 to 30 or an outpulse rule from 1 to 30.

Segment Control Code (byte offset 11)—Identifies the Resource Control command segment included in this macro; a segment is allowed only if Inpulse Rule Control byte = 0. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
CDMAPSD0
```

C—Specifies if a Port Supervision Control ($72) command segment is attached.

C = 0—No Port Supervision Control command segment attached.

C = 1—Port Supervision Control command segment attached.

D—Specifies if a DTMF Collection Control ($67) command segments is attached.

D = 0—No DTMF Collection Control command segment attached.

D = 1—DTMF Collection Control command segment attached.

M—Specifies if an MF Collection Control ($68) command segment is attached.

M = 0—No MF Collection Control command segment attached.

M = 1—MF Collection Control command segment attached.

A—Specifies if a Voice Port Control ($6C) command segment is attached.

A = 0—No Voice Port Control command segment attached.

A = 1—Voice Port Control command segment attached (standard or enhanced).

P—Specifies if an Outgoing Port Control ($69) command segment is attached.

P = 0 —No Outgoing Port Control command segment attached.

P = 1—Outgoing Port Control command segment attached.

S—Specifies if a Speech Collection Control ($6E) command segment is attached.

S = 0—No Speech Collection Control command segment attached.

S = 1—Speech Collection Control command segment attached.

D—Specifies if one or more Outpulse Rule Control segments are attached.

D = 0—No Outpulse Rule Control segments attached.

D = 1—One or more Outpulse Rule Control segments attached.

Optional Segments

Optional Segments consists of the command segment or Outpulse Control segment(s) to be included in this macro and begins with byte offset 12. The type of segment included is defined in the Segment Control Code (byte offset 11). The command segment format follows that of the command represented, with the exclusion of the Function ID, any trailing Spacer Bytes, and Controlling (incoming) Port Address. Spacer bytes in the MF Collection Control ($68) command segment must be included whenever it is used. Outpulse Control segment can be included only when I or U = 1 in the Rule Control byte (offset 10) and are defined in the "Outgoing Port Control ($69) Command" section on page 4-51. Only one command segment can be specified. Up to five Outpulse Control segments can be included in a single command.

System Response

If an inpulse rule or outpulse rule is included in this command, a $D0, $D1, $DA or $DD report may be returned.

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. If the command is returned by the system with a Network Status byte not equal to $01, it indicates that the command was not processed. The following network status bytes may be returned—$03, $06, $0F, $10, $11, $12, $18, $1C, $1F, $21, $24, $26, $2B, $37, and $3C—in addition to any network status bytes specific to the command segments. Refer to Chapter 3, "Message Structure Overview," or Appendix D, "Network Status Byte Definitions," for more information.

If Return All is used, the port address of any resource that was requested by resource group number is returned in place of the group number.

A Resource Limitation ($D6) report indicates the command could not be processed due to lack of available resources when the command or segment attempted to select from a resource group, or when an inpulse or outpulse rule is executed. Refer to the "Resource Limitation ($D6) Report" section on page 5-45 for more information.

If command processing involves a port change of state, an Incoming Port Change of State ($DB) or Outgoing Port Change of State ($DA) report is returned by the system.

Forced disconnect causes the system to return Incoming Port Change of State ($DB), Outgoing Port Change of State ($DA), and Permanent Signal Condition ($D2) reports unless T = 1 (controls $DB reporting) and/or C = 1 (controls $DA reporting) in the Incoming Port Control Code.

Examples

Example 4-23 $6A Command

Assume there is an incoming circuit at address $0018 that has gone off hook. The following command processes inpulse rule 5 on $0018.

```
04 0506 0708 09 10 11
6A 0000 0018 00 85 00
```

The Main Command Segment is as follows:

Function ID = 6A (Incoming Trunk Control)

Spacer Bytes = 00 00

Controlling Port Address = $0018

IP Control Code = 00000000

S = 0 (no switching action required)

A = 0 (S = 0, so this bit is ignored)

P = 0 (use address given)

T = 0 (S = 0, so this bit ignored)

I = 0 (S = 0, so this bit ignored)

C = 0 (S = 0, so this bit ignored)

U = 0 (S = 0, so this bit ignored)

Rule Control = 10000101

I = 1 (execute inpulse rule)

U = 0 (no outpulse rule specified)

RRRRR = 5 (inpulse rule 5)

Segment Control Code = 00000000

C = 0 (no Port Supervision Control command segment attached)

D = 0 (no DTMF Collection Control command segment attached)

M = 0 (no MF Collection Control command segment attached)

A = 0 (no Voice Port Control command segment attached)

P = 0 (no Outgoing Port Control command segment attached)

S = 0 (no Speech Collection Control command segment attached)

D = 0 (no Outpulse Rule Control segments attached)

No optional segments

Example 4-24 $6A Command

Assume there is an incoming circuit at address $0020 with a stable call in progress. The following command forces it to disconnect. Notice there are no segments attached to this command.

```
04 0506 0708 09 10 11
6A 0000 0020 80 00 00
```

The Main Command Segment is as follows:

Function ID = 6A (Incoming Port Control)

Spacer Bytes = 00 00

Controlling Port Address = $0020

IP Control Code = 10000000

S = 1 (switching action required)

A = 0 (S = 1; forced disconnect)

P = 0 (use address given)

T = 0 (report incoming port on hook and PSC)

I = 0 (incoming port forced to idle)

C = 0 (report outgoing port going on hook)

U = 0 (outgoing port forced to idle)

Rule Control = 00000000

I = 0 (no inpulse rule)

U = 0 (no outpulse rule)

RRRR = 0 (no rule)

Segment Control Code = 00000000

C = 0 (no Port Supervision Control command segment attached)

D = 0 (no DTMF Collection Control command segment attached)

M = 0 (no MF Collection Control command segment attached)

A = 0 (no Voice Port Control command segment attached)

P = 0 (no Outgoing Port Control command segment attached)

S = 0 (no Speech Collection Control command segment attached)

D = 0 (no Outpulse Rule Control segments attached)

No optional segments

Example 4-25 $6A Command

Assume there is an incoming circuit at address $0019 with COS = AT that is off hook and idle, and an outgoing circuit at address $0025. The command below initiates a call on the incoming circuit, then attaches it to the outgoing circuit and processes outpulse rule 4. The format for attaching $0025 and executing outpulse rule 4 is taken from the Outgoing Port Control ($69) command.

```
04 0506 0708 09 10 1112131415
6A 0000 0019 C0 00 08C0258400
```

The Main Command Segment is as follows:

Function ID = 6A (Incoming Trunk Control)

Spacer Bytes = 00 00

Controlling Port Address = $0019

IP Control Code = 11000000

S = 1 (switching action required)

A = 1 (forced origination-start a call)

P = 0 (use address given to initiate call)

T = 0 (S = 1, but A is also 1; this bit ignored)

I = 0 (incoming port forced to idle)

C = 0 (report outgoing port going on hook)

U = 0 (outgoing port forced to idle)

Rule Control = 00000000

I = 0 (no inpulse rule)

U = 0 (no outpulse rule)

RRRRR = 0 (no rule)

Segment Control Code = 00001000

C = 0 (no Port Supervision Control command segment attached)

D = 0 (no DTMF Collection Control command segment attached)

M = 0 (no MF Collection Control command segment attached)

A = 0 (no Voice Port Control command segment attached)

P = 1 (Outgoing Port Control command segment attached)

S = 0 (no Speech Collection Control command segment attached)

D = 0 (no Outpulse Rule Control segments attached)

Outgoing Port Control Command Segment = C0 25 84 00

Function ID = omitted

Controlling Port Address = omitted

Outgoing Port Control Code = 11000000

S = 1 (switching action required)

A = 1 (attach outgoing port)

P = 0 (use outgoing port address given)

VV = 00 (cut through path after outpulsing)

Outgoing Port Address = $025

Outpulse Rule Control = 10000100

X = 1 (execute outpulse rule)

N = 0 (no Disconnect Control byte)

I = 0 (no inpulse rule)

RRRRR = 4 (outpulse rule 4)

Digit Outpulse Control = 00000000

FFF = 000 (no digits to be outpulsed)

NNNNN = 0 (0 digits saved in call record)

End of Outgoing Port Control ($69) command segment

Example 4-26 $6A Command

Assume there is an incoming circuit at address $0020 with a stable call in progress. The command below forces it to disconnect. The incoming circuit is left in setup mode while the outgoing circuit begins Permanent Signal Timing. The Attach Outgoing Port Control command attaches the incoming circuit to an outgoing circuit hunted from group 2.

```
04 0506 0708 09 10 111213141516
6A 0000 0020 88 00 08E002800000
```

The Main Command Segment is as follows:

Function ID = 6A (Incoming Port Control)

Spacer Bytes = 00 00

Controlling Port Address = $0020

IP Control Code = 10001000

S = 1 (switching action required)

A = 0 (S = 1; forced disconnect)

P = 0 (use address given)

T = 0 (report incoming port on hook and PSC)

I = 1 (sets incoming port to setup state)

C = 0 (report outgoing port going on hook)

U = 0 (outgoing port forced to idle)

Rule Control = 00000000

I = 0 (no inpulse rule)

U = 0 (no outpulse rule)

RRRRR = 0 (no rule)

Segment Control Code = 00001000

C = 0 (no Port Supervision Control command segment attached)

D = 0 (no DTMF Collection Control command segment attached)

M = 0 (no MF Collection Control command segment attached)

A = 0 (no Voice Port Control command segment attached)

P = 1 (Outgoing Port Control command segment attached)

S = 0 (no Speech Collection Control command segment attached)

D = 0 (no Outpulse Rule Control segments attached)

Outgoing Port Control Command Segment = E0 02 80 00

Function ID = omitted

Controlling Port Address = omitted

Outgoing Port Control Code = 11100000

S = 1 (switching action required)

A = 1 (attach outgoing port)

P = 1 (hunt a port from the resource group in Outgoing Port Address)

VV = 00 (cut through path after outpulsing)

Outgoing Port Address = $002

Outpulse Rule Control = 10000000

X = 1 (execute outpulse rule)

N = 0 (no Disconnect Control byte)

I = 0 (no inpulse rule) RRRRR = 0 (no rule)

Digit Outpulse Control = 00000000

FFF = 000 (no digits to be outpulsed)

NNNNN = 0 (0 digits saved in call record)

End of Outgoing Port Control ($69) command segment.

Change Incoming Port ($6B) Command

Command Type

Resource Control

Description

Use the Change Incoming Port ($6B) command to switch all resources for an active call from one incoming port to another. The original port is forced to an idle state.

The minimum length for the $6B command is 9 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

The old incoming port should have other resources linked to it and be participating in a call for this command to have any effect. The command adjusts all speech paths from the old incoming port to the new incoming port. This command can be used for transferring calls.

The controlling or new incoming port cannot be participating in a conference. If it is, the command is returned with a $1C network status byte.

If the old incoming port is involved in inpulse rule processing, the rule is aborted when this command is received.

The new incoming port must be in CP_SETUP state or, if COS = AT or A2, the port can also be in CP_IDLE if it is off hook. Hunting can be done only if all members of the group specified have COS = A and are off hook. An idle port in that group is selected.

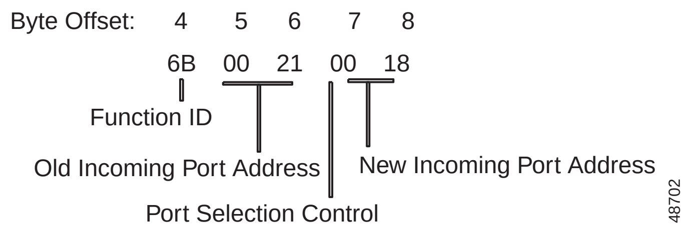
Use this command to replace a virtual port with a physical incoming port. The call must be in either a wait for answer or stable condition to perform this action. The virtual port is idled when removed from the call.

Disconnect Control settings for both the incoming and outgoing ports are determined in the Outgoing Port Control ($69) command. These settings can be carried over from the $69 command or cleared using two bit settings in the $6B command's Port Selection Control segment (byte offset 7). The Disconnect Control settings cannot be set when the incoming port is a virtual call generation port. Refer to the Disconnect Control byte description in the $69 command for details on disconnect settings.

Format

Figure 4-16 shows the byte formatting for this command.

Figure 4-16 $6B Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Old Incoming Port Address (byte offset 5 and 6)—Hexadecimal representation of the circuit address from which to switch active call processing.

Port Selection Control (byte offset 7)—Specifies the disconnect control settings for the incoming and outgoing ports, and determines whether to switch the call to a specific incoming port or select one from a resource group. The first bit setting specifies whether to carry the disconnect bit settings from the old incoming port to the new incoming port, or clear the settings. The second bit determines whether to maintain the settings on the outgoing port as currently defined, or clear the settings. The third bit determines whether a specific incoming port is used or an available port hunted from a resource group. Construct the byte in binary, then convert to hexadecimal for use in the command. Note the NNN bits are part of the New Incoming Port Address. They are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Port Selection Control bits.

```
CKP00NNN
```

C—Specifies whether to carry disconnect control bits defined for the old incoming port to the new incoming port, or clear the current settings on the incoming port.

C = 0—Clear bit settings.

C = 1—Carry bit settings from previous incoming port.

K—Indicates whether to keep the disconnect control bits as currently defined on the outgoing port, or clear the settings.

K = 0—Clear bit settings.

K = 1—Keep bit settings the same as on outgoing port.

P—Determines whether to use a specific port or select from a resource group.

P = 0—Use address given.

P = 1—Select from resource group.

New Incoming Port Address (byte offsets 7 and 8)—Includes second digit of previous byte (Port Selection Control Code). If P = 0, this three-digit number is the hexadecimal representation of the incoming port. If P = 1, this three-digit number is the hexadecimal representation of the resource group to hunt for an available port; convert decimal to hexadecimal for the group number.

System Response

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $06, $0E, $0F, $10, $11, $12, $18, $1C, $1F, $21, $24, $26, $35, and $3C. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

If Return All is used, the port address of the new incoming port requested by resource group number is returned in place of the group number.

A Resource Limitation ($D6) report indicates that the command could not be processed because of a lack of available resources in a specified resource group. Refer to the “Resource Limitation ($D6) Report” section on page 5-45 for more information.

The old incoming port is released and Permanent Signal processing begins for that port (unless it is a virtual port). An Incoming Port Change of State ($DB) report for the old port address is returned when that physical port goes on hook. A Permanent Signal Condition ($D2) report may also be returned. If the old incoming port is a virtual port or its COS = A, it is returned to an idle condition; no $DB report is generated.

Examples

Example 4-27 $6B Command

Assume there is an active call on the incoming port at address $18. Resource group 6 consists of ports with a COS = AT, and all ports in that group are off hook. The following command switches that call to an idle port in resource group 6, and forces the port at address $18 to go idle.

```
04 0506 07 08
6B 0018 20 06
```

Function ID = 6B (Change Incoming Port)

Controlling Port Address = $0018

Port Selection Control = 00100000

C = 0 (clear incoming disconnect bit settings)

K = 0 (clear outgoing disconnect bit settings)

P = 1 (select from resource group)

New Incoming Port Address = resource group 6 ($006)

Example 4-28 $6B Command

Assume there is an active call between a virtual port and an outgoing port. The following command transfers the call to an incoming circuit at $211 that is already in setup state.

```
04 0506 07 08
6B 8025 02 11
```

Function ID = 6B (Change Incoming Port)

Controlling Port Address = 8025 (virtual port)

Port Selection Control = 00000010

C = 0 (clear incoming disconnect bit settings)

K = 0 (clear outgoing disconnect bit settings)

P = 0 (use address given)

New Incoming Port Address = 211

Example 4-29 $6B Command

Assume there is an active call on the incoming port at address $20. The following command switches that call to an incoming circuit at $221 that is already in setup state. The disconnect settings for the incoming ports are carried over and the current outgoing disconnect settings are maintained.

```
04 0506 07 08
6B 0020 C2 21
```

Function ID = 6B (Change Incoming Port)

Controlling Port Address = 0020

Port Selection Control = 11000010

C = 1 (carry over incoming disconnect bit settings)

K = 1 (keep current outgoing disconnect bit settings)

P = 1 (use address given)

New Incoming Port Address = 221

Voice Port Control ($6C) (Standard) Command

Command Type

Resource Control

Description

Use the Voice Port Control ($6C) (Standard) command to instruct the system to play up to 14 voice prompts to a line or trunk port. A prompt consists of one or more words; all prompts are downloaded to the Digital Voice Card (DVC) or Integrated Prompt/Record Card (IPRC) at system boot. Prompts are identified by number (refer to Appendix C, "System Digitized Voice Card Prompts," for a listing of prompt numbers and scripts). When more than one prompt is specified in the command, they are played in the order in which they appear. You can use this command to link a voice card port to, or remove it from, a call's resource chain, and you can also use it as a command segment in the Incoming Port Control ($6A) command.

This command can specify whether a Voice Port Status ($DE) report is generated when all voice prompts have been presented.

The minimum length for the $6C (Standard) command is 10 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

All DVC or IPRC ports must be members of a single resource group for the system to allocate them. You do not need to specify the group number in the command; the system determines the resource group from the database configuration.

The controlling port cannot be participating in a conference. If it is, the command is returned with a $1C network status byte.

This command can be used as a segment in an Incoming Port Control ($6A) command. While voice prompts are being played, other commands can be sent for this port—such as an Outgoing Port Control ($69) command—without interfering with the prompts. This command is aborted if a Voice Path Control ($66) command is received for the controlling port, outpulse rule processing resets the voice path of the controlling port, or another $6C (Standard) command is received for this port.

Once a Voice Port Control command has been used to begin playing prompts to an incoming port, an inpulse rule can be started using a $6A command. If rule processing encounters a TONE ENAB, TONE FDIG, TONE END, or TONE CLR token while prompts are being played, the $6C (Standard) command is aborted. A TONE NOW token is not executed until the prompts are completed.

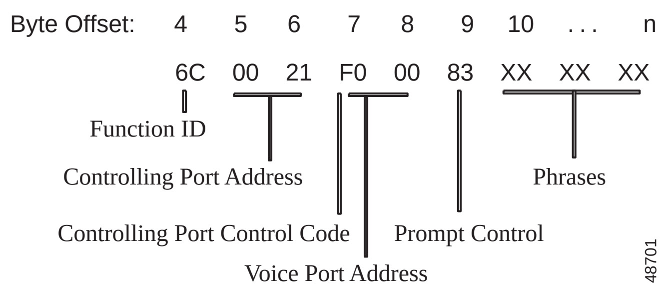
A DVC or IPRC port can be attached to any incoming or outgoing trunk/line circuit. Prompts can be presented to either incoming or outgoing ports.

Multiple prompt libraries can be used; however, you must number the libraries consecutively. Refer to the *Cisco VCO/4K Card Technical Descriptions* for further information.

Format

Figure 4-17 shows the byte formatting for this command.

Figure 4-17 $6C (Standard) Command Format



Function ID (byte offset 4)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the circuit address to which the prompts are to be played.

Controlling Port Control Code (byte offset 7)—Sets up the conditions used for this command. Construct the byte in binary according to the descriptions on the following page, then convert to hexadecimal for use in the command. The CCC bits are part of the Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Controlling Port Control Code bits.

```
SAPR0CCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach DVC or IPRC port; if S = 0, no meaning.

A = 0—If S = 1, detach DVC or IPRC port; if S = 0, no meaning.

A = 1—If S = 1, attach DVC or IPRC port; if S = 0, no meaning.

P—Specifies whether to use a specific voice port circuit or to select a voice port circuit from the resource group. Port address is specified in Voice Port Address bytes; if the port is selected from the resource group, no address or group number is necessary.

P = 0—For S = 0 or 1, use port specified in Voice Port Address bytes.

P = 1—For S = 0, use voice port already in call's resource chain; for S = 1, select port from voice port resource group.

R—Specifies additional control functions performed as part of this command. For voice port circuits, the actions are shown below.

R = 0—Retain DVC or IPRC port after prompts have been played (will remain linked to the line/trunk but not enabled).

R = 1—Release DVC or IPRC port after prompts have been played.

Voice Port Address (byte offset 7 and 8)—Includes second digit of previous byte (Voice Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the voice port. If P = 1, these three digits should be 0; the system determines the correct group to hunt based on the system database.

Prompt Control (byte offset 9)—Determines the number of prompts to be played; you can specify up to 14 prompts in a single command. If no prompts are to be played, this byte must be $00. Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
XR00FFFF
```

X—Specifies if a prompt is to be played to a line/trunk port.

X = 0—No prompts to be played.

X = 1—Play number of prompts specified in rest of the byte.

R—Specifies if a $DE report is generated when all prompts have been played; if X = 0, this value must also be 0.

R = 0—No report upon completion or no prompts specified in X.

R = 1—Generate $DE report upon prompt completion.

FFFF—If X = 1, determines the number of prompts that are to be played using this command; you can specify up to 14 prompts. Convert decimal to binary for this number. If X = 0, this value must also be 0.

Phrases (byte offset 10 to n)—The phrase number(s) corresponding to the phrase(s) to be played. The number of phrase bytes required is equal to the number of phrases specified in the FFFF bits of the Prompt Control byte. Phrases are played in the order in which they appear in the command. Refer to Appendix C, "System Digitized Voice Card Prompts," for a listing of phrases by number. Convert the phrase number from decimal to hexadecimal for the correct byte value.

System Response

No response from the system upon successful completion is provided unless you specified Voice Port Status ($DE) report in the command or set Return All in the Network Header. If you specify a command to select from a resource group, the command returned contains the port address of the voice port selected by the system. A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $07, $09, $0D, $0E, $0F, $11, $12, $16, $17, $18, $1C, $1F, $22, $24, $26, $27, and $3C. Refer to Chapter 3, "Message Structure Overview," or Appendix D, "Network Status Byte Definitions," for more information.

A command returned with a $1F network status byte indicates that no voice ports were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the voice card resource group were busy (allocated or out of service). If no $D6 is sent, a voice card resource group does not exist (no members). Refer to the "Resource Limitation ($D6) Report" section on page 5-45 for more information on the $D6 report.

Examples

Example 4-30 $6C (Standard) Command

Assume there is an active call on the incoming port at address $18. The following command starts a series of prompts to be played to that port. Upon completion of prompts, a $DE report is generated.

```
04 0506 07 0809 10 1112131415
6C 0018 D0 50C6 27 5B4B4C4D4F
```

Function ID = 6C (Voice Port Control)

Controlling Port Address = 0018

Controlling Port Control Code = 11010000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use address given)

R = 1 (release voice port after prompts have been played)

Voice Port Address 050

Prompt Control = 11000110

X = 1 (play number of prompts in remainder of byte)

R = 1 (report to host upon prompt completion)

FFFF = 6 (6 prompts)

Prompt 1 = prompt number 27

Prompt 2 = prompt number 5B

Prompt 3 = prompt number 4B

Prompt 4 = prompt number 4C

Prompt 5 = prompt number 4D

Prompt 6 = prompt number 4F

Example 4-31 $6C (Standard) Command

The following command aborts the prompts started by the command in Example 4-30 and releases the voice port (removes it from the call's resource chain).

```
04 0506 07 0809
6C 0018 80 5000
```

Function ID = 6C (Voice Port Control)

Controlling Port Address = 0018

Controlling Port Control Code = 10010000

S = 1 (switching action required)

A = 0 (detach resource)

P = 0 (use address given)

R = 0 (release voice port; port is being detached)

Voice Port Address 050

Prompt Control = 00000000

X = 0 (no prompts to be played)

R = 0 (no reporting; X = 0)

FFFF = 0 (0 prompts)

Voice Port Control ($6C) (Enhanced) Command

Command Type

Resource Control

Description

The Voice Port Control ($6C) (Enhanced) command is specific to the IPRC. It is used to instruct the system to play up to 20 voice prompts, consisting of one or more words each, to a line or trunk port in the form of a single announcement. The $6C (Enhanced) command also allows the system application to play prompts from any one of 16 prompt libraries and to loop the playback of individual prompts or a list of prompts. The $6C (Enhanced) command is also used to record a prompt to any of the 16 prompt libraries.

This command gives you the ability to access any of the temporary prompts maintained by an individual IPRC port for play or record operations. Temporary prompts are maintained by the IPRC as long as the associated playback port is involved with a call. When the playback port is released from the call, the temporary prompt is erased. The temporary prompts are accessed for recording and subsequent playback through inpulse rule processing and $6C (Enhanced) command processing.

All prompts are downloaded to the IPRC at IPRC card initialization. Prompts are identified by number Refer to Appendix G, "Integrated Prompt and Record Card Prompt Library," for a listing of the standard prompt library and their numbers. When more than one prompt is specified in the command, they are played in the order in which they appear. You can use this command to link a voice card port to, or remove it from, a call's resource chain, and you can also use it as a command segment in the Incoming Port Control ($6A) command.

This command can specify whether a Voice Port Status ($DE) report is generated when all voice prompts have been presented.

The minimum length for the enhanced $6C (Enhanced) command is 10 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

All IPRC ports must be members of a single resource group for the system to allocate them. You do not need to specify the group number in the command; the system determines the resource group from the database configuration.

The controlling port cannot be participating in a conference. If it is, the command is returned with a $1C network status.

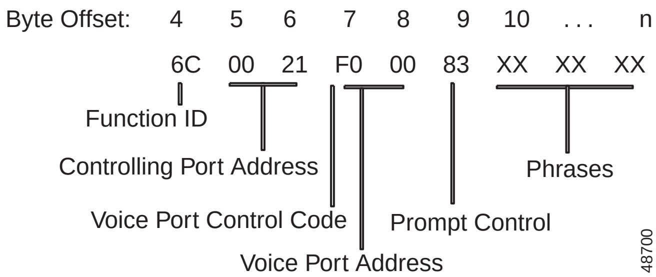
This command can be used as a segment in a $6A command. While voice prompts are being played, other commands can be sent for this port (such as an Outgoing Port Control ($69) command) without interfering with the prompts. This command is aborted if a Voice Path Control ($66) command is received for the controlling port, outpulse rule processing resets the voice path of the controlling port, or another Voice Port Control command is received for this port. An IPRC port can be attached to any incoming or outgoing trunk/line circuit. Prompts can be presented to either incoming or outgoing ports.

Multiple prompt libraries can be used; however, you must number the libraries consecutively. Refer to the *Cisco VCO/4K Card Technical Descriptions* for further information.

Format

Figure 4-18 shows the byte formatting for this command.

Figure 4-18 $6C (Enhanced) Command Format



Function ID (byte offset 4)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the circuit address to which the prompts are to be played.

Voice Port Control Code (byte offset 7)—Sets up the conditions used for this command. The CCC bits are part of the Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the Controlling Port Control Code bits. Construct the byte in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
SAPR0CCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach IPRC port; if S = 0, no meaning.

A = 0—If S = 1, detach IPRC port; if S = 0, no meaning.

A = 1—If S = 1, attach IPRC port; if S = 0, no meaning.

P—Specifies whether to use a specific voice port circuit or to select a voice port circuit from the resource group. The port address is specified in Voice Port Address bytes; if the port is selected from the resource group, no address or group number is necessary.

P = 0—For S = 0 or 1, use port specified in Voice Port Address bytes.

P = 1—For S = 0, use voice port already in call's resource chain; for S = 1, select port from voice port resource group.

R—Specifies additional control functions performed as part of this command. For voice port circuits, the actions are shown below.

R = 0—Retain IPRC port after prompts have been played (will remain linked to the line/trunk but not enabled).

R = 1—Release IPRC port after prompts have been played.

Voice Port Address (byte offsets 7 and 8)—Includes second digit of previous byte (Voice Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the voice port. If P = 1, these three digits should be 0; the system determines the correct group to hunt based on the system database.

Prompt Control (byte offset 9)—Controls prompt playback and record. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
XREP0000
```

X—Specifies if a prompt is to be played to a line/trunk port.

X = 0—Stop play/record.

X = 1—Play/record prompt.

R—Specifies if a $DE report is generated when all prompts have been played; if X = 0, this value must also be 0.

R = 0—No report upon completion or no prompts specified in X.

R = 1—Generate $DE report upon prompt completion.

E—Specifies $6C (Standard) or $6C (Enhanced) command.

E = 0—Use $6C (Standard) command.

E = 1—Use $6C (Enhanced) command.

P—Specifies whether playback or record segment is attached.

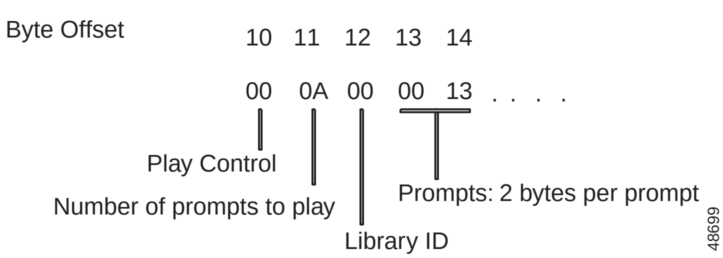
P = 0—Playback segment attached.

P = 1—Record segment attached.

Play Segment (byte offset 10...)—Determines the number of prompts to play, the library from which to access the prompt, and the prompt phrase IDs. Include when P equals zero (P = 0) in Prompt Control (byte offset 9).

Figure 4-19 shows the byte formatting for the Play Segment.

Figure 4-19 Play Segment of the $6C (Enhanced) Command



Byte offset 10—Play control.

00 = Do not loop.

01 = Loop prompt string.

02 = Loop last prompt.

Byte offset 11—Number of prompts to play.

$1 to $14 = valid range (1 to 20).

Byte offset 12—Library ID.

$00 to $0F = specifies prompt library to access.

Byte offsets 13 and 14 – prompts: 2 bytes per prompt.

Byte 1 = Flags.

Bit 7 = Temporary prompt.

T = 0, nontemporary.

T = 1, temporary.

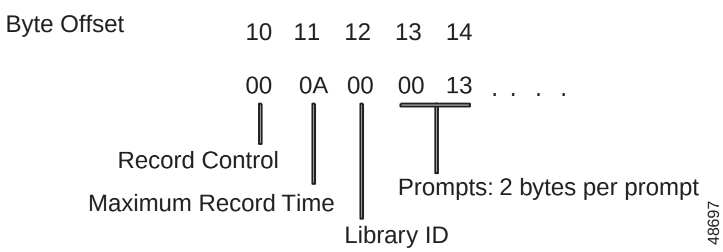
Bits 6 to 0: Set to 0.

Byte 2 = $01 to $FF prompt ID (1 to 255).

Record Segment (byte offset 10...)—Used to define the library to record a prompt to, the maximum record time value, and the prompt ID. Include when P equals zero (P = 0) in Prompt Control (byte offset 9).

Figure 4-20 shows the byte formatting for the Record Segment.

Figure 4-20 Record Segment of the $6C (Enhanced) Command



Byte offset 10—Record control.

Reserved for future use.

Byte offset 11—Record time.

0 to $FF valid range.

Byte offset 12—Library ID.

$00 to $0FF: Specifies prompt library to access.

Byte offset 13 and 14—Prompt: 2 bytes.

Byte 1: Flags.

Bit 7: Temporary prompt.

T = 0, non-temporary.

T = 1, temporary.

Bits 6 - 0: set to 0.

Byte 2: $01 to $FF prompt ID (1 to 255).

System Response

No response from the system upon successful completion is provided unless you specified Voice Port Status ($DE) report in the command or set Return All in the Network Header. If command specified to select from resource group, the command returned contains the Port Address of the voice port selected by the system. A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $09,

$0E, $0F, $11, $12, $16, $17, $18, $1F, $22, $24, $26, $27, $3C, $43, $44, $45, $46. $47, and $48. Refer to Chapter 3, "Message Structure Overview," or Appendix D, "Network Status Byte Definitions," for more information.

A command returned with a $1F network status byte indicates that no voice ports were available to satisfy this command or that no IPRC ports were available from the specified prompt library. If a returned command is followed by a Resource Limitation ($D6) report, all members of the voice card resource group were busy (allocated or out of service). If no $D6 is sent, a voice card resource group does not exist (no members). Refer to the "Resource Limitation ($D6) Report" section on page 5-45 for more information on the $D6 report.

Examples

Example 4-32 $6C (Enhanced) Command

Take port 29 off hook.

```
Tx Host: ALL HOST-F0 40 80 00 DB 00 80 00 29 00 00 00
```

Record for 10 seconds and store the recording in temporary Prompt ID 80 01.

```
Rx Host: HOST1-DF DF 00 00 6C 00 29 E0 00 F0 00 1 0A 00 80 01
TX Host: HOST1-DF DF 80 01 6C 00 29 E2 AF F0 00 0A 00 80 01
```

Record the complete message.

```
TX: Host: ALL HOST-F0 40 80 00 DE 00 29 00 00 02 AF 00
```

Play the temporary prompt stored in Prompt ID 80 01 to port 29.

```
Rx Host: HOST1-DF DF 00 00 6C 00 29 20 00 E0 00 01 00 80 01
Tx Host: HOST1-DF DF 80 01 6C 00 29 20 00 E0 00 01 00 80 01
Tx Host: ALL HOSTS-F0 40 80 00 DE 00 29 00 00 02 AF 10
Tx Host: ALL HOSTS-F0 40 80 00 DB 00 40 00 29 00 00 00
```

Example 4-33 $6C (Enhanced) Command

Take port 29 off hook.

```
Tx Host: ALL HOSTS-F0 40 80 00 DB 00 80 00 29 00 00 00
```

Record for 5 seconds and store the recording in temporary Prompt ID 80 01.

```
Rx Host: HOST1-DF DF 00 00 6C 00 29 E0 00 F0 00 05 00 80 01
Tx Host: HOST1-DF DF 80 01 6C 00 29 E0 00 F0 00 05 00 80 01
```

Record the complete message.

```
Tx Host: AL HOST-F0 40 80 00 DE 00 29 00 00 02 B1 00
```

Seize out port 2A.

```
Rx Host: HOST1-DF DF 00 00 69 00 29 C0 2A 80 00
Tx Host: HOST1-DF DF 80 01 69 00 29 C0 2A 80 00
```

Example 4-34 $6C (Enhanced) Command

The 00 is replaced by whatever port sent the recording.

Answer port 2A.

```
Tx Host: ALL HOST-F0 40 80 00 DA 00 80 00 2A 00 29 32 06 80
```

Play the temporary prompt stored in Prompt ID 80 01 to Port 2A.

```
Rx Host: HOST1-DF DF 00 00 6C 00 2A 20 00 E0 00 01 00 80 01
Tx Host: HOST1-DF DF 80 01 6C 00 2A 20 00 E0 00 01 00 80 01
Tx Host: ALL HOSTS-F0 40 80 00 DE 00 2A 00 00 02 B2 10
```

Conference Control ($6D) Command

Command Type

Resource Control

Description

The Conference Control ($6D) command controls the conferencing features. Up to eight conference ports can be used for a conference. An incoming or outgoing line/trunk port can be marked to listen only (one-way path) or listen and talk (two-way path). A single conference can accommodate up to eight two-way line/trunk ports, or up to seven two-way line/trunk ports and as many one-way line/trunk ports as are available in the system. The system can support up to 128 simultaneous conferences. The $6D command lets the host perform one of the following functions:

- Reserve a conference—Up to eight conference ports can be reserved and a conference structure set up for later use. Line/trunk ports can be added or deleted to the conference structure as necessary.
- Start a conference—A conference structure can be set up with one or more line/trunk ports by starting a conference. The system uses only as many conference ports as are necessary to allocate one to each line/trunk port two-way connection and one for all one-way connections specified in the command; no additional conference resources are reserved.
- Tear down a conference—A conference structure can be torn down by specifying the conference number. If no line/trunk ports are specified in the command, a forced disconnect is performed on all line/trunk ports involved in the conference and Permanent Signal processing begins. The command allows the host to specify that one or more of the line/trunk ports should be left active (returned to setup state).
- Add line/trunk ports to a conference—One or more line/trunk ports can be added to an existing conference structure. For two-way connections, if a reserved conference port is available, the line/trunk port is assigned to it. If a reserved conference port is not available, the system readjusts the conference structure to add both the conference and line/trunk port, up to a maximum of eight of each type per conference structure. For one-way connections, if a conference port is already set up for a one-way path, the line/trunk port is added to it. Otherwise, processing is the same as for two-way connections. There is no limit on the number of one-way connections that can be added to a conference.
- Delete line/trunk ports from a conference—One or more line/trunk ports can be deleted from an existing conference. The line/trunk port can either be set to idle through Permanent Signal processing or left active (returned to setup state). If the conference port was reserved, it remains reserved to that conference. Otherwise, it is released.
- Adjust the input/output level from/to line/trunk ports—The input level of each line/trunk to a conference and output level to the line/trunk from the conference can be adjusted by the host on a per port basis. This adjustment can be made when the port is initially added to the conference or at any time thereafter.

In addition, the following features support talk-only conference support for Communication Assistance for Law Enforcement Act (CALEA) applications:

- Ports of a proper call state (CP_SETUP, CP_STABLE) can be entered as a talk-only party to a CALEA conference with the $6D command.
- One port, defined as talk-only, can be entered into multiple CALEA conferences simultaneously.

- A talk-only port can be removed from a CALEA conference with the $6D command, and does not cause any disturbance.
- If the port (CALEA conference intercept subject) is involved in an active call or conference, entering the port into the CALEA conference does not cause any disturbance to the current active call or conference.
- If a port is involved in multiple CALEA conferences, the tearing down of one conference does not cause any disturbance.

The minimum length for the $6D command is 8 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

All conference ports must be members of a single resource group for the system to allocate them. The system determines the resource group from the database configuration.

Reserved conference ports remain reserved until the conference is torn down. If a line/trunk port is deleted from a reserved conference, the conference port to which it was linked remains reserved.

The system can accommodate up to eight Digital Conference Cards and a total of 128 simultaneous conferences and/or monitors. When a conference is reserved or started, the system assigns it a conference number. If Return All has been set in the Network Header, the conference number is returned to the host in the second byte of the command (byte offset 5). The system requires the conference number to add ports to, delete ports from, adjust input/output gain levels for, or tear down a conference.

To add a port to a conference, one of the following conditions must be true:

- Port must be in the CP_SETUP or CP_STAB MState.
- If COS = A, port can also be in CP_IDLE if it is off hook.
- If COS = O or internal COS = U, outgoing port can also be in CP_WTFSUP; port goes to CP_SETUP upon answer (port goes off hook).
- If COS = T (and internal COS = T), incoming port can also be in CP_WANS; port goes to CP_SETUP when added to a conference.

If an idle port with COS = 2 is used, it assumes a COS of T. While in a conference, the port is assigned an internal COS of C. When a port is removed from a conference (delete or tear down) and the command specifies to leave that port active, it remains in the CP_SETUP MState until further host action. Refer to Appendix F, “Call Processing States,” for information on major and supplementary call processing states.

When a line/trunk port involved in a conference goes on hook, it is automatically deleted from the conference.

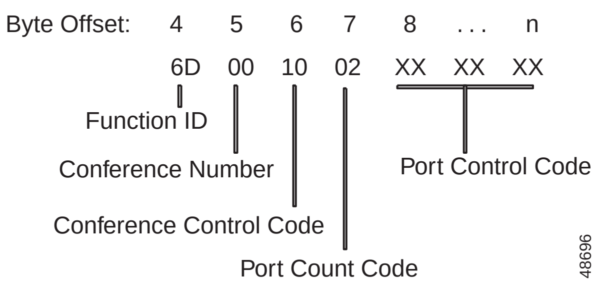
Other resource control commands cannot be used on ports in a conference. To collect digits or play prompts, the port must first be removed from the conference, instructed to perform the action, and then added back to the conference. The $66 command can be used to make the port in a conference listen to Quiet; however, anything transmitted by that port can still be received by other conference parties.

If one port in a stable call is added to a conference (also if the outgoing port is in CP_WTFSUP or the incoming is in CP_WANS), the other port in the call is placed into CP_SETUP *unless* it is a virtual port or its COS = A. If a physical port is placed into CP_SETUP, the host must take some action on that port. Virtual ports and ports with COS = A are returned to CP_IDLE and are available for use.

Format

Figure 4-21 shows the byte formatting for this command.

Figure 4-21 $6D Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Conference Number (byte offset 5)—Specifies the number of the conference upon which the action should be taken. To start or reserve a conference, specify a conference identifier from 0 to 128; 0 is valid only if a conference is available for allocation. When the conference identifier = 0, the system returns the ID of the allocated conference. When adding to, deleting from, adjusting input/output levels for, or tearing down a conference, the conference number is required. Convert from decimal to hexadecimal for the conference number.

Conference Control Code (byte offset 6)—Determines the action to be taken for this command. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

Note Set only one of the following bits (R, S, T, A, D, or G) to 1; all other bits must be set to 0 (zero).

```
RSTADG00
```

R—Specifies if command is used to reserve up to eight ports for a future conference.

R = 0 —Command not used to reserve a conference.

R = 1—Reserve a conference. Port Control Codes (byte offset 8-n) are not specified.

S—Specifies if command is used to start a conference.

S = 0—Command not used to start a conference.

S = 1—Start a conference.

T—Specifies if command is used to tear down a conference.

T = 0—Command not used to tear down a conference.

T = 1—Tear down a conference.

A—Specifies if command is used to add one or more line/trunk ports to a conference.

A = 0—Command not used to add port(s) to a conference.

A = 1—Add one or more ports to a conference.

D—Specifies if command is to delete one or more line/trunk ports from a conference.

D = 0—Command not used to delete port(s) to a conference.

D = 1—Delete one or more ports from a conference.

G—Specifies if input/output level adjustment is specified in this command.

G = 0—No level adjustment necessary.

G = 1—Level adjustment specified in command.

Port Count Code (byte offset 7)—Specifies the number of ports affected by this command. If R = 1 in Conference Control Code (byte offset 6), the Port Count Code specifies how many conference ports to reserve. In this case, Port Control Codes are not specified. For all other settings, the Port Count Code specifies how many Port Control Code bytes are contained in this command. Convert from decimal to hexadecimal for use in the command.

Port Control Code (byte offset 8 to n)—Three-byte set required when a conferencing action is required for a specific line/trunk port. One Port Control Code byte set is required for each line/trunk port affected when S, T, A, D, or G = 1 in the Conference Control Code (byte offset 6); the number of Port Control Code byte sets must be equal to PPPP specified in the Port Count Code (byte offset 7). When T = 1 in the Conference Control Code (byte offset 6), any line/trunk port that should be left active must be represented by a Port Control Code byte set.

Note Do not specify Port Control Codes when reserving a conference (R=1). The system will automatically reserve the ports based on their availability. Setting R=1 and specifying Port Control Codes causes a syntax error.

Construct the bytes in binary according to the following descriptions, then convert to hexadecimal for use in the command.

```
IIIIA0LL WSV00PPP PPPPPPPP
```

IIII—Determines whether the input level from this line/trunk port into the conference is to be adjusted when S, A, or G = 1.

- 0001 = –1 dB
- 0010 = –2 dB
- 0011 = –3 dB
- 0100 = –4.5 dB
- 0101 = –6 dB
- 0110 = –7.5 dB
- 0111 = –9 dB
- 1000 = –10.5 dB
- 1001 = –12 dB
- 1010 = –13.5 dB
- 1011 = –15 dB
- 1100 = + 6 dB
- 1101 = +4.5 dB
- 1110 = + 3 dB
- 1111 = +1.5 dB
- 0000 = no level adjustment (default)

A—Specifies the talk-only conference capability.

A = 1—Talk-only conference enabled—the port is talk-only to the conference to which it is attached; this setting has precedence over the W setting (described below).

A = 0—Talk-only conference disabled; the W setting determines configuration.

LL—Specifies if the output level of the conference port associated with this line/trunk port is to be decreased by 3 dB when S, A, or G = 1.

LL = X0—No output level adjustment required.

LL = X1—Decrease output level by 3 dB.

W—Determines whether to set up a two-way (talk and listen) or one-way (listen only) voice path for this line/trunk port when it becomes part of a conference. This bit has no meaning unless S or A = 1 in the Conference Control Code.

W = 0—Set up two-way voice path (talk and listen) for line/trunk port when it becomes part of conference.

W = 1—Set up one-way voice path (listen-only) for line/trunk port when it becomes part of conference.

Note Do not set both the talk-only bit (A) and the listen-only bit (W) equal to 1 for the same port and time. Failure to follow this guideline results in a port added to a conference which can neither receive from nor transmit to other ports.

S—Determines whether this line/trunk port should be left active (CP_SETUP state) or idled (Permanent Signal processing begun) when it is removed from a conference. This bit has no meaning unless D or T = 1 in the Conference Control Code.

S = 0—Leave line/trunk port active (setup state) when deleted from conference.

S = 1—Set line/trunk port to idle through Permanent Signal processing when deleted from conference.

V—Determines when the voice path of an outgoing trunk port in CP_WTFSUP is set to the conference. The voice path can be established when the outgoing is answered or immediately when the command is received.

V = 0—Establish voice path of outgoing port to conference when outgoing is answered.

V = 1—Establish voice path of outgoing port to conference immediately.

PPP PPPPPPPP—Binary representation of the line/trunk port address for which conferencing action is to be performed. Convert to hexadecimal for use in the command.

System Response

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. Return All should be used when R or S = 1 in the Conference Control Code to track the conference number assigned by the system. Any command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $0B, $0C, $0F, $12, $1C, $1D, $1E, $1F, $21, $23, $24, $29, $3C, $54, and $55. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

A command returned with a $1F network status byte indicates that no conference ports were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the DCC resource group were busy (allocated or out of service). If no $D6 report is sent, a DCC resource group does not exist (no members). Refer to the “Resource Limitation ($D6) Report” section on page 5-45 for more information on the $D6 report.

When a conference is torn down or a line/trunk port is deleted from a conference and the port(s) is idled, an Incoming Port Change of State ($DB) or Outgoing Port Change of State ($DA) report is received for each port sent to idle (except for those with COS = A). The type of report is based on whether the port was considered incoming or outgoing prior to being added to the conference structure. Permanent Signal Condition ($D2) reports may also be returned by the system under these conditions.

Examples

Example 4-35 $6D Command

Assume that an incoming port at address $18 and an outgoing port at address $30 are connected in a stable call. A third port at address $45 is in CP_SETUP state. The following command creates a conference using these three ports.

```
04 05 06 07 080910111213141516
6D 00 40 03 400018B00030E00045
```

Function ID = 6D (Conference Control)

Conference Number = 00 (begin a new conference)

Conference Control Code = 01000000

R = 0 (command not used to reserve)

S = 1 (start a conference)

T = 0 (command not used to tear down)

A = 0 (command not used to add ports)

D = 0 (command not used to delete ports)

G = 0 (command not used for level adjustments)

Port Count Code = 03 (3 ports)

The Port Control Code sets are as follows:

First set = 40 00 18

IIII = 0100 (adjust input level by –4.5 dB)

LL = 00 (no output level adjustment)

W = 0 (two-way path; talk and listen)

S ignored (T and D = 0)

Port Address = 018

Second set = B0 00 30

IIII = 1011 (adjust input level by –15 dB)

LL = 00 (no output level adjustment)

W = 0 (2-way path; talk and listen)

S ignored (T and D = 0)

Port Address = 030

Third set = E0 00 45

IIII = 1110 (adjust input level by +3 dB)

LL = 00 (no output level adjustment)

W = 0 (two-way path; talk and listen)

S ignored (T and D = 0)

Port Address = 045

Example 4-36 $6D Command

Assume the conference above was assigned a conference number of 4 by the system. An incoming port at address $27 is in CP_SETUP state. The following command adds the port at address $27 to conference 4 as a listener (one-way).

```
04 05 06 07 080910
6D 04 10 01 008027
```

Function ID = 6D (Conference Control)

Conference Number = 04 (conference number 4)

Conference Control Code = 00010000

R = 0 (command not used to reserve)

S = 0 (command not used to start a conference)

T = 0 (command not used to tear down)

A = 1 (command used to add ports)

D = 0 (command not used to delete ports)

G = 0 (command not used for level adjustments)

Port Count Code = 01 (1 ports)

Port Control Code sets

First set = 00 80 27

IIII = 0000 (no change to input—listen-only voice path)

LL = 00 (no output level adjustment)

W = 1 (1-way path; listen only)

S ignored (T and D = 0)

Port Address = 027

Example 4-37 $6D Command

The command below removes the port at address $45 from conference 4. The port is to be idled and sent through Permanent Signal processing.

```
04 05 06 07 080910
6D 04 08 01 004045
```

Function ID = 6D (Conference Control)

Conference Number = 04 (conference number 4)

Conference Control Code = 00001000

R = 0 (command not used to reserve)

S = 0 (command not used to start a conference)

T = 0 (command not used to tear down)

A = 0 (command not used to add ports)

D = 1 (command used to delete ports)

G = 0 (command not used for level adjustments)

Port Count Code = 01 (1 ports)

Port Control Code sets

First set = 00 40 45

IIII ignored (S, A, and G = 0)

LL ignored (S, A, and G = 0)

W ignored (S and A = 0)

S = 1 (set port to idle through Permanent Signal processing)

Port Address = 045

Example 4-38 $6C Command

The following command tears down conference 4, leaving the ports at addresses $18 and $30 in CP_SETUP state so that an Outgoing Port Control ($69) command can be used to reconnect them into a stable call. Port $27 is released and put through Permanent Signal processing. Note that it is not necessary to include a Port Control Code byte set for a port that is to be idled when a conference is torn down.

```
04 05 06 07 080910111213
6D 04 20 02 000018000030
```

Function ID = 6D (Conference Control)

Conference Number = 04 (conference number 4)

Conference Control Code = 00100000

R = 0 (command not used to reserve)

S = 0 (command not used to start a conference)

T = 1 (command used to tear down)

A = 0 (command not used to add ports)

D = 0 (command not used to delete ports)

G = 0 (command not used for level adjustments)

Port Count Code = 02 (2 ports)

Port Control Code sets

First set = 00 00 18

IIII ignored (S, A, and G = 0)

LL ignored (S, A, and G = 0)

W ignored (S and A = 0)

S = 0 (set port CP_SETUP)

Port Address = $018

Second set = 00 00 30

IIII ignored (S, A, and G = 0)

LL ignored (S, A, and G = 0)

W ignored (S and A = 0)

S = 0 (set port CP_SETUP)

Port Address = $030

Speech Collection Control ($6E) Command

Command Type

Resource Control

Description

The Speech Collection Control ($6E) command instructs the system to collect the spoken digits 0 to 9 inclusive and the words oh (used for zero), yes, and no sent over any line or trunk circuit. Digits are sent to the host in the form of a Spoken Digit ($D4) report and can be stored in any of the controlling port's digit fields (1 to 4 and ANI). This command is also used to attach or detach SRC ports to or from a line or trunk. First digit, interdigit, and field timing can be specified in the command. Enabling of the SRC port can be done immediately or delayed until one of the following conditions is met:

- A specified period of time has passed.
- A specified supervision event has occurred.
- The specified voice prompt (DVC or IPRC) has completed.
- The specified tone has been presented.

Collection in progress can be terminated by this command; the digits collected prior to the termination order are returned to the host in a successful $D4 report. This command can be used as a command segment in the Incoming Port Control ($6A) command.

The minimum length for the $6E command is 13 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

Usage Guidelines

The $6E command has the format:

Main Command segment [optional segments...]

The Main Command segment is 8 bytes long (offsets 4 through 12) and must be included in its entirety every time the $6E command is used. If default collection timer values and receiver enabling is used, no optional segments are required.

Two optional segments are available for use with the $6E command:

- Collection Timers segment—Allows host control of first digit, interdigit, and field collection timers. If this segment is not included, the following default values are used:
  - First Digit Timer—4 seconds
  - Interdigit Timer—2 seconds
  - Field Collection Timer—20 seconds
- Enabling Options segment—Allows host control over when the SRC port is enabled. Enabling can be done immediately or when one of the following conditions has been met:
  - Time period specified has passed.
  - Outpulse rule processing completes.

- Specified voice prompts have completed.
- Specified tone is presented.

Each segment can be included only once in a single command. When more than one segment is used, they must appear in the following order:

[Collection Timers] [Enabling Options]

If a segment is not to be included, it is omitted.

A command can specify to present up to 14 voice prompts prior to enabling the SRC port. Prompts are specified in the Enabling Options segment.

If any of the timers (default digit timers, Collection Timers segment timers, or Enabling Options timers) set in the command expire, the command is aborted. A $D4 report is issued indicating which timer expired. The report indicates the reason for the command abort.

Timers specified in seconds may vary by as much one half second. This variation affects the $6E command and is most pronounced in values set to 1 or 2 seconds.

Up to 15 digits can be collected using a single $6E command. Collected digits are reported to the host in a $D4 report and can be stored in any of the controlling port's five digit fields (ANI and Fields 1 through 4). Collected digits may also be appended to the string already contained in one of the digit fields. Field length restrictions of 20 digits for Fields 1 through 4 and 12 digits for ANI still apply. Any appended digits in excess of the field limit are reported to the host but are not saved internally by the system.

Yes/no responses cannot be stored in a digit field.

The controlling port cannot be participating in a conference. If it is, the command is returned with a $1C network status byte.

All SRC receiver ports must be members of a single resource group for the system to allocate them. You do not need to specify the group number in the command; the system determines the resource group from the database configuration.

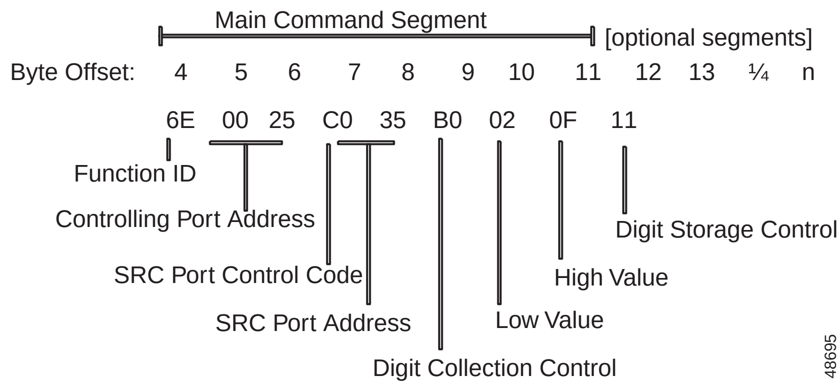
An SRC port can be attached to any incoming or outgoing circuit for spoken digit collection.

If either spoken or DTMF digits are to be accepted, this command must be either preceded or followed by a DTMF Collection Control ($67) command.

Format

Figure 4-22 shows the byte formatting for this command.

Figure 4-22 $6E Command Format



Main Command Segment

The Main Command segment is composed of byte offsets 4 to 12 and must be included in its entirety. This segment can be used without optional segments for attaching or detaching an SRC port, enabling an already attached SRC port, or collecting a digit string or a yes or no response. Collected digits can be stored in or appended to the controlling port's digit fields as specified in this segment. Components of the Main Command segment are defined as follows.

Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offset 5 and 6)—Hexadecimal representation of the circuit address to which the SRC port is attached.

SRC Port Control Code (byte offset 7)—Sets up the conditions used for this command. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. The CCC bits are part of the SRC Port Address and are included in the conversion from hexadecimal to binary just to provide the proper spacing to interpret the SRC Port Control Code bits.

```
SAPR0CCC
```

S—Specifies if switching action is required.

S = 0—No switching action required; A bit ignored and set to 0.

S = 1—Switching action required.

A—Specifies whether to attach or detach SRC; if S = 0, no meaning.

A = 0—If S = 1, detach SRC.

A = 1—If S = 1, attach SRC.

P—Specifies whether to use a specific SRC circuit or to select any SRC circuit from a resource group; port address is specified in SRC Port Address bytes.

P = 0—For S = 0 or 1, use port specified in SRC Port Address bytes.

P = 1—For S = 0, use SRC port already in call's resource chain; for S = 1, select port from SRC resource group.

R—Specifies additional control functions performed as part of this command. For SRC ports, the actions are shown below.

R = 0—Retain SRC port after report (will remain linked to the line/trunk but not enabled).

R = 1—Release SRC port after report.

SRC Port Address (byte offsets 7 and 8)—Includes second digit of previous byte (SRC Port Control Code). If P = 0, this three-digit number is the hexadecimal representation of the receiver port. If P = 1, set to $000.

Digit Collection Control (byte offset 9)—Determines if SRC is to be enabled, a Collection Timers segment is attached, an Enabling Option Segment is attached, and the vocabulary (digits or yes/no) to be used for this collection. Construct byte in binary according to the descriptions that follow, then convert to hexadecimal for use in the command.

```
M0TEVVVV
```

M—Specifies whether to enable the SRC port; if this bit is set to 0, no further conditions are set using this byte.

M = 0—Do not enable SRC port.

M = 1—Enable SRC port.

T—Specifies if a Collection Timers segment is attached.

T = 0—No Collection Timers segment attached; use default values.

T = 1—Collection Timers segment attached beginning with byte offset 13.

E—Specifies if an Enabling Options segment is attached.

E = 0—No Enabling Options segment attached.

E = 1—Enabling Options segment attached; if T = 0 segment begins with byte offset 13, if T = 1, segment begins with byte offset 16.

VVVV—Determines if the SRC port is set up to recognize digits (0 through 9 and oh) or words (yes or no).

VVVV = 0000—Recognize digits (0 to 9 and oh).

VVVV = 0001—Recognize words (yes or no).

Low Value of Collection Range (byte offset 10)—Determines the minimum number of digits or words to be collected. Value must be less than or equal to the High Value of Collection Range specified in byte offset 11. Convert decimal to hexadecimal for this value.

High Value of Collection Range (byte offset 11)—Determines the maximum number of digits or words to be collected. Value must be less than or equal to 15 and greater than or equal to the Low Value of Collection Range specified in byte offset 11. Convert decimal to hexadecimal for this value.

Digit Storage Control (byte offset 12)—Determines if Collected digits are stored in or appended to one of the controlling port's digit collection fields (1 to 4, ANI). Construct byte in binary according to the descriptions below, then convert to hexadecimal for use in the command. If digits are not to be stored (yes/no values cannot be stored), this byte must be set to $00.

```
000SAFFF
```

S—Specifies whether to store collected digits in one of the controlling port's digit fields; digit field is specified in the FFF bits.

S = 0—Do not store digits.

S = 1—Store digits in field specified in FFF; A must be 0.

A—Specifies whether to append collected digits to one of the controlling port's digit fields; digit field is specified in the FFF bits.

A = 0—Do not append digits.

A = 1—Append digits to field specified in.

FFF; S must be 0 FFF—Specifies the field in which digits are stored/appended.

000 = store/append digits for ANI Field.

001 = store/append digits for Field 1.

010 = store/append digits for Field 2.

011 = store/append digits for Field 3.

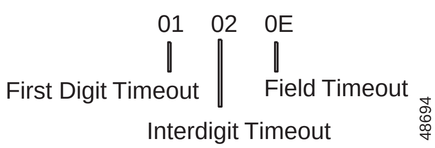
100 = store/append digits for Field 4.

Collection Timers Segment

The Collection Timers Segment is an optional $6E segment that is three bytes in length and specified only when the Digit Collection Control (byte offset 9) T bit is set to 1. If this condition is true, this segment must appear in byte offsets 13 through 15.

Figure 4-23 shows the byte formatting for the Collection Timers segment.

Figure 4-23 Collection Timers Segment of the $6E Command



First Digit Timeout—Specifies the number of seconds, in hex, allowed for the user to speak the first digit of the string. This timer starts when the SRC port is enabled. Allowed values are 1 to 25 seconds decimal ($01 to $19), inclusive. Convert from decimal to hexadecimal for the correct value. To use default timer value (4 seconds), set byte to $00.

Interdigit Timeout—Specifies the number of seconds, in hex, allowed for the user to pause between speaking digits. This timer starts when the first digit is received. Allowed values are 1 to 25 seconds decimal ($01 to $19), inclusive. Convert from decimal to hexadecimal for the correct value. To use default timer value (2 seconds), set byte to $00.

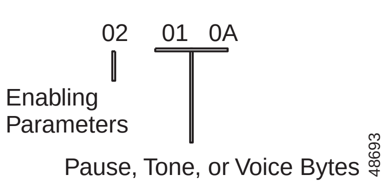
Field Timeout—Specifies the number of seconds, in hex, allowed for the user to enter the number of digits specified in the High Value Collection Range (byte offset 11) minus 1. This timer starts when the recognizer is enabled. Allowed values are 1 to 60 seconds decimal ($01 to $3C), inclusive. Convert from decimal to hexadecimal for the correct value. To use default timer value (20 seconds), set byte to $00.

Enabling Options Segment

The Enabling Options segment is an optional $6E segment that is from 2 to 15 bytes in length. This segment is used to delay the speech recognition attempt until the specified enabling event has completed. When the Digit Collection Control (byte offset 9) T bit is set to 1 and the E bit is set to 1, this segment must start at byte offset 16. If T = 0 and E = 1, this segment starts at byte offset 13.

Figure 4-24 shows byte formatting of the Enabling Options segment.

Figure 4-24 Enabling Options Segment of the $6E Command



Enabling Parameters Byte—Determines which of the four enabling options are used for this command. Only one enabling option can be specified in a single $6E command. Depending upon the option specified, a variable number of additional bytes follow this byte. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
00A0PTSV
```

P—Specifies to pause the amount of time indicated before enabling SRC port; time specified in the Pause byte as the number of 0.1-second increments to pause up to a maximum of 25.5 seconds.

P = 0—Do not use pause option.

P = 1—Use pause option; Pause byte follows this byte and all other option bits must be set to 0

A—specifies whether the play/record option is enabled.

A = 0—No play/record option.

A = 1—Play/record segment.

T—Specifies to present a tone for the amount of time indicated before enabling SRC port; tone value and time specified in the Tone bytes.

T = 0—Do not use tone option.

T = 1—Use tone option; Tone bytes follow this byte and all other option bits must be set to 0.

S—Specifies to wait until outpulse rule processing completes before enabling SRC port.

S = 0—Do not wait for rule processing to complete.

S = 1—Wait for outpulse rule processing to complete before enabling SRC port; all other option bits must be set to 0.

V—Specifies to present up to 14 voice prompts before enabling SRC port; number of prompts and the prompt numbers specified in the Voice bytes.

V = 0—Do not use voice option.

V = 1—Use voice option; Voice bytes follow this byte and all other option bits must be set to 0.

Pause Byte—Single byte used only when P = 1 in Enabling Parameters byte. Determines the number of seconds to wait before enabling the SRC port. Duration is specified in 0.1-second increments. This timer starts when the command is processed. Allowed values are 0.1 second to 25.5 seconds decimal ($01 to $FF) in 0.1-second increments. Convert from decimal to hexadecimal for the correct value.

Tone Bytes—Two bytes used only when T = 1 in Enabling Parameters byte. Determines the tone to present and the number of seconds to present the tone before enabling the SRC port. Individual bytes are defined as follows.

Tone—Tone to present. Refer to Appendix E, “Tone Values,” for tone values. Convert from decimal to hexadecimal for use in the command.

Time—Amount of time to present tone. Duration is specified in 0.1-second increments. This timer starts when the command is processed. Allowed values are 0.1 second through 25.5 seconds decimal ($01 to $FF) in 0.1-second increments. Convert from decimal to hexadecimal for the correct value. If tone specified is beep ($00), this byte is ignored.

Voice Bytes—Up to 15 bytes used only when V = 1 in Enabling Parameters byte. Determines the total number of prompts and specific prompts to present before enabling the SRC port. Individual bytes are defined as follows:

Number—Total number of voice prompts to present before enabling SRC port. Allowed values are 1 through 14 decimal ($01 to $0E), inclusive.

Prompts—Up to 14 bytes, with each byte specifying (in hex) the voice prompt to play. Prompts must be listed in the order in which they are to be presented. Refer to Appendix C, “System Digitized Voice Card Prompts,” for a listing of available DVC prompts, or Appendix G, “Integrated Prompt and Record Card Prompt Library,” for a listing of IPRC prompts.

Play/Record Segment Bytes—Determines the setting of the Play/Record segment byte—if A = 1, then the option data is the $6C (Enhanced) command’s Play/Record segment, starting with byte offset 7 of $6C (Enhanced) command.

System Response

Spoken Digit ($D4) report.

A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $09, $0A, $0E, $0F, $11, $12, $13, $16, $17, $18, $1C, $1F, $22, $24, $26, $27, $2C, $2D, $2E, $2F, $30, $31, $32, $33, $34, $3C, $43, $44, $45, $46, $47, and $48. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

If Return All is used, the port address of the SRC port requested by resource group number is returned in the port address bytes.

A command returned with a $1F network status byte indicates that no SRC ports were available to satisfy this command. If this returned command is followed by a Resource Limitation ($D6) report, all members of the SRC resource group were busy (allocated or out of service). If no $D6 is sent, an SRC resource group does not exist (no members). Refer to the “Resource Limitation ($D6) Report” section on page 5-45 for more information on the $D6 report.

Examples

Example 4-39 $6E Command

The following host command performs a speech recognition only. The command sets up the recognizer port at $28 to collect 7 digits.

```
04 0506 07 0809 10 11 12
6E 0048 D0 2880 07 07 00
```

Function ID = 6E (Speech Collection Control)

Controlling Port Address = 48

SRC Port Control = 11010000

S = 1 (switching action required)

A = 1 (attach resource)

P = 0 (use specified address)

R = 1 (release SRC after collection)

SRC Port Address/Group = 28

Digit Collection Control = 10000000

M = 1 (enable SRC port)

T = 0 (no Collection Timers segment attached)

E = 0 (no Enabling Options segment attached)

VVVV = 0000 (recognize digits 0 to 9 and oh)

Low Value of Collection Range = 07

High Value of Collection Range = 07

Digit Storage Control = $00 (do not store collected digits in controlling port's call record)

Example 4-40 $6E Command

The following command sets up an SRC port to collect a range of 4 to 11 digits following a voice announcement. The command selects an SRC from a resource group, uses the default first digit, interdigit and field collection timers, and stores the collected digit information in digit field 1 of the controlling port's call record.

```
04 0506 07 0809 10 11 12 13 14 15 16
6E 0048 E0 0090 04 0B 11 01 02 71 4C
```

Function ID = 6E (Speech Collection Control)

Controlling Port Address = 48 SRC Port Control = 11100000

S = 1 (switching action required)

A = 1 (attach resource)

P = 1 (hunt SRC port from resource group)

R = 0 (retain SRC after collection)

SRC Port Address/Group = 00

Digit Collection Control = 10010000

M = 1 (enable SRC port)

T = 0 (no Collection Timers segment attached)

E = 1 (Enabling Options segment attached)

VVVV = 0000 (recognize digits 0 to 9 and oh)

Low Value of Collection Range = 04

High Value of Collection Range = 0B

Digit Storage Control = 00010001

S = 1 (store digits in call record)

A = 0 (do not append digits)

FFF = 001 (store digits in Field 1)

Enabling Parameters = 00000001

P = 0 (do not use pause option)

T = 0 (do not use tone option)

S = 0 (do not use supervision option)

V = 1 (use voice option; voice prompts are specified in following bytes)

Voice Bytes = 02 71 4C

02 = Present two voice prompts before enabling SRC port

71 = Play voice prompt “Number”

4C = Play voice prompt “please”

Example 4-41 $6E Command

The following command sets up an SRC port to recognize the response Yes or No. The command selects a SRC from a resource group, uses a first digit timer of 5 seconds, and plays a beep prior to enabling the receiver.

```
04 0506 07 0809 10 11 12 13 14 15 16 17 18
6E 0048 F0 00B1 01 01 00 05 00 00 04 00 00
```

Function ID = 6E (Speech Collection Control)

Controlling Port Address = 48

SRC Port Control = 11110000

S = 1 (switching action required)

A = 1 (attach resource)

P = 1 (hunt SRC port from resource group)

R = 1 (release SRC after collection)

SRC Port Address/Group = 00

Digit Collection Control = 10110001

M = 1 (enable SRC port)

T = 1 (Collection Timers segment attached)

E = 1 (Enabling Options segment attached)

VVVV = 0001 (recognize Yes and No)

Low Value of Collection Range = 01

High Value of Collection Range = 01

Digit Storage Control = 00 (not used for Yes and No)

First Digit Timer = 05 (5 seconds)

Interdigit Timer = 00 (use default value of 2 seconds)

Field Collection Timer = 00 (use default value of 20 seconds)

Enabling Parameters = 00000100

P = 0 (do not use pause option)

T = 1 (use tone option; play tone specified then enable receiver)

S = 0 (do not use supervision option)

V = 0 (do not use voice option)

Tone Bytes = 00 00

00 = Play beep tone

00 = (unused)

Port Hook State Control ($70) Command

Command Type

Resource Control

Description

The Port Hook State Control ($70) command provides the host with following functionality:

- Process offhook, onhook, and answer hook state events that are received external to the system, such as hook state events received over SS7 links.
- Set call-specific class of service (COS) for ports that are defined in the database as two-way.
- Start an inpulse or outpulse rule when an offhook event occurs.

Normal system host commands must be used to connect the two ports into a call prior to processing an answer condition for the outgoing port, and for setting up a voice path between two ports.

The $70 command is recommended for use only with call scenarios in which all signaling or call control occurs outside the system.

Note The $70 command does not support PRI (or PRI/N) ports. All signaling for these ports must be received over an ISDN D-channel.

Hook state processing within the command for a specified line/trunk is controlled by the Hook State byte and COS byte. Table 4-5 summarizes the $70 command processing for each hook state and COS.

Table 4-5 $70 Command Processing

Command Hook State/COS	System Port State/COS	Action
Offhook/Default	Idle/T or 2	The port goes to CP_SETUP, for COS of 2 is set to 2T, start and end records are allocated.
	Idle/O	The port goes to CP_MBUSY (far end busy out).
	Nonidle/T or 2T	Ignored.
	Nonidle/O or 2U	The port goes to CP_STABLE (answer condition).
Offhook/Incoming	Idle/T or 2	The port goes to CP_SETUP. For COS 2, the COS is set to 2T. Start and end records are allocated.
	Idle/O	The command is rejected with $18 error.
	Nonidle/T or 2T	The command is ignored.
	Nonidle/O or 2U	The command is rejected with $18 error.

Table 4-5 $70 Command Processing (continued)

Command Hook State/COS	System Port State/COS	Action
Offhook/Outgoing	Idle/2 or O	The port goes to CP_SETUP. For COS of 2, the COS is set to 2U.
	Idle/T	The command is rejected with $18 error.
	Nonidle/T or 2T	The command is rejected with $18 error.
	Nonidle/O or 2U	The command is ignored.
Onhook/Any	Idle/Any	The command is ignored.
	Nonidle/T or 2T	The call is torn down with immediate guard complete.
	Nonidle/O or 2U	The call is torn down with immediate guard complete.

The execution of an inpulse or outpulse rule within the $70 command is controlled by the Rule Control byte and the Rule Identifier byte. The Rule Control byte specifies whether the rule is an inpulse rule or an outpulse rule. The Rule Identifier specifies which rule to execute. Execution is valid for both incoming and outgoing ports. Table 4-6 summarizes the processing for inpulse and outpulse rules within the $70 command. Rules can only be executed when a port is offhook.

Table 4-6 $70 Command Inpulse and Outpulse Rules Processing

Rule Control Byte	Rule Identifier	$70 Command Processing
Inpulse	$00 (zero)	Default inpulse rule for the specified port is invoked (if one is assigned). **Note** For outgoing ports without a start/end record, a start and end record will be allocated prior to rule execution.
	Nonzero	Specified inpulse rule is invoked.
Outpulse	$00 (zero)	No rule is invoked.
	Nonzero	Specified outpulse rule is invoked.

Usage Guidelines

The usage guidelines for the $70 command are as follows:

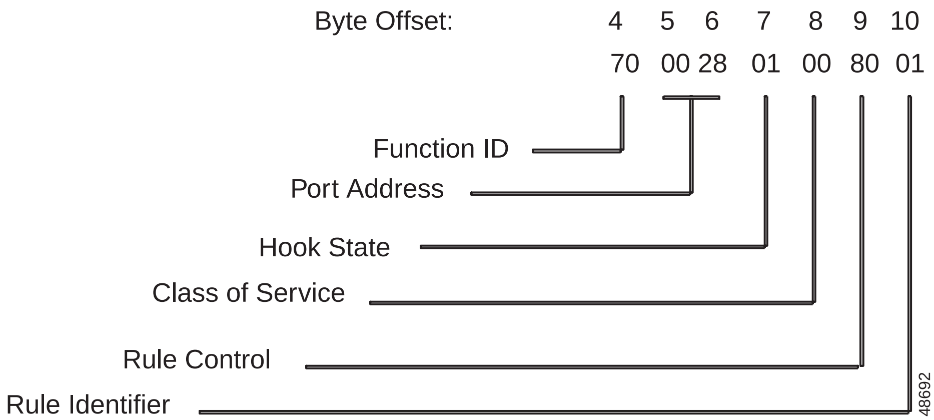
- The command must be exactly 7 bytes long, not including the Network Header segment.
- The port address specified in the command must be valid (between 0 and 7FFF) and correspond to a defined card and port within the system configuration.
- The Hook State control code must be either $00 (onhook) or $01 (offhook). Any other value returns an error.
- The COS must be 0 (default), 1 (incoming), or 2 (outgoing). Any other value returns an error and the report suppression bit is disregarded.
- Only bit 7 or bit 6 in the Rule Control byte can be set. If any of the 0 through 5 bits, or both the 7 and 6 bits are set, an error is returned.

- The Rule Identifier byte must contain a valid inpulse or outpulse rule ID. If the rule ID is not valid, an error is returned.
- The specified line or trunk port must be on an active card.
- The specified port must not be under the control of another host process.
- The specified port must not be in a deactivated state.
- Command processing terminates if call records cannot be allocated for the call.
- The specified port must be in the proper state for the execution of an inpulse or outpulse rule.

Format

Figure 4-25 shows the byte formatting for this command.

Figure 4-25 $70 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header. The Function ID uniquely identifies the command to the system.

Port Address (byte offset 5 and 6)—Hexadecimal representation of the circuit address. This number must fall within the range of 0 to 7FFF. This address must also correspond to a card and line or trunk port configured in the system. The exception is PRI ports; PRI is not supported by the $70 command.

Hook State (byte offset 7)—Used to define the Hook State for the port and whether to suppress the Outgoing Port Change of State ($DA) and Incoming Change of State ($DB) reports. The format for the byte is as follows:

```
S000000H
```

S—Specifies whether or not to suppress $DA or $DB reports.

S = 0—Do not suppress $DA and $DB reports.

S = 1—Suppress $DA and $DB reports.

H—Specifies Hook State.

H = 0—Onhook.

H = 1—Offhook.

Any other value will return an error code.

Class of Service (byte offset 8)—Used to define the COS (incoming or outgoing) when the port is defined in the database as having a COS of two-way. Valid values for this byte are 00 (default), 01 (incoming), or 02 (outgoing.) A COS of none (0) is only valid with a hook state of offhook and a COS defined in the database as two-way.

Rule Control (byte offset 9)—Specifies whether to invoke an inpulse rule or an outpulse rule. The format of the byte is as follows:

```
OI000000
```

O—Specifies to invoke an outpulse rule.

O = 0—Do not invoke an outpulse rule.

O= 1—Invoke the outpulse rule identified in the next byte (Rule Identifier, byte 10). The I bit must be set to zero.

I—Specifies to invoke an inpulse rule.

I = 0—Do not invoke an inpulse rule.

I = 1—Invoke the inpulse rule identified in the next byte (Rule Identifier, byte 10). The O bit must be set to zero.

Rule Identifier (byte offset 10)—Specifies which inpulse or outpulse rule to invoke. If this byte is nonzero, the rule corresponding to the Rule Identifier is invoked. When an inpulse rule is being invoked (the I bit in byte offset 9 is set to 1) and the Rule Identifier is zero, a default inpulse rule is invoked if one is defined for the port in the database. When an outpulse rule is being invoked (the O bit in byte offset 9 is set to 1) and the Rule Identifier is zero, no outpulse rule is invoked. If the Rule Identifier is not valid (a number other than 1 to 30), an error is returned.

$70 Command Error Checking and Handling

The command format and content is verified within call processing when the $70 command is received. Any format or content error results in the command being returned to the host without processing. When an error occurs, the appropriate error code is inserted into the network status byte. Table 4-7 describes the valid $70 command error codes.

Table 4-7 $70 Command Valid Error Codes

Error Code	Meaning
$0F	The port address you specified in offset bytes 5 and 6 is under the control of another host.
$12	The port address specified in offset bytes 5 and 6 is for a port other than a T1 port. The $70 command does not support any other circuit types.
$18	The specified port address has an incorrect COS for the requested operation. This error occurred due to one of the following conditions: • Hook state/COS of offhook/incoming for an idle port with a COS of O, or non-idle port with a COS of O or 2U. • Hook state/COS of offhook/outgoing for an idle port with a COS of T, or non-idle port with a COS of T or 2T.
$23	The port address you specified in offset bytes 5 and 6 is not within the range of 0 to 7FFF or the port is not defined in the system configuration.
$24	The port address you specified is for a port on a card that is inactive. Specified ports must be on active cards for the $70 command.

Table 4-7 $70 Command Valid Error Codes (continued)

Error Code	Meaning
$26	The specified port is in an uncontrollable state (CP_MBUSY).
$29	A system internal processing error has occurred. Start and End call records could not be allocated for this call.
$2B	The specified inpulse or outpulse rule byte value is not within the valid range of 1 to 30. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information.
$3E	The value of the Hook State Control byte (offset byte 7) is invalid. Valid values for offset byte 7 are 00 (onhook), 01 (offhook), or 80 and 81 (suppress reports).
$3F	The value of the Class of Service byte (offset byte 8) is invalid. Valid values for offset byte 8 are 00 (default COS), 01 (incoming), or 02 (outgoing).
$40	The value of the Rule Control byte (offset byte 9) is invalid. Valid values for offset byte 9 are 40 (inpulse rule) or 80 (outpulse rule).
$41	The length of the command is invalid. The $70 command must be exactly 7 bytes long (not counting the Network Header).
$42	The port specified in offset bytes 5 and 6 is not in a valid state to execute an inpulse rule or an outpulse rule.

Port Supervision Control ($72) Command

Command Type

System Diagnostics

Definition

Use the Port Supervision Control ($72) command for manual host control over outward handshake and supervision signals on both incoming and outgoing circuits. Available actions are seize and wink (hookflash if off hook); their effects on different system hardware types are summarized in Table 4-8. This command can be used as a command segment in an Incoming Port Control ($6A) command.

Table 4-8 $72 Command Seize and Wink Effects

Hardware Type	Seize Effect	Wink Effect
SLIC-2	Ring line	No effect
DID-2	Tip/ring reversal	Tip/ring reversal for 200 ms or unreversal for 500 ms[1]
UTC-2 (LS)	Close loop	On hook for 500 ms[2]
UTC-2 outgoing (GS)	Ground ring	On hook for 500 ms[2]
UTC-2 incoming (GS)	Ground tip/close loop	On hook for 500 ms[2]
T1	Raise A/B signal	Raise/lower A/B signal for 250 ms[2]
E+M	Raise E/M lead	Raise E/M lead for 250 ms

1. DID wink when on hook provides a 200 ms wink signal; DID wink when off hook provides a T1 500 ms hook flash; signal.
2. T1 wink when on hook provides a wink signal; T1 and UTC wink when off hook provides a T1 hook flash; signal.

The minimum length for the $72 command is 9 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

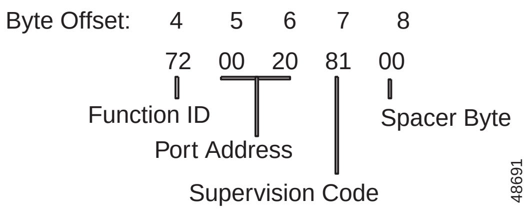
Usage Guidelines

Wink applies only to idle ports, and has no effect on off hook ports except DID, UTC, and T1 ports. A wink specified for an off hook DID, UTC, or T1 port provides a hookflash signal. Command does not affect voice path, states, or resource linkages.

Format

Figure 4-26 shows the byte formatting for this command.

Figure 4-26 $72 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the address of the port acted upon.

Supervision Code (byte offset 7)—Determines whether an action is executed (seize, wink) or cancelled (seize only), and the type of action performed. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
A0000MMM
```

A—Specifies whether to execute or cancel an action.

A = 0—Cancel supervision action (seize only).

A = 1—Execute supervision action.

MMM—Specifies the action performed.

MMM = 001—Seize port.

MMM = 010—Wink/hookflash on port.

Spacer Byte (byte offset 8)—Byte reserved for future enhancements; set to $00.

System Response

No response from the system upon successful completion unless Return All has been set in the Network Header. Command returned by the system with a Network Status byte not equal to $01 indicates command was not processed. The following network status bytes may be returned: $03, $23, $24, and $3C. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Examples

Example 4-42 $72 Command

Assume there is an T1 circuit at address $23. The following command causes the T1 port to seize outwards by raising its AB signals.

```
04 0506 07 08
72 0023 81 00
```

Function ID = 72 (Port Supervision Control)

Controlling Port Address = 0023

Supervision Code = 10000001

A = 1 (execute supervision action)

MMM = 001 (seize port)

Spacer Byte = 00

Example 4-43 $72 Command

Assume the T1 port in Example 4-42 is still seized. The following command causes a hookflash on the port by lowering the A/B signal for 250 ms.

```
04 0506 07 08
72 0023 82 00
```

Function ID = 72 (Port Supervision Control)

Controlling Port Address = 0023

Supervision Code = 10000010

A = 1 (execute supervision action)

MMM = 010 (wink port)

Spacer Byte = 00

Example 4-44 $72 Command

Assume the T1 port in Example 4-42 is still seized. The following command causes the port to unseize by lowering its AB signals.

```
04 0506 07 08
72 0023 01 00
```

Function ID = 72 (Port Supervision Control)

Controlling Port Address = 0023

Supervision Code = 00000001

A = 0 (cancel supervision action)

MMM = 001 (seize port)

Spacer byte = 00

Request Resource Allocation ($80) Command

Command Type

System Status

Description

Use the Request Resource Allocation ($80) command to obtain a Resource Allocation ($80) report. This report is a bit map that specifies the online or offline status of every port within a given resource group and port address range. At least one request for each resource group in the system is necessary to determine the complete configuration.

The minimum length for the $80 command is 6 bytes. If a command is too short, it is rejected and a syntax error with a status byte of 03 is returned to the host.

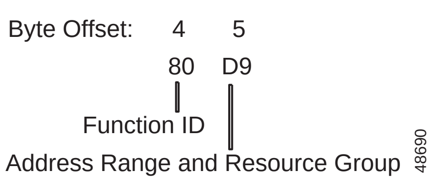
Usage Guidelines

The Resource Allocation ($80) report takes the form of a command returned from the host with a Network Status byte = $01 and the bit-mapped information for the requested address range and resource group. Although this command can be used at any time after system boot, its use is recommended during periods of low traffic volume because of the communications link and system processing overhead required.

Format

Figure 4-27 shows the byte formatting for this command.

Figure 4-27 $80 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Address Range and Resource Group (byte offset 5)—Determines the range of port addresses and resource group for which the report is requested. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
RRGGGGGG
```

RR—Specifies the address range.

RR = 00—Ports $00 to $1FF (0 to 511).

01—Ports $200 to $3FF (512 to 1023).

10—Ports $400 to $5FF (1024 to 1535).

11—Ports $600 to $7FF (1536 to 2047).

GGGGGG—Specifies the resource group; convert decimal to binary for group number (1 to 63).

System Response

Resource Allocation ($80) report. The system returns a copy of the command with allocation information attached as a report, and a $01 network status byte. A $0D network status byte indicates that the command was not processed. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Examples

Example 4-45 $80 Command

The following command requests a report of all ports between $00 and $1FF that are in resource group 21.

```
04 05
80 15
```

Function ID = 80 (Request Resource Allocation)

Address Range and Resource Group = 00010101

RR = 00 (ports $00 to $1FF)

GGGGG = 10101 (resource group 21)

Example 4-46 $80 Command

The following command requests a report of all ports between $400 and $5FF that are in resource group 1.

```
04 05
80 81
```

Function ID = 80 (Request Resource Allocation)

Address Range and Resource Group = 10000001

RR = 10 (ports $400 to $5FF)

GGGGG = 00001 (resource group 1)

Request Hardware Allocation ($81) Command

Command Type

System Status

Description

Use the Request Hardware Allocation ($81) command to obtain a Hardware Allocation ($81) report. This report is a bit map that allows the host to match the logical port addresses used in system commands to their corresponding physical rack-level-slot hardware addresses. Reports are requested by port address ranges of 512 ports each; one request for each address range is necessary to determine the complete system configuration.

The minimum length for an $81 command is 6 bytes. If a command is too short, it is rejected and a syntax error with a $03 network status byte is returned to the host.

Usage Guidelines

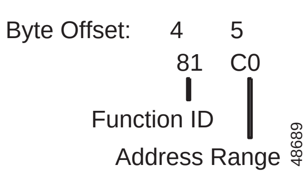
The $81 report takes the form of a command returned from the host with a $01 network status byte and the bit-mapped information for the requested address range. Although this command can be used at any time after system boot, its use is recommended during periods of low traffic volume because of the communications link and system processing overhead required.

This command returns the address range of Four Span Programmable T1 Interface (4xT1) and Four Span Programmable E1 Interface (4xE1) card spans correctly because ports are added to the database contiguously and in ascending order. Users of ICCs must use the Card Status ($82) command to determine the correct port address range for the spans. ICC spans are added in descending order, and not necessarily contiguously.

Format

Figure 4-28 shows the byte formatting for this command.

Figure 4-28 $81 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Address Range (byte offset 5)—Specifies the port address range for which the Hardware Allocation report is to be generated. Specify the byte as follows:

00—Ports $00 to $1FF (0 to 511).

40—Ports $200 to $3FF (512 to 1023).

80—Ports $400 to $5FF (1024 to 1535).

C0—Ports $600 to $7FF (1536 to 2047).

System Response

Hardware Allocation Report ($81). The system returns copy of command with allocation information attached as a report and a $01 network status byte. A $03 network status byte indicates that the command was not processed. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Example

Example 4-47 $81 Command

The following command requests a report of all ports between $00 and $1FF inclusive.

```
04 05
81 00
```

Function ID = 81 (Request Hardware Allocation)

Address Range = 00 (ports $00 - $1FF)

Card Status ($82) Command

Command Type

System Status

Description

Use the Card Status ($82) command to obtain the Card Status ($82) report. You can specify a single card or a range of cards.

Specify the card by its rack-level-slot (R-L-S) position. Specify a range of cards by encoding the starting R-L-S and ending R-L-S in the command. One $82 report is generated for each card specified in the range. For single cards, the starting R-L-S and the ending R-L-S should be the same.

Usage Guidelines

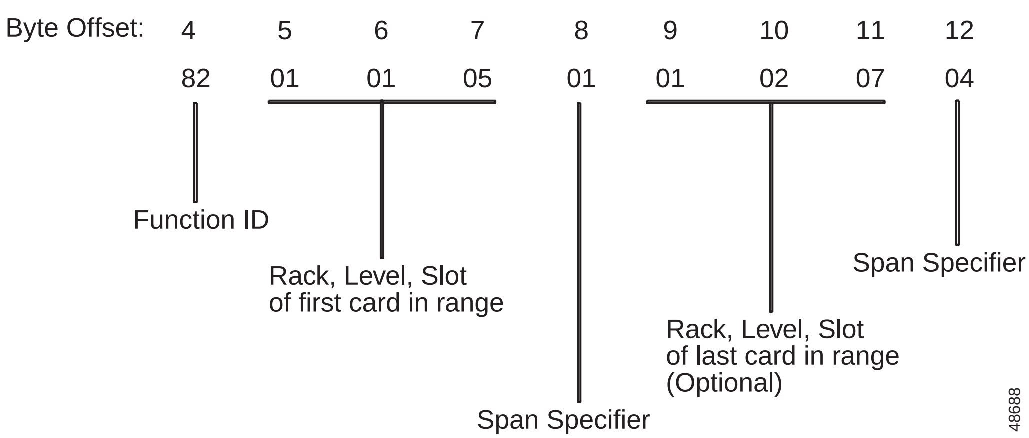
The $82 report takes the form of a command returned with a $01 network status byte. The report includes the status of the card and the type of the card.

Cisco recommends that you use the command during periods of low traffic volume because of the communications link and system processing overhead.

Format

Figure 4-29 shows the byte formatting for this command.

Figure 4-29 $82 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

R-L-S of the first card in range (byte offsets 5, 6, and 7)—The rack, level and slot number of the first card in the range for which the status is requested. These three bytes correspond to the rack, level and slot location of the card, represented in hex. Valid values for rack are 1 or 2; valid values for level are 0 through 3; valid values for slot are from 1 to 21 (0 to 15 in hexadecimal). Convert the decimal value of the slot into hexadecimal for encoding.

Span Specifier (byte offset 8)—Specifies the span number of the first card in the range. Value of zero specifies that the request is for all spans of a multispan card. For a single-span card, this value can be either 0 or 1.

R-L-S of the last card in range (byte offsets 9, 10, and 11)—This is an optional field. The rack, level and slot number of the last card in the range for which the status is requested. These three bytes correspond to the rack, level, and slot location of the card represented in hexadecimal. Valid values for rack are 1 or 2; valid values for level are 0 to 3; valid values for slot are 1 to 21 (0 to 15 in hexadecimal). Convert the decimal value of the slot into hexadecimal for encoding.

Span Specifier (byte offset 12)—This is an optional field. Specifies the span number of the last card in the range. Zero specifies that the request is for all spans of a multispan card. For a single-span card, this value can be either 0 or 1. If a report is required for a single card, the bytes 9 to 12 are not required in the command.

The R-L-S encoding in bytes 9 to 11 must designate a location at the higher end of the range than the R-L-S specified in byte 5. For example, if bytes 5 to 7, specify rack 1, level 2, and slot 1, bytes 9 to 11 can not specify rack 1, level 1 and slot 1; however, rack 2, level 0, and slot 1 would be valid.

If bytes 5, 6, 7, and 8 (first R-L-S and span), specify rack 1, level 2, slot 1 and span 0, and bytes 9, 10, 11, and 12 (last R-L-S and span) specify rack 2, level 0, slot 1 and span 2, an $82 report is generated for all spans of a card at 1,2,1 (if it is a multispan card), and for all spans of each of the cards in between, and for spans 1 and 2 of a card at 2,0,1.

If any of the slots falling within the range contains a multispan card, an $82 report will be generated for each of the spans in the slot.

System Response

One $82 report is generated for each of the cards specified in an $82 command. For any multispan card, a separate report is generated for each of the spans. If the command is processed without any errors, the $82 report indicates a $01 network status byte (NSB).

An NSB of INVALID_RLS_CODE ($4A) indicates that the R-L-S encoding is not valid.

An NSB of INVALID_COMMAND_LENGTH ($41) indicates invalid command length.

An NSB of INVALID_RLSRANGE ($52) indicates that the R-L-S range specified in the command is not valid. This could be because the ending R-L-S is sequentially lower than the starting R-L-S.

An NSB of INVALID_SPAN_CODE ($53), indicates that the span specified in the command is invalid. This will be the return code for cases where a single-span card status is requested with a span specifier greater than 1, or for a multispan card with a span specifier greater than 4.

Example

Example 4-48 $82 Command

The following command requests the status of the cards located at R-L-S 1,1,6 and R-L-S 1,1, 7.

```
04 050607 08 091011 12
82 010106 00 010107 02
```

Function ID = 82 (Card Status command)

Starting RLS = 1,1,6

Span specifier = 0

Ending RLS = 1,1,7

Span specifier = 2

Request for all spans of the card at R-L-S 1,1,6 and for spans 1 and 2 of the card at R-L-S 1,1,7

Port Status ($83) Command

Command Type

System Status

Description

Use the Port Status ($83) command to obtain the Port Status ($83) report. The command queries the status of a range of ports specified by either a port address range or the rack, level and slot (R-L-S) encoding of a card, with the specified span or resource group.

In the case of a query for ports in a multispan card (through R-L-S specification), you must also specify the span (interface).

Usage Guidelines

You can specify a range of ports in different ways, depending upon the application. You can get the status of all the ports on a card by specifying the R-L-S encoding for the card in the command.

You can also get the status of all ports within a port address range by specifying the port address range, which can span cards. If the starting port address and the ending port address are same, the report is generated for that particular port.

You can get the status of all ports within a resource group by specifying the resource group number.

The $83 report takes the form of a command returned with a $01 network status byte. The report contains a series of status report elements; each element contains the port address and its call processing state.

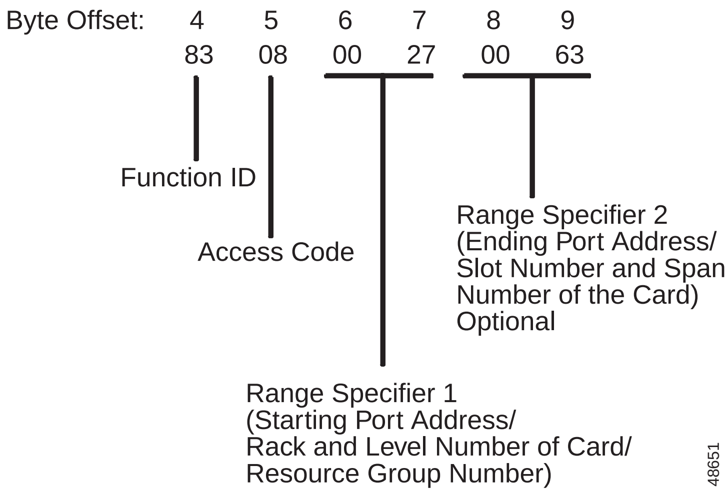
More than one $83 report may be generated for one $83 command if all the port status report elements could not be accommodated in one report. An indicator is present in a group of reports, that identifies which reports are generated for one $83 command.

Cisco recommends that the command be used during periods of low traffic volume because of the communications link and VCO/4K system processing overhead.

Format

Figure 4-30 shows the byte formatting for this command.

Figure 4-30 $83 Command Format



Function ID (byte offset 4)—Byte immediately following the network header; uniquely identifies the report from the VCO/4K system.

Access Code (byte offset 5)—A port address range can be specified in different ways. The access code specifies the way in which the port address range is chosen. Construct the byte in binary according to the descriptions below, then convert to hexadecimal for use in the command.

```
C000 AGR0
```

C—Always set to 0 in the $83 command. The C bit is used by the $83 report to indicate that there are more fragments of the report.

A—Specifies the port address range.

A = 1—If the port address range is specified.

A = 0—If the port address range is not specified.

G—Specifies a resource group.

G = 1—If a resource group is specified.

G = 0—If a resource group is not specified.

R—Specifies the R-L-S and span content.

R = 1—If the R-L-S of a card is specified, with or without the span information.

R = 0—If the R-L-S of a card is not specified.

Range Specifier 1 (byte offset 6 and 7)—Set the field after converting the corresponding values into two bytes, right justified, in hexadecimal.

If bit A in the Access Code byte is set, specify the starting port address.

If bit G in the Access Code is set, specify the Resource Group number.

If bit R in the Access Code is set, specify the rack and level number of the card. These two bytes specify the rack and level in which the card is located. The rack can have a value of 1 or 2; the level can have a value of 0 to 3.

Range Specifier 2 (byte offset 8 and 9)—This is an optional field. If bit G is set in the Access Code, this field should not be included in the command.

The field should be set after converting the corresponding values into two bytes, right justified, in hexadecimal.

Specify the ending port address if bit A in the Access Code byte is set.

These two bytes specify the slot number and the span number of the card if the R bit in the Access Code is set. Valid slot numbers are from 1 to 21 (0 to 15 in hexadecimal); valid span number range is 0 to 4.

Convert the decimal value of the slot into hexadecimal for encoding.

System Response

The $83 report is generated by the system with a $01 network status byte (NSB), if the command is processed successfully.

If the port range for which the status report is requested is such that one $83 report can not accommodate all the port status report elements, the report is split into as many $83 reports as necessary.

An NSB of OK_MSG ($01) indicates the successful processing of the command.

An NSB of INVALID_ACCESS_CODE ($49) indicates and invalid Access Code.

An NSB of INVALID_COMMAND_LENGTH ($41) indicates an invalid command length.

An NSB of INVALID_RLS_CODE ($4A) indicates an invalid R-L-S encoding.

An NSB of BADGRP_MSG ($0D) indicates an out of range resource group number.

An NSB of WRGGRP_MSG ($39) indicates an undefined resource group number.

An NSB of BADMAT_MSG ($23) indicates that the port address range specified in the command is not valid. This could also be because the ending port address is less than the starting port address.

An NSB of INVALID_SPAN_CODE ($53), indicates that the span specified in the command is invalid. This will be the NSB for cases when the port status of a single span card is requested with a span specifier greater than 1, or for a multispan card with a span specifier greater than 4.

Example

Example 4-49 $83 Command

The following command requests status reports for ports $27 and $28. The command specifies the range through port addresses.

```
04 05 0607 0809
83 08 0027 0028
```

Function ID = 83 (Port Status command)

Access Code = 0000 1000 (C000 AGRS)

C = 0, A = 1 (Address Range specified), G = 0, R = 0

Staring Port Address = 0027

Ending Port Address = 0028

Change Port Status ($90) Command

Command Type

System Maintenance

Description

The Change Port Status ($90) command enables host to activate and deactivate individual ports on an internal service circuit or network interface card. This command performs the same action as taking ports out-of-service using the system administration Card Maintenance screen. Changes performed by the command can be written to the database on the C:\ drive.

The minimum length for a $90 command is 8 bytes. If a command is too short, it is rejected and a syntax error with a $03 network status byte is returned to the host.

Usage Guidelines

This command can be used for ports on all service circuit and network interface card types. When a port is activated, it is placed in idle state. A port can be deactivated immediately (regardless of whether the port is in stable state) or when the port is in idle state (if not idle, the command is aborted). You can specify single ports, clusters of 8 and 24 ports, and groups of nonconsecutive ports. All ports specified in a single command must reside on the same card.

You must specify the activation and deactivation of PRI/N card ports on a port basis only, not on a span basis, in order to avoid an FRM error message. For example, instead of specifying a span (DF DF 00 00 90 72 00 38), specify the ports you want to activate or deactivate (DF DF 00 00 90 72 00 38 FF FF FE) on the span.

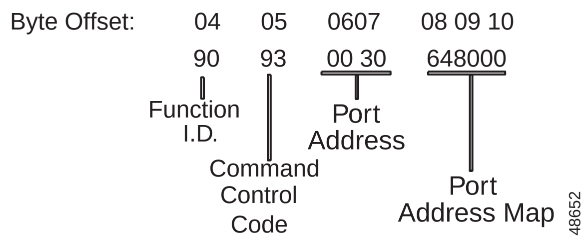
Port Status ($D3) reports are issued for each port affected by the command. When the command is used to deactivate clusters and groups of ports only if they are idle, the command may be returned with a $01 Network Status byte (command processing successful) although not all ports specified in the command experienced status changes.

This command can also seize out (busy out) the affected line/trunk ports regardless of their class of service (COS). Busying out ports prevents connected equipment from attempting to use ports taken out of service on the system.

Format

Figure 4-31 shows the byte formatting for this command.

Figure 4-31 $90 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Command Control Code (byte offset 5)—Specifies the type of action to be performed. Actions include activating/deactivating ports, seizing out on port, and updating the database on hard disk. The status of a single port, a cluster of ports, or a group of ports, can be changed. Construct the byte in binary according to descriptions below, then convert to hexadecimal for use in the command.

```
AAMD00CC
```

AA—Specifies whether to activate or deactivate a port, and the conditions under which to perform the action. Specify bits according to the list below.

AA = 00—Activate the port and set it to idle state.

AA = 01—Deactivate the port immediately (regardless of port state).

AA = 10—Deactivate the port only if port is in idle state.

M—Specifies whether to seize out on port. Seizing out on the port prevents attached equipment from originating calls on the port. Applies only to line/trunk ports when the port is deactivated (AA = 01 or 10). Notes that SLIC and DID ports automatically seize out when deactivated.

M = 0—Do not seize out on port.

M = 1—Seize out on port.

Note Setting bit M to either 0 or 1, for E1, 4xE1, T1, or 4xT1 ports, results in the same response—E1, 4xE1, T1, or 4xT1 ports always seize out when a $90 command is used to deactivate them.

D—Specifies whether to update the database on the hard disk with a port status change. If the change is not updated on the hard disk, the port is automatically brought into service following a system reboot.

D = 0—Do not update the database with a port status change.

D = 1—Update the database with a port status change.

CC—Specifies whether the change of status affects a single port, a cluster of eight ports, or a list of ports indicated in the Port Address Map (byte offsets 8 to 10).

CC = 00—Change 1 port (port address in byte offsets 6 and 7).

CC = 01—Change cluster of 8 ports (first port address in byte offsets 6 and 7).

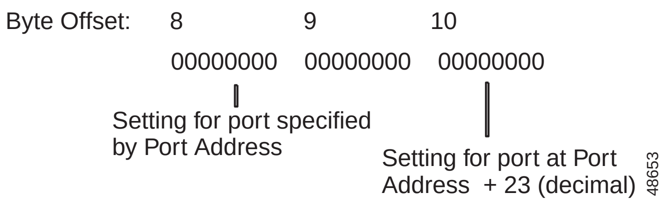
CC = 10—Change cluster of 24 ports (first port address in byte offsets 6 and 7).

CC = 11—Change ports listed in Port Address Map (byte offsets 8 to 10).

Port Address (byte offset 6 and 7)—Hexadecimal representation of the first port address affected by the change of state. Check CC bits in the Command Control Code to determine which port address this byte should represent. If CC = 00, this is the address of the single port affected. If CC = 01 or CC = 10, this is the first address of the cluster of eight or twenty-four ports. If CC = 11, this is the port address of the port represented by the first bit of the Port Address Map (starting in byte offset 8).

Port Address Map (byte offset 8 to 10)—Included only when CC = 11 in the Command Control Code. One to three bytes specifying the ports to be affected by the status change. Each bit represents one of up to 24 consecutive ports, beginning with the port at the port address specified in byte offset 6 & 7. A “1” in the port's bit position indicates its status is to be changed. For card types with 8 ports, use only byte offset 8 to indicate status changes; bytes 9 & 10 can be omitted. Construct the bytes according to the format shown Figure 4-32 and convert to hexadecimal.

Figure 4-32 Port Address Map Format



System Response

A Port Status ($D3) report is generated for each port affected. The Old Status/New Status byte (byte offset 5) in the $D3 report indicates whether the command was successfully executed and the new port status. The $D3 report Originator byte (byte offset 8) is $61 when the port change of state attempt was originated by the host with a $90 command. However, if a port is deactivated using a $90 command and the card it resides on is later taken out-of-service, any $D3 reports generated when the card returns to service will contain a $12 Originator byte value (port busied out via system administration) rather than a $61 byte value.

When the command is applied to the first port of the DTG card, the $D3 report generated will always indicate no status change (this port is not supported and remains deactivated at all times). Also, port status changes applied to DTG ports are only performed on the ports residing on the Active tone card. Although the ports on the Standby tone card are assigned the same logical addresses as the ports on the Active card, any $D3 report generated represents the status of the Active tone card port.

A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $0E, $23 and $3B.

Examples

Example 4-50 $90 Command

Assume there is an incoming trunk port at port address $30. The status of the port is CP_IDLE. The command below deactivates the port, writes the change to the hard disk, and seizes out the far end.

```
04 05 0607
90 70 0030
```

Function ID = 90 (Change Port Status)

Command Control Code = 01110000

AA = 01 (Deactivate port immediately)

M = 1 (Seize out to far end)

D = 1 (Write changes to hard disk)

CC = 00 (Change only single port)

Port Address = 00 30

The same action can be performed using the following command:

```
04 05 0607 080910
90 73 0030 800000
```

Function ID = 90 (Change Port Status)

Command Control Code = 01110011

AA = 01 (Deactivate port immediately)

M = 1 (Seize out to far end)

D = 1 (Write changes to hard disk)

CC = 11 (Change ports listed in Port Address Map)

Port Address = 00 30

Port Address Map = 10000000 00000000 00000000

Example 4-51 $90 Command

The following command deactivates the ports at addresses $00 31, $00 32, $00 35 and $00 38. Ports are deactivated only if they are in idle state. Changes are written to the hard disk and the ports are not seized out at the far end. Note that all the ports are on one card.

```
04 05 0607 080910
90 93 0030 648000
```

Function ID = 90 (Change Port Status)

Command Control Code = 10010011

AA = 10 (Deactivate port if idle; if not, abort command)

M = 0 (Do not seize out to far end)

D = 1 (Write changes to hard disk)

CC = 11 (Change ports listed in Port Address Map)

Port Address = 00 30

Port Address Map = 01100100 10000000 00000000

Example 4-52 $90 Command

The command below activates the port at address $00 49 and writes the change to the hard disk. Because the port is activated, no outward seizure can be performed.

```
04 05 0607
90 10 0049
```

Function ID = 90 (Change Port Status)

Command Control Code = 00010000

AA = 00 (Activate port and set to idle state)

M = 0 (Do not seize out to far end)

D = 1 (Write changes to hard disk)

CC = 00 (Change only single port)

Port Address = 00 49

Voice Prompt Maintenance Control ($91) Command

Command Type

Resource Control

Description

Use the Voice Prompt Maintenance Control ($91) command to allow the host to maintain voice prompt information on the IPRCs in a system. The $91 command provides a mechanism for the host to upload voice prompt information from, and download prompt information to, one or more IPRCs.

This command returns a $01 network status byte upon acceptance of the command, which indicates that the command was successfully validated and that the prompt maintenance operation has begun. When the command processing completes, a subsequent message is sent to the host to indicate the completion status. The requested command is re-sent with a $4B network status byte, which indicates that the command processed successfully, or a $4C network status byte, which indicates that an error was encountered while processing the command.

Usage Guidelines

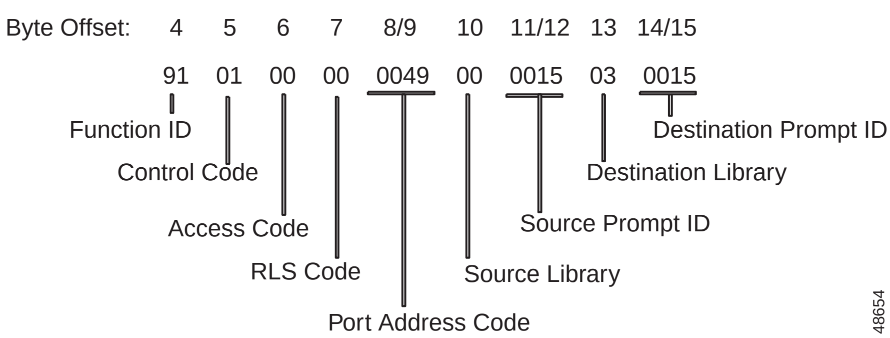
The $91 command has the format:

Main Command Segment [optional segment(s)...]

Format

Figure 4-33 shows the byte formatting for this command.

Figure 4-33 $91 Command Format



Main Command Segment

The Main Command segment is composed of byte offsets 4 to 15 and must be included in its entirety. Components of the Main Command segment are defined as follows.

Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the command to the system.

Control Code (byte offset 5)—1 byte.

0—Download prompt information.

1—Upload prompt information.

Access Code (byte offset 6)—1 byte.

0—Access card containing port specified by port address code.

1—Access card specified by R-L-S code.

2—Access all cards supporting specified prompt library (download only).

RLS Code (byte offset 7)—1 byte.

See $81 Hardware Allocation report for R-L-S code specification.

Set to $00 if accessing by port address.

Port Address Code (byte offsets 8 and 9)—2 bytes.

Card that contains port address will be accessed. Set to $0000 if accessing by R-L-S code.

Source Library (byte offset 10)—1 byte.

Hexadecimal representation of library ID ($00 to $0F).

Source Prompt ID (byte offsets 11 and 12)—2 bytes.

Byte 1—Flags.

Bit 8—Temporary prompt.

Byte 2—Hexadecimal representation of prompt ID ($00 to $FF), where $00 means all prompts in library if downloading.

Destination Library (byte offset 13)—1 byte, upload only.

Hexadecimal representation of library ID ($00 to $0F).

Destination Prompt ID (byte offsets 14 and 15)—2 bytes, upload only.

Hexadecimal representation of prompt ID ($0001 to $00FF)

Configure VCA/Set System Clock ($C0 00) Command

Command Type

Configuration Control

Description

Use the Configure VCA/Set System Clock ($C0 00) command to configure any specific Virtual Communication Addresses (VCAs) needed in addition to the global communications address, $DF. This command also allows you to set the system real-time clock. Specific VCAs are especially important when a single host controls multiple systems, and are maintained through system resets or power-down cycles.

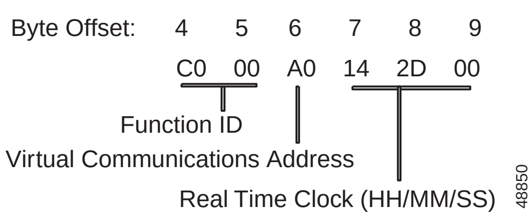
Usage Guidelines

In a redundant system, this command can be sent to both the active and standby controllers.

Format

Figure 4-34 shows the byte formatting for this command.

Figure 4-34 $C0 00 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Virtual Communications Address (byte offset 6)—Hexadecimal representation of new address; system still responds to commands sent to the global address $DF. Specifying $FF in this byte leaves the VCA unchanged, and is used when just setting the clock. Specifying $FE sets the VCA to the global address $DF.

Real Time Clock (byte offset 7 D9)—24-hour clock setting; hours, minutes, and seconds are represented separately in hex. To leave the hours, minutes, or seconds unchanged, specify $FF in the byte. If there is no change to the clock, set all three bytes to $FF.

System Response

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. A command returned by the system with a network status byte not equal to $01 indicates that the command was not processed.

Invalid clock values, such as 44:55:66, cause the system to return the command with a network status byte of $1A (bad date/time). If the command specifies to change both the VCA and the time, the VCA is changed even if the clock value is invalid. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Examples

Example 4-53 $C0 00 Command

The following command sets the Virtual Communications Address to $B0 and leaves the system time unchanged.

```
0405 06 070809
C000 B0 FFFFFF
```

Function ID = C0 00 (Configure VCA/Set System Clock)

Virtual Communications Address = B0

Real Time Clock = No change ($FF in all time bytes)

Example 4-54 $C0 00 Command

The following command sets the Virtual Communications Address to $A0 and sets the system time to 8:45:00pm.

```
0405 06 070809
C000 A0 142D00
```

Function ID = C0 00 (Configure VCA/Set System Clock)

Virtual Communications Address = $A0

Real Time Clock = Change time to 8:45:00pm ($14 = 20; $2D = 45; $00 = 00)

Example 4-55 $C0 00 Command

The following command sets the system time to 12:00:00 midnight without configuring a new Virtual Communications Address.

```
0405 06 070809
C000 FF 000000
```

Function ID = C0 00 (Configure VCA/Set System Clock)

Virtual Communications Address = $FF (do not configure new address)

Real Time Clock = Change time to 12:00:00 midnight [$00 = 00 (first hour of the day is hour 0); $00 = 00; $00 = 00]

Change Active Controllers ($C0 01) Command

Command Type

Configuration Control

Description

Use the Change Active Controllers ($C0 01) command in redundant systems to transfer system control from the active side to the standby side. This command can be sent to either the active or standby system controller. Optional reset of previously active side is also available.

The $C0 01 command can only function if both sides, active and standby, are operational.

Usage Guidelines

The $C0 01 command is forwarded, via the update channel, to the active system for processing; however, the standby side system cannot unilaterally make itself active. This action requires the participation of the active side processor and the AAC.

A controller can request a change to standby from active, but only the AAC can complete standby to active transitions. When a request is sent to a standby processor, the $C0 01 command is sent to the active side processor. The active side processor then sends a message to the AAC, changing system control to standby status. The AAC does this by using its switchover circuitry and changes the formerly standby side status to active.

If a switchover is desired following an AAC reset of the active side, toggle the A/B side switch to the side that needs to be made active. If you reset a controller via the AAC front panel, the normal AAC failure detection and switchover circuitry is disabled. In this event, if you then reset the active side from the AAC front panel, the standby side will not change status to active.

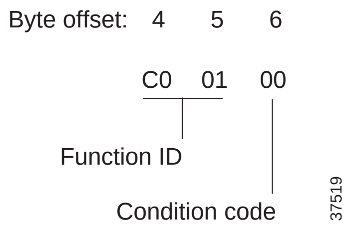
Use the MVME147 reset button, or physically remove the combined controller, to make a switchover. These actions do not disable the AAC detection/switchover logic.

Note If there is no active controller, the AAC reset of the active side causes loss of operation for several minutes.

Format

Figure 4-35 shows the byte formatting for this command.

Figure 4-35 $C0 01 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Condition Code (byte offset 6)—Determines the conditions of the transfer; specify this byte as follows:

00—Do not reset previously active side after transfer.

04—Reset previously active side after transfer.

System Response

Active/Standby Mode ($DC) report from both sides is provided when transfer has occurred.

No response from the system upon successful completion is provided unless Return All has been set in the Network Header. A command returned with a $03 network status byte indicates a syntax error. A command returned with a $08 network status byte indicates that the system is not redundant and cannot perform a switchover. A command returned with a $36 network status byte indicates that the switchover request has been queued until completion of File Synchronization between the active and standby sides. A $5E network status byte is returned to indicate that a host-initiated switchover request was denied due to a Live Upgrade in progress.

Examples

Example 4-56 $C0 01 Command

The following command forces a transfer without a reset.

```
0405 06
C001 00
```

Function ID = C0 01 (Change Active Controllers)

Condition Code = 00 (no reset)

Example 4-57 $C0 01 Command

The following command specifies a transfer, resetting the previously active side.

```
0405 06
C001 04
```

Function ID = C0 01 (Change Active Controllers)

Condition Code = 04 (reset previously active side after transfer)

T1 Synchronization Control ($C0 02) Command

Command Type

Configuration Control

Description

Use the T1 Synchronization Control ($C0 02) command to alter Master Timing Link parameters. All changes made using this command become part of the system database. This command allows the following:

- Switch to internal synchronization.
- Switch to external synchronization.
- Switch to incoming synchronization and specify/change Master Timing Link.
  - Primary only
  - Secondary only
  - Both primary and secondary

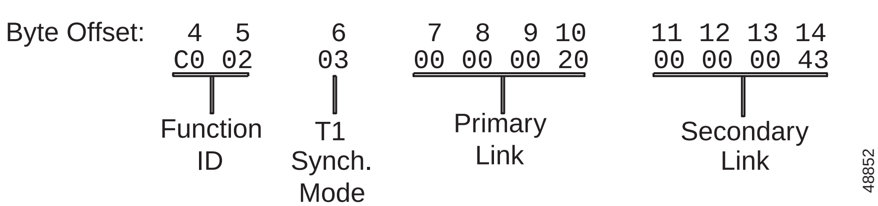
Usage Guidelines

If the command is used to switch to incoming synchronization, the system verifies that the card on which the specified port(s) is located is an in-service T1 or PRI card, and that the primary and secondary addresses are not on the same T1 or PRI card. If these conditions are met or no switch to incoming is specified in the command, the database is updated on both the active and standby sides before switching to the new timing source occurs. If the new timing source has active alarms, the database is updated but the switch to the new source does not occur. For a flowchart of T1/PRI Synchronization, refer to the *Cisco VCO/4K System Administrator's Guide*.

Format

Figure 4-36 shows the byte formatting for this command.

Figure 4-36 $C0 02 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the VCO/4K system.

Synchronization Mode (byte offset 6)—Specifies the Master Timing Link parameters to be altered.

0—Switch to internal synchronization; no link values needed in command.

02—Switch to external synchronization; no link values needed in command.

03—Change Master Timing Link (new primary and secondary). If primary link value specified in command matches current SDS system primary link value, no action taken; if primary link value specified in command does not match current SDS system primary link value, it will be changed. If change cannot occur (card not active or alarm condition present), timing switches to secondary link value specified in command. New primary link value and new secondary link value must be included in command.

04—Change Master Timing Link (primary); timing switches to new primary value. New primary link value must be included in command; secondary value is omitted.

05—Change Master Timing Link (secondary); timing switches to new secondary value. New secondary link value must be included in command; primary value is omitted.

Primary Link Value (byte offsets 7 and 8)—T1 port address; specify only if Synchronization Mode = 03 or 04; new primary link value to be used for timing

Secondary Link Value (byte offsets 9 and 10 or 7 and 8 if no Primary Link Value)—T1 or PRI port address; specify only if Synchronization Mode = 03 or 05; new secondary link value to be used for timing

System Response

No response from the VCO/4K upon successful completion is provided unless Return All has been set in the Network Header. A command returned by the VCO/4K with a network status byte not equal to $01 indicates that the command was not processed. The following network status bytes may be returned: $03, $19, $23, $24, and $2A. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

A command returned by the system with a $2A network status byte indicates that the primary and secondary values specified are on the same T1 or PRI card.

Examples

Example 4-58 $C0 02 Command

The following command changes the primary and secondary link values in the database. If the primary link is available, timing is switched to it. If the primary is not available, the system switches timing to the secondary value. If neither primary nor secondary links are available, timing switches to Internal. If both link values specified in the command are the same as those already in use on the VCO/4K system, no change occurs.

```
0405 06 07080910 11121314
C002 03 00000018 00000059
```

Function ID = C0 02 (T1 Synchronization Control)

Synchronization Mode = change Master Timing Link (new primary and secondary – $03)

Primary Link Value = 0018

Secondary Link Value = 0059

Example 4-59 $C0 02 Command

The following command will cause the VCO/4K system to switch to internal synchronization. If the VCO/4K system is already using internal synchronization, no change occurs.

```
0405 06
C002 01
```

Function ID = C0 02 (T1 Synchronization Control)

Synchronization Mode = switch to internal synchronization ($01)

No link values needed in command

Example 4-60 $C0 02 Command

This following command switches timing to a new secondary link value and updates the database. Timing is switched to this new secondary link regardless of whether a secondary or primary link was already being used.

```
0405 06 07080910 11121314
C002 05 00000000 00000017
```

Function ID = C0 02 (T1 Synchronization Control)

Synchronization Mode = change Master Timing Link (secondary – $05)

Primary Link Value = not necessary for this command; omitted

Secondary Link Value = 0017

Set/Reset Host Alarms ($C0 03) Command

Command Type

Configuration Control

Description

Use the Set/Reset Host Alarms ($C0 03) command to set or clear major, minor, and auxiliary alarms controlled by the host. These host alarms affect the alarm indicators located on the front of the Alarm Arbiter Card (AAC) as a central monitor point. Major and minor alarms are accompanied by an audible signal if the AAC is equipped with the audible alarm and closes the external alarm contacts on the AAC. This command does not reset the system internally controlled alarms. Any alarms set by this command are cleared when the system resets.

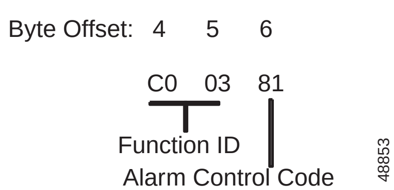
Usage Guidelines

If an AAC is connected to a CO alarm system (external alarm), this command should be used with those implications in mind.

Format

Figure 4-37 shows the byte formatting for this command.

Figure 4-37 $C0 03 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Alarm Control Code (byte offset 6)—Determines whether an alarm is set or reset, and the type of alarm. The first digit of this byte specifies whether the alarm is set or reset; the second digit specifies the type of alarm.

First digit:

0—Clear an alarm.

8—Set an alarm.

Second digit:

0—Major alarm.

1—Minor alarm.

2—Aux 1 alarm.

3—Aux 2 alarm.

System Response

Upon setting or clearing an alarm, the system generates an Alarm Condition ($F0) report indicating the alarm condition and severity. Command returned by the system with a Network Status byte equal to $03 indicates a syntax error. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Messages written to the system printer will reflect the alarm set/clear by the host. The alarms are also displayed on the System Alarm Display and output as part of the Periodic Alarm Reports. For more information on the system alarm report and display information, refer to *Cisco VCO/4K System Administrator's Guide* and *Cisco VCO/4K System Messages*.

Examples

Example 4-61 $C0 03 Command

The following command sets a host major alarm on the system.

```
0405 06
C003 80
```

Function ID = C0 03 (Set/Reset Host Alarms)

Alarm Control Code = 80

First digit = 8 (set an alarm)

Second digit = 0 (major alarm)

Example 4-62 $C0 03 Command

The following command clears a host minor alarm on the system.

```
0405 06
C003 01
```

Function ID = C0 03 (Set/Reset Host Alarms)

Alarm Control Code = 01

First digit = 0 (clear an alarm)

Second digit = 1 (minor alarm)

Host Call Load Control ($C0 04) Command

Command Type

Configuration Control

Description

Use the Host Call Load Control ($C0 04) command in conjunction with the Host Control of Call Load feature. (Refer to the System Host Configuration screen information in the *Cisco VCO/4K System Administrator's Guide*.) When the feature is enabled, this command allows the host to start or stop the sending of Inpulse Rule Complete ($DD) reports and Incoming Port Change of State ($DB) reports that indicate an off hook on an incoming port. Because calls cannot be completed through the system without host intervention, this effectively stops call processing.

Usage Guidelines

The system verifies that the Enable Host Control of Call Load feature has been enabled before processing the command. If the feature is not enabled, the command is returned with a $1B network status byte (feature not enabled) in the Network Header.

If byte offset 6 is set at 01, no off hook reports ($DB with offhook state) and no Inpulse Rule Complete reports ($DD) are sent to a host link until it has issued a $C0 04 command indicating that it is ready to process calls. In addition, commands received from that host link are rejected until it is ready to process calls. On hook reports for both incoming and outgoing ports are still sent to the host as well as other reports.

If byte offset 6 is set at 02, new call reports will not be sent to a host link until that link has indicated that it is ready to process calls. However, commands will still be accepted from the host link for calls in progress.

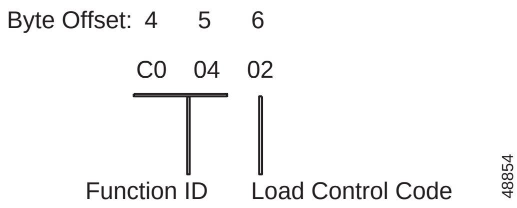
The $C0 04 command can be used, for example, to allow the host to request configuration information after a system reboot, before handling calls. Also, with byte offset 6 set at 02 as described above, current calls can be completed, with no new calls taken – a type of “graceful” shutdown.

This command affects only the host port on which it is received. If there are multiple active links to the host, the command must be sent over each active link.

Format

Figure 4-38 shows the byte formatting for this command.

Figure 4-38 $C0 04 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Load Control Code (byte offset 6)—Specifies whether the system should process incoming calls by reporting them to the host.

00—Report call events to host; normal call processing.

01—No reports to host; call processing suspended.

02—No reports to host; commands will be accepted for calls already in progress.

System Response

No response from the system upon successful completion unless Return All has been set in the Network Header. A command returned by the system with a $1B network status byte indicates that the Host Load Control feature is not enabled and the command was not processed. A $03 network status byte indicates a syntax error in the command. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

Table 4-9 summarizes $C0 04 command modes.

Table 4-9 Host Message Control Configurations

Host Link State	Affect On Messaging
ONLINE_READY	“Normal” messaging. All host commands and reports are allowed. Set by disabling the Call Load feature (and host link becomes active), or by a $C0 04 host command with a parameter value of 00.

Table 4-9 Host Message Control Configurations (continued)

Host Link State	Affect On Messaging
ONLINE_NOT_READY	Call processing is effectively suspended; host commands are rejected (original feature functionality). Set by a $C0 04 host command with a parameter value of 00. None of the following are allowed: • New call reports. • Incoming Port Change of State ($DB). • ISDN Incoming Port Change of State ($EA). • Inpulse Rule Complete (Macro) ($DD). • ISDN Inpulse Rule Complete ($ED). • Call control commands.
ONLINE_RESTRICTED	Processing of calls in progress; host commands accepted (enhanced feature functionality). Set by a $C0 04 command with a parameter value of 02. None of the following are allowed: • New call reports. • Incoming Port Change of State ($DB). • ISDN Incoming Port Change of State ($EA). • Inpulse Rule Complete (Macro) ($DD). • ISDN Inpulse Rule Complete ($ED).

Examples

Example 4-63 $C0 04 Command

The following command instructs the system to start sending Incoming Port Change of State ($DB) and Inpulse Rule Complete (Macro) ($DD) reports to the host.

```
0405 06
C004 00
```

Function ID = C0 04 (Host Call Load Control)

Load Control Code = 00 (report call events to host; normal call processing)

Example 4-64 $C0 04 Command

The following command instructs the system to stop sending change of state and Inpulse Rule Complete (Macro) ($DD) reports to the host.

```
0405 06
C004 01
```

Function ID = C0 04 (Host Call Load Control)

Load Control Code = 01 (no reports to host; call processing suspended)

Example 4-65 $C0 04 Command

In the following command, current calls can be run to completion (i.e., host commands are accepted for calls in progress). No new calls will be reported to the host (“restricted” call processing).

```
0405 06
C004 02
```

Function ID = C0 04 (Host Call Load Control)

Load Control Code = 02 (no reports to host; commands will be accepted for calls already in progress)

Host Assume/Relinquish Port Control ($C0 05) Command

Command Type

Configuration Control

Description

Use the Host Assume/Relinquish Port Control ($C0 05) command to extend the system controller functionality. This command allows a host to relinquish control of a call assigned to itself, or assume control of a call that has been assigned to a different host.

Usage Guidelines

The $C0 05 command has been extended to perform the assume/relinquish port control and assume/relinquish conference control functions. A function code has been added to allow a host link to override a controlling host assignment. Two port control operating modes, and two conference control operating modes, are provided.

The 00 port control operating mode allows a host to assume control of a port, and the 01 port control operating mode allows a host to relinquish control of a port. In either case, the assignment override remains in effect as long as the affected port is involved in a call, or until a subsequent override command is received. The relinquish mode clears the controlling host assignment for the specified port so that another host can take control of that port.

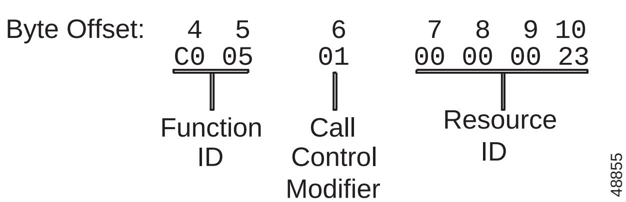
The 02 conference control operating mode allows a port to relinquish control of a port, and the 03 conference control operating mode allows a port to assume control of a port. In either case, the assignment override remains in effect as long as the affected port is involved in a call, or until a subsequent override command is received. The relinquish mode clears the controlling port assignment for the specified port so that a host can take control of that port.

All command modes affect all line/trunk and virtual ports associated with the named port; all line/trunk and virtual ports in the call chain will have their controlling host indicators cleared or overridden. Resource ports are not affected.

Format

Figure 4-39 shows the byte formatting for this command.

Figure 4-39 $C0 05 Command Format



Function ID (byte offsets 4 and 5)—Bytes immediately following the Network Header; uniquely identifies the command to the system.

Call Control Modifier (byte offset 6)—Determines the type of action to be taken.

00—Relinquish port control to an alternate host.

01—Assume port control by the host issuing the command.

02—Relinquish conference control by conference number to an alternate host.

03—Assume conference control by conference number by the host issuing the command.

Port Address/Conference Number (byte offsets 7 and 8)—Port Address or Conference Number for which control is being seized or relinquished. A 0000 value is invalid.

If the Call Control Modifier is 00 or 01, byte offsets 7 and 8 represent the Port Address.

If the Call Control Modifier is 02 or 03, byte offsets 7 and 8 represent the Conference Number.

Table 4-10 shows the network status bytes (NSBs) associated with the $C0 05 command.

Table 4-10 $C0 05 Command Network Status Bytes

NSB	Description
$03	Syntax error.
$0F	Call or conference is not controlled by this host. Indicates that the host port from which this command was received does not correspond to the port controlling the call. This return code is possible only when relinquishing a port (Port Control Modifier value 00).
$11	The port in command is idle but should not be. Indicates that the circuit identified by the port address specified in the command (usually a controlling port or incoming port) is in the CP_IDLE MState and the command cannot be processed.
$23	An invalid port address is specified in the command. Indicates that the port address byte values do not fall within the range $00 00 to $07 FF, or $80 00 to $80 FF (virtual ports). This NSB also indicates an invalid conference number for host control modifiers 02 and 03.

System Response

A Call Control Modifier value of 00 (relinquish control) causes the switch to set the controlling host indicator to “no host” for the specified port and any other associated ports. An alternate host can subsequently take control of that port (and any/all associated ports by sending a command which affects that port.

A Port Control Modifier value of 01 (assume control) causes the switch to override any existing controlling host indicator for the specified port and any associated ports. The controlling host identifier for these ports is set to the host issuing the command. Assumption of control over a port is therefore equivalent to the aggregate behavior provided by a “relinquish control” command followed by normal host command processing which affects that port. Refer to Chapter 3, “Message Structure Overview,” or Appendix D, “Network Status Byte Definitions,” for more information.

A Call Control Modifier value of 02 (relinquish conference control by conference number) causes the switch to set the controlling host indicator to no host for the specified conference number. The controlling host identifier for the conference call, as well as for all individual interface ports involved in that conference, are also set to no host. An alternate host can subsequently take control of that conference call (and all associated ports) by sending a command which affects that conference call.

A Call Control Modifier value of 03 (assume conference control by conference number) causes the switch to override any existing controlling host indicator for the specified conference number. The controlling host identifier for the conference call, as well as for all individual interface ports involved in that conference, are also set to the host issuing the command. This command mode assists in load sharing among controlling hosts.

Examples

Example 4-66 $C0 05 Command

The following command instructs the system relinquish host control of the specified port address.

```
0405 06 0708
C005 00 nnnn
```

Function ID = C0 05 (Host Assume/Relinquish Port Control)

Port Control Modifier = 00 (Relinquish control)

Port Address = nnnn (represents specified port address)

Example 4-67 $C0 05 Command

The following command instructs the system to assume host control of the specified port address.

```
0405 06 0708
C005 01 nnnn
```

Function ID = C0 05 (Host Assume/Relinquish Port Control)

Port Control Modifier = 01 (Assume control)

Port Address = nnnn (represents specified port address)

System Reports

The system reports communicate the operating and call processing status of the system to the host. These reports fall into three categories—configuration control, system status, and resource control.

The system reports consist of a string of bytes immediately following the Network Header. Refer to Chapter 3, “Message Structure Overview.” Although the format of the reports varies, they all begin with a Function Identifier. Table 5-1 shows the report type and Function ID for each system report.

Table 5-1 System Reports and Function Identifiers

Function ID	Report Name	Report Type
$80	Resource Allocation	System Status
$81	Hardware Allocation	System Status
$82	Card Status	System Status
$83	Port Status	System Status
$D0	MF Digit	Resource Control
$D1 (Standard)	DTMF Digit	Resource Control
$D1 (Enhanced)	DTMF Digit	Resource Control
$D2	Permanent Signal Condition	Resource Control
$D3	Port Status	System Status
$D4	Spoken Digit	Resource Control
$D6	Resource Limitation	System Status
$D9	Card Status	System Status
$DA	Outgoing Port Change of State	Resource Control
$DB	Incoming Port Change of State	Resource Control
$DC	Active/Standby Mode	Configuration Control
$DD	Inpulse Rule Complete	Resource Control
$DE	Voice Port Status	Resource Control
$EA	ISDN Port Change of State	Resource Control
$ED	ISDN Inpulse Rule Complete	Resource Control
$F0	Alarm Condition	System Status

This chapter is divided into sections—one for each report—and arranged according to each report's Function ID.

The description for each report contains the following information:

- Report Type—Indicates if this is a Configuration Control, System Status, or Resource Control report.
- Destination VCA (Virtual Communications Address)—Specifies the Network Header Destination VCA byte value for this report.
- Description—Contains a brief overview of the actions that can be accomplished with this report.
- Action Causing Report Generation—Lists system commands or conditions that could cause this report.
- Format—Shows an example of the report with each byte identified and defined.
- Examples—Shows sample reports with a byte-by-byte analysis.

Each byte in a report is a hexadecimal (base 16) number. Most reports require you to convert this hexadecimal number into binary (base 2) or decimal (base 10) numbers to interpret the byte. A Decimal-Hexadecimal-Binary conversion table is provided in Appendix B.

Byte offset values under the Format heading are counted from the initial byte of the Network Header (byte offset 0 to 3). Interpret these values according to the following list.

Byte Offset	Meaning
a	A single byte.
a and b	Two consecutive bytes.
a to c	All consecutive bytes between a and c.
a/b	The second nibble of byte a and all of byte b.
a to n	A variable number of consecutive bytes between a and n, inclusive.
n + 1	A byte that follows a variable.

Note Unless otherwise stated, all MF processing described in this chapter applies to both MF and MFCR2 processing.

Resource Allocation ($80) Report

Report Type

System Status

Destination VCA

Same as Source VCA of command requesting this report.

Description

The Resource Allocation ($80) report returns a bit map containing the status of each port within a given range and specified resource group. This report takes the same form as the Request Resource Allocation ($80) command, with the port information attached. The $80 report shows if a port is of the specified resource group and whether it is on line or off line. Ports in the maintenance busy state are reported as being off line. This report does not specify if the port is idle or busy. Each status byte contains information on four adjacent ports.

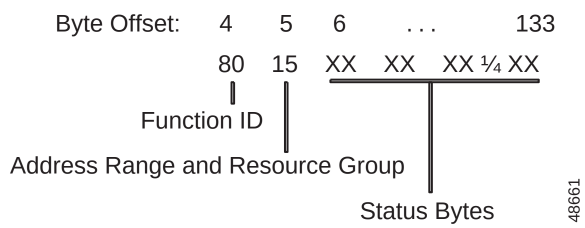
Action Causing Report Generation

The $80 report is generated in response to an $80 command. If the resource group for which the report is requested is empty, the report is returned with the $01 network status byte—message processing was successful—but without any $80 report status bytes attached.

Format

Figure 5-1 shows byte formatting for this report.

Figure 5-1 $80 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Address Range and Resource Group (byte offset 5)—Specifies the range of port addresses and resource group shown in this report; convert byte from hexadecimal to binary and interpret the bits as follows.

```
RRGGGGGG
```

RR—Specifies the address range.

00—Ports $00 to $1FF (0 to 511).

01—Ports $200 to $3FF (512 to 1023).

10—Ports $400 to $5FF (1024 to 1535).

11—Ports $600 to $7FF (1536 to 2047).

GGGGGG—Specifies the resource group; convert binary to decimal for group number (1 to 63).

Status Bytes (byte offsets 6 to 133)—Each report contains 128 Status Bytes; each Status Byte contains information for four adjacent ports. Ports are counted from lowest address to highest address within the requested range. Convert the byte from hexadecimal to binary and interpret the bits in pairs as described below.

Bit pair = 00—Port is not in this resource group.

01—Port is in this resource group but off line (port has been deactivated via the system administration Card Maintenance screen, busied out from the distant end, or resides on a card that is out of service).

10—Reserved (no meaning in this report).

11—Port is in this resource group and on line.

Examples

Example 5-1 $80 Report

The report below is in response to an $80 command.

```
04 05 06 07 08 09...nn
80 15 00 00 FF C1...55
```

Function ID = 80 (Resource Allocation)

Address Range and Resource Group = 00010101

RR = 00 (ports $00 - $1FF)

GGGGGG = 010101 (resource group 21)

Status Byte 1 = 00000000

Ports $0 to $3 not in group 21

Status Byte 2 = 00000000

Ports $4 to $7 not in group 21

Status Byte 3 = 11111111

Ports $8 to $11 in group 21 and on line

Status Byte 4 = 11000001

Port $12—Group 21, and on line

Port $13—Not in group 21

Port $14—Not in group 21

Port $15—In group 21 but off line

Status Byte 128 = 01010101

Port $1FC—Port in group 21 but off line

Port $1FD—Port in group 21 but off line

Port $1FE—Port in group 21 but off line

Port $1FF—Port in group 21 but off line

Example 5-2 $80 Report

The report below is in response to a Request Resource Allocation command for a resource group that is not defined in the database.

```
04 05
80 60
```

Function ID = 80 (Resource Allocation)

Address Range and Resource Group = 11000000

RR = 11 (ports $600 to $7FF)

GGGGGG = 000000 (resource group 0)

Hardware Allocation ($81) Report

Report Type

System Status

Destination VCA

Same as source VCA of command requesting this report.

Description

The Hardware Allocation ($81) report returns a bit map of ports within a given range. The report contains 66 bytes. The first two bytes contain the Function ID and Address Range information. The next 64 bytes contain hardware address information, with each byte representing 8 port addresses.

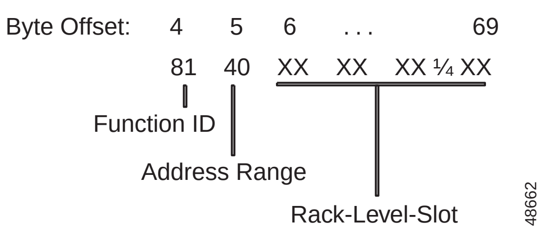
Action Causing Report Generation

The $81 report is generated in response to a Request Hardware Allocation ($81) command.

Format

Figure 5-2 shows the byte formatting for this report.

Figure 5-2 $81 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Address Range (byte offset 5)—Specifies the port address range for which the report was generated. Interpret the byte according to the following list.

- 00—Ports $00 to $1FF (0 to 511).
- 40—Ports $200 to $3FF (512 to 1023).
- 80—Ports $400 to $5FF (1024 to 1535).
- C0—Ports $600 to 7FF (1536 to 2047).

Rack-Level-Slot (byte offset 6 to 68)—Each report contains 64 rack, level, slot (R-L-S) bytes; each byte contains 8 port addresses worth of information. Interpret the bytes according to Table 5-2.

Table 5-2 R-L-S Byte Interpretation

Hexadecimal Values	R-L-S Range
$01 to $14	1-1-2 to 1-1-21
$15 to $29	1-2-1 to 1-2-21
$2A to $3E	1-3-1 to 1-3-21
$3F to $53	2-0-1 to 2-0-21
$54 to $68	2-1-1 to 2-1-21
$69 to $7D	2-2-1 to 2-2-21
$7E to $92	2-3-1 to 2-3-21

Example

Example 5-3 $81 Report

The report below gives the R-L-S locations for ports in the address range $200 to $3FF. Port addresses $220 to $237 correspond to a card in R-L-S location 1-2-2, and port addresses $2E0 to $2F8 correspond to a card in R-L-S location 1-3-9. All other port addresses in this range are not allocated. Because they are T1 cards, they have 24 port addresses assigned to them.

```
81 40 00 00 00 00 16 16 16 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
32 32 32 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00
```

No status bytes attached.

Card Status ($82) Report

Report Type

System Status

Destination VCA

Same as Source VCA of command requesting this report.

Description

The Card Status ($82) report informs the host of the status of a card. The card location is represented both by the port address and the physical rack, level, and slot (R-L-S) address. The report includes the status of the card and the type of the card.

One $82 report is generated for each card specified in a Card Status ($82) command. In the case of a multispan card, an $82 report is generated for each span in the slot.

The $82 report takes the form of a command returned with a $01 network status byte.

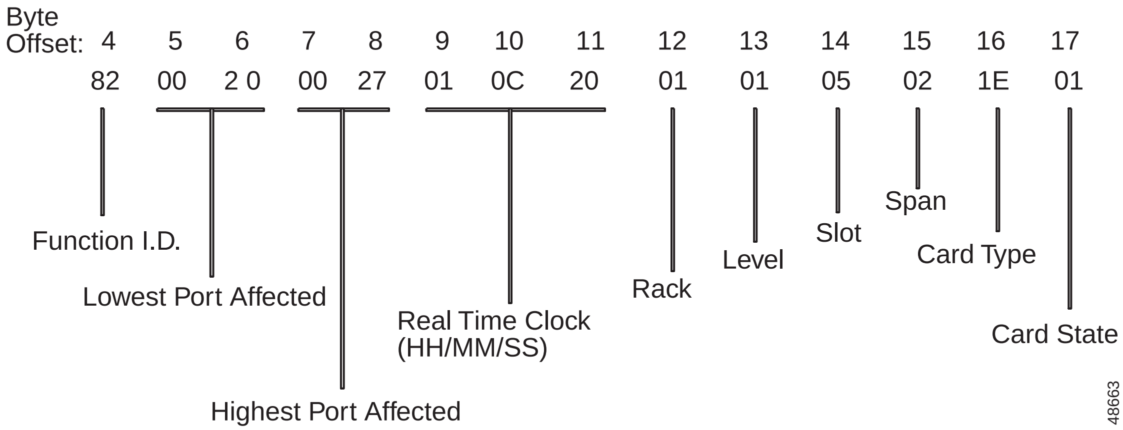
Action Causing Report Generation

The system's response to the $82 command is a separate $82 report for each card specified in the $82 command from the host. In the case of a multispan card, a separate $82 report is generated for each interface.

Format

Figure 5-3 shows the byte formatting for this report.

Figure 5-3 $82 Report Format



Function ID (byte offset 4)—Byte immediately following the network header; uniquely identifies the report from the system.

Lowest Port Affected (byte offsets 5 and 6)—Hexadecimal representation of the first port address on the card for which the report is sent. This is also useful in identifying the span for which the report is sent in the case of a multispan card. This field is set to $00 if the card is not found in the database.

Highest Port Affected (byte offsets 7 and 8)—Hexadecimal representation of the last port address on the card for which the report is sent. This is also useful in identifying the span for which the report is sent in the case of a multispan card. This field is set to $00 if the card is not found in the database.

Real Time Clock (byte offset 9 to 11)—Time represented in the format Hours:Minutes:Seconds; hours, minutes, and seconds are represented separately in hexadecimal.

Rack-Level-Slot Code (byte offsets 12 to 14)—Specifies the rack, level, and slot in which the card is located. Valid values are:

- 1 or 2—Rack.
- 0 through 3—Level.
- 1 to 21 (0 through 15 in hexadecimal)—Slot.

Convert the decimal value of the slot into hexadecimal for encoding. For multispan cards (4xE1/T1), if the query has a zero as the span specifier, (representing all four interfaces), there will be four responses, one for each interface. In this case, the $82 reports contain the same R-L-S for all the spans, but the lowest and highest ports affected are differentiated. The span specifier indicates the span for which the report is generated.

Span Code (byte offset 15)—Represents the interface (span) number for a multi-span card, for which the report is generated. The value is 1 for a single-span card status report.

Card Type (byte offset 16)—Type of the card for which the report is generated. This field is set to $00 if the card is not found in the database. The possible values of the field, if the card is present in the database, are as follows:

0x1—Subscriber Line Interface Card (SLIC-2)

0x3—E+M Trunk Card (E+M)

0x4—T1 Trunk Card (T1)

0x5—Digital Tone Generator (DTG)

0x6—Digital Voice Card (DVC)

0x8—DTMF Receiver Card 8 Port (DRC-8)

0xA—MF Receiver Card (MRC)

0xB—Direct Inward Dial Card (DID-2)

0xC—Universal Trunk Card (UTC-2)

0xD—Network Bus Controller (NBC)

0xE—Bus Repeater Card (BRC)

0xF— Digital Conference Card (DCC)

0x11—Speech Recognition Card (SRC)

0x12—Call Progress Analyzer (CPA)

0x13—Primary Rate Interface (PRI)

0x14—E1 Interface Card (E1)

0x15—MFCR2 Transceiver Card (MFCR2)

0x16—DTMF Receiver Card 24 Port (DRC-24)

0x17—DTMF Receiver Card 48 Port (DRC-48)

0x18—Integrated Play/Record Card 8 Port (IPRC-64)

0x19—Primary Rate Interface/NFAS (PRI/N)

0x1A—DPNSS E1-PRI (DPNSS)

0x1B—DASS2, Network Termination E1-PRI (NTDASS2)

0x1E—Four Span T1 Interface Card (4xT1)

0x1F—Four Span E1 Interface Card (4xE1)

0x20—Integrated Prompt/Record Card 8 Port (IPRC-8)

0x21—Integrated Prompt/Record Card 128 Port (IPRC-128)

0x22—MVDC-T1

0x23—MVDC-PRI

0x24—Net5 ISDN

0x27—Drop and Insert Card

0x28—Subrate Switch Card

0x29—J1 ISDN

0x46—Interface Controller Card/T1

0x47—Interface Controller Card/E1

0x50—Service Platform Card/DTMF

0x51—Service Platform Card/CPA

0x52—Service Platform Card/MFC

0x53—Service Platform Card/MFCR2

0x54—Service Platform Card/TONE

0x55—Service Platform Card/OUTP

0x56—Service Platform Card/CNF

0x60—Interface Controller Card/PRINI2

0x61—Interface Controller Card/PRI5ESS

0x62—Interface Controller Card/PRI4ESS

0x63—Interface Controller Card/PRINTI

0x64—Interface Controller Card/PRINTT

0x70—Interface Controller Card/PRI NET5

0x71—Interface Controller Card/PRI DPNSS

Card State (byte offset 17)—Card states are defined as follows:

00—Card not defined in database

01—Active

02—Maintenance

03—Diagnostic

04—Out of service

05—Standby

06—Camped on

07—Card in diagnostics mode with remote loopback

08—Card in diagnostics mode with payload loopback

FF—Unknown

Example

Example 5-4 $82 Report

The following $82 command requests the status of the cards 1, 1, 6 and 1, 1, 7.

```
04 050607 08 091011 12
82 010106 00 010107 02
```

Function ID = 82 (Card Status)

Starting RLS = 1, 1, 6

Span = all spans

Ending RLS = 1, 1, 7

Span = spans 1 and 2

The following two $82 reports are generated for the command in Example 5-4:

- First report:

  ```
  04 0506 0708 091011 12 13 14 15 16 17
  82 0020 003F 010C20 01 01 06 01 19 01
  ```

  Function ID = 82 (Card Status)

  Lowest Port Affected = 0020

  Highest Port Affected = 003F

  Real Time Clock = 1:12:32 am ($01 = 1; $0C = 12; $20 = 32)

  R-L-S = 1,1,6

Span = 1 (single span card)

Card Type = 19 (PRI/N card)

Card State = 01 (Active)

- Second report:

```
04 0506 0708 091011 12 13 14 15 16 17
82 0040 005F 010C20 01 01 07 01 1F 02
```

Function ID = 82 (Card Status)

Lowest Port Affected = 0040

Highest Port Affected = 005F

Real Time Clock = 1:12:32 am ($01 = 1; $0C = 12; $20 = 32)

RLS = 1,1,7

Span = 1 (span # 1)

Card Type = 1F (4 span E1 card)

Card State = 02 (Maintenance)

- Third report:

```
04 0506 0708 091011 12 13 14 15 16 17
82 0060 007F 010C20 01 01 07 02 1E 02
```

Function ID = 82 (Card Status)

Lowest Port Affected = 0060

Highest Port Affected = 007F

Real Time Clock = 1:12:32 am ($01 = 1; $0C = 12; $20 = 32)

RLS = 1,1,7

Span = 2 (span # 2)

Card Type = 1E (4 span E1 card)

Card State = 02 (Maintenance)

Port Status ($83) Report

Report Type

System Status

Destination VCA

Same as source VCA of the command requesting this report.

Description

The Port Status ($83) report informs the host of the status of a range of ports. The command, for which the report is generated, forms the leading portion of the report. This leading portion is followed by a series of port status report elements, each of which is three bytes long. The first two bytes specify the port address; the third byte specifies the call processing status of the port.

If the port range for which the status report is requested is such that one $83 report cannot accommodate all the port status report elements, the report is split into as many $83 reports as necessary. Such fragments are distinguished from each other through a continuity bit.

Up to 82 port status report elements can be in one $83 report, considering that the maximum length of the report is 256 bytes.

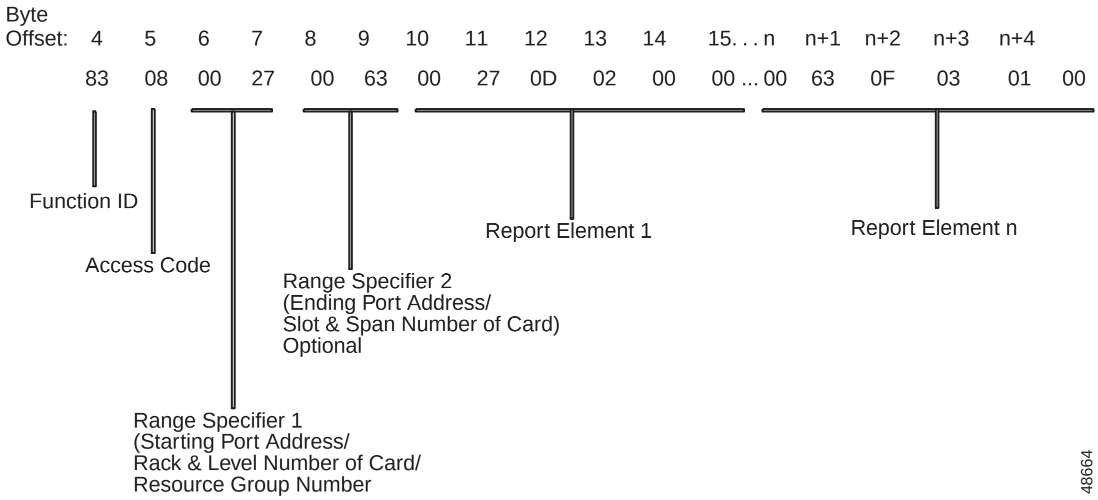
Action Causing Report Generation

The $83 command generates the $83 report. If the $83 command is successfully processed, the network status byte is set to $01.

Format

Figure 5-4 shows the byte formatting for this report.

Figure 5-4 $83 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Access Code (byte offset 5)—Copied from the Port Status ($83) command for which the report is being generated. Only bit C is modified, if required.

A port address range can be specified in different ways. The access code specifies the way in which the port address range is chosen.

```
C000 AGR0
```

C—Specifies fragments of an $83 report.

C = 1—This is a fragment of a $83 report in response to a $83 command and more fragments will be sent.

C = 0—This is the last or only fragment of the $83 report

A—Specifies the port address range.

A = 1—If port address range is specified.

A = 0—If the port address range is not specified.

G—Specifies the resource group.

G = 1—A resource group is specified.

G = 0—A resource group is not specified.

R—Specifies R-L-S-S information.

R = 1—R-L-S of the card is specified, with the span information.

R = 0—No R-L-S-S information is specified.

Range Specifier 1 (byte offsets 6 and 7)—Copied from the $83 command for which the report is being generated.

Range Specifier 2 (byte offsets 8 and 9)—This is an optional field in $83 reports. Copied from the $83 command for which the report is being generated.

Report Element 1 (byte offsets 10 to 14)—If Range Specifier 2 is not present, the first Report Element starts at byte offset 8. This forms the single report element containing the port status report for one port. Other similar report elements follow.

The first two bytes (byte offsets 10 and 11) specify the port address; the third byte (byte offset 12) specifies the call processing state of the port. Table 5-3 lists the possible port call processing major states.

Table 5-3 Report Element Content—Port Call Processing Major States

Hexadecimal Value	Major Call Processing State
0	CP_IDLE
1	CP_WAIT
2	CP_WWINK
3	CP_DIAL
4	CP_STAB
6	CP_WANS
7	CP_DCON
9	CP_GARD
0xB	CP_FEXC
0xC	CP_WTIM
0xD	CP_MBUSY
0xE	CP_MFWT
0xF	CP_SETUP
0x10	CP_PRIMARY
0x11	CP_RDR
0x12	CP_MF
0x13	CP_ATT
0x14	CP_DIAG
0x15	CP_DISC
0x16	CP_HOST
0x17	CP_FDIG
0x18	CP_DIG
0x19	CP_INPULSE
0x1A	CP_DTMF
0x1B	CP_TALK
0x1C	CP_TONE
0x1D	CP_CONF
0x1E	CP_MON
0x1F	CP_OUTPULSE
0x20	CP_WTONE
0x21	CP_SPEECH

Table 5-3 Report Element Content—Port Call Processing Major States (continued)

Hexadecimal Value	Major Call Processing State
0x22	CP_SELFTEST
0x23	CP_WTFSUP
0x24	CP_ANALYZE
0x25	CP_RECORD
0x26	CP_CPAMON
0x27	CP_DONECOLLECT
0x28	CP_DELAY
0x29	CP_WAITACK
0xFE[1]	CP_OOS
0xFF[2]	CP_NOTINDB

1. If the card containing the port is OOS.
2. If the card containing the port is not defined in DB.

Byte offset 13 indicates the supplementary state of the port with respect to the major state of the port. Table 5-4 lists the possible port call processing supplementary states.

Table 5-4 Report Element Content—Port Call Processing Supplementary States

Major State	Hexadecimal Value	Supplementary Call Processing State
Reorder	0x01	RDR_FBUSY
	0x02	RDR_QUIET
	0x04	RDR_DONE
TNK wait	0x01	WT_DTMF
	0x02	DIALING
	0x03	WT_DIAL
	0x04	WT_SPC
	0x04	WT_ANNC
	0x08	WT_BEEP
	0x10	SPC_ATT
	0x10	WT_TALK
	0x20	WT_PSC
	0x40	WT_TIM
	0x80	WT_MF
Guard	0x00	GD_NORMAL
	0x01	GD_WTRLS
	0x02	GD_WTRLSH

Table 5-4 Report Element Content—Port Call Processing Supplementary States (continued)

Major State	Hexadecimal Value	Supplementary Call Processing State
Diagnostic/maintenance busy	0x00	DIAG_IDLE
	0x01	DIAG_CMAINT
	0x02	DIAG_PATH
	0x03	DIAG_OEND
	0x04	DIAG_AUTO
	0x05	DIAG_INTRN
	0x06	DIAG_TEST
Conference port	0x01	CF_1WAY
	0x02	CF_2WAY
	0x04	CF_SET
	0x08	CF_ACK
	0x10	CF_RSRV
Receiver enabling	0x01	DLY_TIME
	0x04	DLY_WINK
	0x08	DLY_ANS
	0x10	DLY_ANN
Dialing	0x00	D_UNK
Outpulse rule	0x01	DIAL_DIG
	0x02	WAIT_SUP
	0x03	WAIT_TM
	0xFE[1]	CARD_OOS_STATE
	0xFF[2]	NOT_INDB_STATE

1. If the card containing the port is OOS.
2. Card containing the port is not defined in DB.

Byte offset 14 indicates the ISDN state of the port. Table 5-9 lists the possible values of the port call processing ISDN major states.

Table 5-5 Report Element Content—Port Call Processing ISDN Major States

Hexadecimal Value	ISDN Major State
0x00	PT_ACTIVE
0x01	PT_OOS_NE
0x02	PT_OOS_FE
0x03	PT_MAINT_NE
0x04	PT_MAINT_FE
0x05	PT_DCHAN
0x06	PT_OOS_FE_MAINT_NE

Table 5-5 Report Element Content—Port Call Processing ISDN Major States (continued)

Hexadecimal Value	ISDN Major State
0xFD[1]	PT_NON_CNTRLD
0xFE[2]	PT_OOS_STATE
0xFF[3]	PT_NOT_INDB

1. If the card containing the port is not ISDN controlled.
2. If the card containing the port is OOS.
3. Card containing the port is not defined in DB.

Byte offset 15 indicates the ISDN sub-state of the port. Table 5-6 lists the possible port call processing ISDN supplementary states.

Table 5-6 Report Element Content—Port Call Processing ISDN Supplementary States

Hexadecimal Value	ISDN Supplementary State
0x00	ISDN_IDLE
0x01	O_INITED
0x02	O_OVRLP
0x03	O_PRCEED
0x04	O_ACTIVE
0x05	O_DELIVRD
0x0B	I_CPRSNT
0x0C	I_OVRLP
0x0D	I_PRCEED
0x0E	I_CONNECT
0x0F	I_DELIVRD
0x10	I_ACTIVE
0x14	DISC_IND
0x15	DISC_REQ
0x16	DISC_RLS
0x80	ISDN_WAIT
0xFD[1]	PORT_NON_CNTRLD
0xFE[2]	PORT_OOS
0xFF[3]	PORT_NOT_INDB

1. If the card containing the port is not ISDN controlled.
2. If the card containing the port is OOS.
3. Card containing the port is not defined in DB.

Example

Example 5-5 $83 Report

The following command requests status reports for ports $27 and $28. The command specifies the range through port addresses:

```
04 05 0607 0809
83 08 0027 0028
```

Main command segment elements are as follows:

Function ID = 83 (Port Status)

Access Code = 0000 1000 (C000 AGRS)

C = 0; A = 1 (Address Range specified); G = 0; R = 0;

Starting Port Address = 0027

Ending Port Address = 0028

The following report is generated for the command in Example 5-5.

```
04 0506 0708 091011121314 15161718192021
83 0800 2700 2800270D02FD FD002800000000
```

Function ID = 83 (Port Status)

Access Code = 0000 1000 (C000 AGRS)

C = 0 (Only fragment); A = 1 (Address Range specified);

G = 0; R = 0; S = 0;

Starting Port Address = 0027 (Copied from command)

Ending Port Address = 0028 (Copied from command)

Port Address = 0027 (Report Element 1)

Port Status = 0D (CP_MBUSY)

Supplementary State = 02 (DIAG_PATH)

ISDN State = fd (Unknown)

ISDN Sub-state (Unknown)

Port Address = 0028 (Report Element 2)

Port Status = 00 (CP_IDLE)

Supplementary State = 00 (IDLE)

ISDN State = 00 (PT_ACTIVE)

ISDN Sub-state (ISDN Idle)

MF Digit ($D0) Report

> **Note** Unless otherwise stated, the MF processing described in this section applies to both MF and MFCR2 processing.

Report Type

Resource Control

Destination VCA

$40

Description

The MF Digit ($D0) report transfers MF digit collection information from the system to the host. Report indicates if the digit report is valid and the incoming port from which the digits were collected. If a collection error occurred, the present state of the Controlling Port (CP_SETUP or forced to idle) is also indicated. This report can be included as a report segment in an Inpulse Rule Complete ($DD) report.

The report indicates if garbled MF digits were detected by the receiver. A garbled MF digit is declared if one of the following conditions exists:

- Twist is greater than 8 dB.
- A single tone of the tone pair for all or part of the digit is present.
- More than two tones are present.

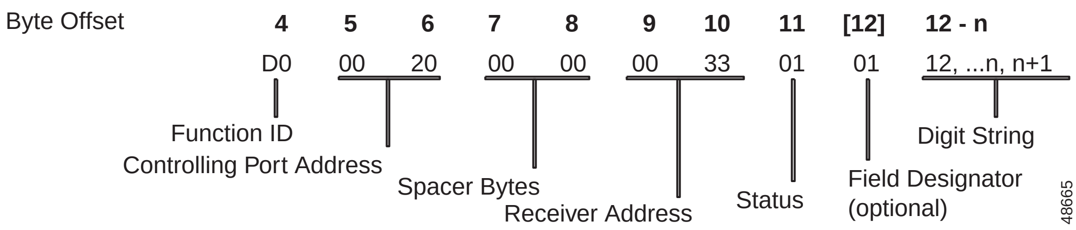
Action Causing Report Generation

The $D0 report is generated in direct response to an MF Collection Control command ($68), or as a result of inpulse rule processing. In MF processing, KP and ST are stripped from the digit report by the system. In MFCR2 processing, Group I-15 digits are stripped from the digit report by the system.

Format

Figure 5-5 shows the byte formatting for this report.

Figure 5-5 $D0 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies this report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the incoming port from which the digits were collected. Omitted if the report is included as a segment in a $DD report.

Spacer Bytes (byte offsets 7 and 8)—Reserved for future enhancements; always returned as 00 00. Omitted if the report is included as a segment in a $DD report.

Receiver Address (byte offsets 9 and 10)—Hexadecimal representation of the MF/MFCR2 receiver port processing the incoming digits.

Status (byte offset 11)—In MF processing, this byte indicates the status of the digit report; convert byte from hexadecimal to binary and interpret the bits as described below.

```
VS000XYZ
```

V—Specifies if the report from the MF receiver was garbled (digit on time > 6 seconds).

V = 0—Report not garbled.

V = 1—Report garbled.

S—If a collection error occurred (garbled digit, collection timer fired), specifies if the Controlling port has been forced to idle or placed into CP_SETUP.

S = 0—Controlling port forced to idle; V or Y is set to 1.

S = 1—Controlling port placed into CP_SETUP state to await further host action; V or Y is set to 1.

X—Specifies if MF receiver was available when initially requested.

X = 0—MF receiver available on initial request.

X = 1—MF receiver not available on initial request.

Y—Specifies if MF digit collection timer fired (KP not received within 15 seconds, ST not received within 30 seconds, or off time > 6 seconds).

Y = 0—MF digit collection timer did not fire.

Y = 1—MF digit collection timer fired.

Z—Specifies if this report contains a valid MF digit string.

Z = 0—Not a valid MF digit report.

Z = 1—Valid MF digit report.

In MFCR2 processing, this byte also indicates the status of the digit report. However, only the Y and Z bytes are converted from hexadecimal to binary as described below.

```
000000YZ
```

Y—Specifies if MFCR2 digit collection timer fired after 30 seconds.

Y = 0—MFCR2 digit collection timer did not fire.

Y = 1—MFCR2 digit collection timer fired.

Z—Specifies if this report contains a valid MFCR2 digit string.

Z = 0—Not a valid MFCR2 digit report.

Z = 1—Valid MFCR2 digit report.

Optional Field Designator/Digit String (byte offsets 12 to n)—When the “Enable Digit Field Reporting” feature is enabled from either Data Base Administration Menu or Maintenance Menu of the System Administrator database, the byte at offset 12 indicates into what field the system stores the reported digits (refer to the *Cisco VCO/4K System Administrator's Guide*). Possible byte values are as follows:

00—ANI Field.

01—Field 1.

02—Field 2.

03—Field 3.

04—Field 4.

05—Not stored in any field.

Digit String (byte offsets 12 + n to n)—Collected MF digits; digits represented are from 1 to 9, and 0 ($A). Each nibble in the hexadecimal byte represents a single digit. The Digit String always ends with an $F. The KP, ST, ST1, ST2, and ST3 digits are stripped from the digit string before the report is sent. If the “Enable Digit Field Reporting” feature is not enabled, then the Digit String bytes begin at byte offset 12. The Optional Field Designator and Digit String are included only when Z = 1 in the MF Status byte.

Examples

Example 5-6 $D0 Report

The following report shows an MF receiver port at address $34 used to collect three MF digits (1, 2, 3) from the incoming port at address $18. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 0506 0708 0910 11 12 13
D0 0018 0000 0034 01 12 3F
```

Main command segment elements are as follows:

Function ID = D0 (MF Digit)

Controlling Port Address = 0018

Spacer Bytes = 00 00

MF Receiver Address = 0034

MF Status = 00000001

V = 0 (report not garbled)

S = 0 (no meaning since V and Y = 0)

X = 0 (MF receiver available on initial request)

Y = 0 (MF digit collection timer did not fire)

Z = 1 (valid MF digit string collected)

Digit String = 123 (F marks end of string)

Example 5-7 $D0 Report

The report below shows the MF digit collection was aborted due to a timeout. The controlling port at address $021 was placed into CP_SETUP state to await further host action. No digits are reported.

```
04 0506 0708 0910 11
D0 0021 0000 0034 42
```

Main command segment elements are as follows:

Function ID = D0 (MF Digit)

Controlling Port Address = 0021

Spacer Bytes = 00 00

MF Receiver Address = 0034

MF Status = 01000010

V = 0 (report not garbled)

S = 1 (Controlling Port in CP_SETUP due to collection timeout)

X = 0 (MF receiver available on initial request)

Y = 1 (MF digit collection timer fired)

Z = 0 (no valid MF digit string collected)

No digit string attached

DTMF Digit ($D1) (Standard) Report

Report Type

Resource Control

Destination VCA

$40

Description

The DTMF Digit ($D1) (Standard) report transfers DTMF/DP digit collection information from the system to the host. The report indicates whether the digit report is valid and the line or trunk from which the digits were collected. If a timeout occurs, any digits collected up to that point are returned. This report can also indicate if one of the following conditions occurred:

- Report is generated for first digit receipt
- Voice prompt being presented was aborted
- Timeout occurred while waiting for supervision
- Digit field overflow (for append of collected digits) occurred
- Receiver port was not available at first request (hunting only)

This report can be included as a report segment in an Inpulse Rule Complete ($DD) report.

Action Causing Report Generation

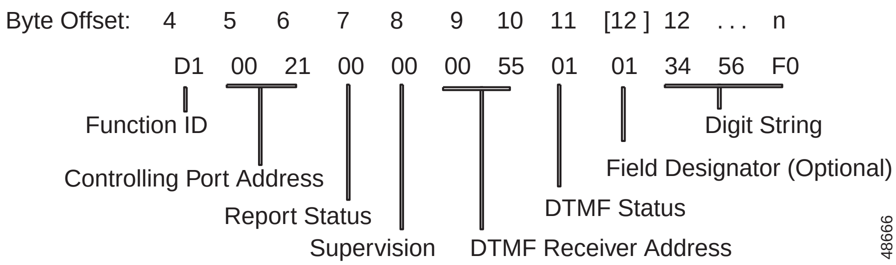
The $D1 report is generated in direct response to a DTMF Collection Control ($67) command, or as a result of inpulse rule processing. No distinction is made between DTMF or DP digits. If first digit reporting was specified by the host in the DTMF Collection Control ($67) command, digit collection produces two reports: the first report indicates it is a first digit report and contains only one digit; the second is a valid digit report with all collected digits, including the first digit that was previously reported.

An exception to first digit reporting is when the first digit entered is a single-digit end of string code ($F). In this case, the first digit report is returned with bit settings in the DTMF Status byte (offset 11) indicating a first digit report without a valid digit string (V = 1 and Z = 0).

Format

Figure 5-6 shows the byte formatting for this report.

Figure 5-6 $D1 (Standard) Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies this report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the line/trunk from which the digits were collected. Omitted if report included as a segment in a $DD report.

Report Status (byte offset 7)—Indicates if an event condition is reflected in this report, such as voice prompt abort or outgoing port detached when the first digit is detected, collection was aborted because expected supervision was not detected, or digit field overflow occurred. Omitted if the report is included as a segment in a $DD report. Convert the byte from hexadecimal to binary and interpret the bits as described below.

```
0VDTA000
```

V—Specifies if a voice prompt was aborted when the user entered the first digit.

V = 0—No prompt abort performed.

V = 1—Prompt aborted on first digit detection; no effect to digit collection.

D—Specifies if the outgoing port was detached from the call when the user entered the first digit.

D = 0—No outgoing detach performed.

D = 1—Outgoing port detached on first digit detection.

T—Specifies if digit collection was aborted because the supervision timer fired; type of supervision expected indicated in the Supervision byte (offset 8).

T = 0—Supervision timer did not fire.

T = 1—Digit collection aborted on supervision timeout; receiver removed from call.

A—Specifies if the digits collected and appended to one of the controlling port's digit fields did not fit into the field.

A = 0—No digit field overflow.

A = 1—Digit field overflow; excess digits discarded.

Supervision (byte offset 8)—When T = 1 in the Report Status byte, indicates the type of supervision that was expected but not received before the supervision timer fired. If T = 0, this byte is set to $00. Omitted if report included as a segment in a $DD report. Interpret byte according to the following list.

01—Wink expected but not received.

02—Answer expected but not received.

DTMF Receiver Address (byte offsets 9 and 10)—Hexadecimal representation of the DTMF receiver port processing the incoming digits. For SLIC, DID, and UTC ports, this address is the same as the Controlling Port Address.

DTMF Status (byte offset 11)—Indicates the status of the digit report; convert byte from hexadecimal to binary and interpret the bits as described below.

```
0T0VWXYZ
```

T—Specifies if the interdigit timer fired.

T = 0—Interdigit timeout did not fire.

T = 1—Interdigit timer fired.

V—Specifies a first digit report.

V = 0—Not a first digit report.

V = 1—First digit report. If Z = 1, only one digit is reported in a string. If Z = 0, no digit is reported (first digit was a single-digit end-of-string character).

W—Specifies if DTMF receiver was available when initially requested.

W = 0—DTMF receiver available on initial request.

W = 1—DTMF receiver not available on initial request.

X—Specifies if the DTMF digit collection timer fired.

X = 0—DTMF digit collection timer did not fire.

X = 1—DTMF digit collection timer fired.

Y—Specifies if the first digit timer fired before the first DTMF digit was received.

Y = 0—DTMF first-digit collection timer did not fire.

Y = 1—DTMF first-digit collection timer fired.

Z—Specifies if this report contains a valid DTMF digit string.

Z = 0—No DTMF digits reported.

Z = 1—DTMF digits reported.

Optional Field Designator/Digit String (byte offset 12 to n) – When the “Enable Digit Field Reporting” feature is enabled from either Data Base Administration Menu or Maintenance Menu of the System Administrator database, the byte at offset 12 indicates into what field the system stores the reported digits (refer to the *Cisco VCO/4K System Administrator's Guide*). Possible values are as follows:

00—ANI Field.

01—Field 1.

02—Field 2.

03—Field 3.

04—Field 4.

05—Not stored in any field.

Digit String (byte offsets 12 + n to n)—The DTMF digits collected; digits represented are from 1 to 9, and 0 ($A), plus the special characters * ($B) and # ($C). The digit string always ends with an $F. Each nibble in the hexadecimal byte represents a single digit. If the “Enable Digit Field Reporting” feature is not enabled, then the Digit String bytes begin at byte offset 12. The Optional Field Designator and Digit String are included only when Z = 1 in the DTMF Status byte.

Examples

Example 5-8 $D1 (Standard) Report

The following report shows a DTMF receiver at address $52 collected seven DTMF digits (1 to 7) from the port at address $18. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 0506 07 08 0910 11 12 131415
D1 0018 00 00 0052 01 12 34567F
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0018

Report Status = 00000000

V = 0 (no voice prompt abort performed)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 00000001

T = 0 (interdigit timer did not fire)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer did not fire)

Z = 1 (DTMF digit string reported)

Digit String = 1234567 (F marks end of string)

Example 5-9 $D1 (Standard) Report

The following report shows that a DTMF receiver at address $52 was enabled to collect digits from the port at address $18. One digit was received before the DTMF interdigit timer fired, so there is only one digit in this report. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 0506 07 08 0910 11 12
D1 0018 00 00 0052 41 9F
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0018

Report Status = 00000000

V = 0 (no voice prompt abort performed)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 01000001

T = 1 (interdigit timer fired)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer fired)

Z = 1 (DTMF digit string reported)

Digit String = 9 (F marks end of string)

Example 5-10 $D1 (Standard) Report

The following report shows a DTMF receiver at address $35 has received the first digit of a string and is reporting it to the host. A voice prompt was aborted when the first digit was received. The "Enable Digit Field Reporting" feature has not been enabled.

```
04 0506 07 08 0910 11 12
D1 0021 40 00 0052 11 5F
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0021

Report Status = 01000000

V = 1 (voice prompt aborted when the first digit was received)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 00010001

T = 0 (interdigit timer fired)

V = 1 (first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer fired)

Z = 1 (DTMF digit string reported)

Digit String = 5 (F marks end of string)

DTMF Digit ($D1) (Enhanced) Report

Report Type

Resource Control

Destination VCA

$40

Description

The DTMF Digit ($D1) (Enhanced) report transfers DTMF/DP digit collection information from the system to the host. The report indicates if the digit report is valid and the line or trunk from which the digits were collected. If a timeout occurs, any digits collected up to that point are returned. This report can also indicate if one of the following conditions occurred:

- Report is generated for first digit receipt,
- Voice prompt being presented was aborted.
- Timeout occurred while waiting for supervision.
- Digit field overflow (for append of collected digits) occurred.
- Receiver port was not available at first request (hunting only).

This report can be included as a report segment in an Inpulse Rule Complete ($DD) report.

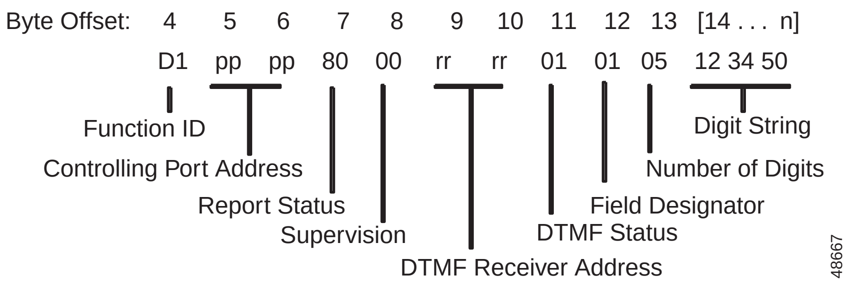
Action Causing Report Generation

The $D1 (Enhanced) report is generated in direct response to the 4th-column DTMF option being enabled, or as a result of inpulse rule processing. No distinction is made between DTMF or DP digits. If first digit reporting was specified by the host in the DTMF Collection Control ($67) command, digit collection produces two reports: the first report indicates it is a first digit report and contains only one digit; the second is a valid digit report with all collected digits, including the first digit that was previously reported.

Format

Figure 5-7 shows the byte formatting for this report.

Figure 5-7 $D1 (Enhanced) Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies this report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the line/trunk from which the digits were collected. Omitted if report included as a segment in a $DD report.

Report Status (byte offset 7)—Indicates the status of the digit report. Also, indicates if an event condition is reflected in this report, such as voice prompt abort or outgoing port detached when first digit detected, collection was aborted because expected supervision was not detected, or digit field overflow occurred. Omitted if the report is included as a segment in a $DD report. Convert the byte from hexadecimal to binary and interpret the bits as follows.

```
0VDTA000
```

V—Specifies if a voice prompt was aborted when the user entered the first digit.

V = 0—No prompt abort performed.

V = 1—Prompt aborted on first digit detection; no effect to digit collection.

D—Specifies if the outgoing port was detached from the call when the user entered the first digit.

D = 0—No outgoing detach performed.

D = 1—Outgoing port detached on first digit detection.

T—Specifies if digit collection was aborted because the supervision timer fired; the type of supervision expected is indicated in the Supervision byte (offset 8).

T = 0—Supervision timer did not fire.

T = 1—Digit collection aborted on supervision timeout; receiver removed from call.

A—Specifies if the digits collected and appended to one of the controlling port's digit fields did not fit into the field.

A = 0—No digit field overflow.

A = 1—Digit field overflow; excess digits discarded.

Supervision (byte offset 8)—When T = 1 in the Report Status byte, indicates the type of supervision that was expected but not received before the supervision timer fired. If T = 0, this byte is set to $00. Omitted if the report is included as a segment in a $DD report. Interpret the byte according to the following list:

01—Wink expected but not received.

02—Answer expected but not received.

DTMF Receiver Address (byte offsets 9 and 10)—Hexadecimal representation of the DTMF receiver port processing the incoming digits. For SLIC, DID, and UTC ports, this address is the same as the Controlling Port Address.

DTMF Status (byte offset 11)—Specifies that this report follows the enhanced report format; convert byte from hexadecimal to binary and interpret the bits as described below.

```
ET0VWXYZ
```

E—Specifies that this report is an enhanced DTMF digit report that is capable of reporting fourth-column DTMF digits.

E = 0—This report follows the old style report format.

E = 1—This report follows the enhanced report format.

T—Specifies if the interdigit timer fired.

T = 0—Interdigit timeout did not fire.

T = 1—Interdigit timer fired.

V—Specifies a first digit report.

V = 0—Not a first digit report.

V = 1—First digit report. If Z = 1, only one digit is reported in the string. If Z = 0, no digit is reported (first digit was a single-digit end-of-string character).

W—Specifies if DTMF receiver was available when initially requested.

W = 0—DTMF receiver available on initial request.

W = 1—DTMF receiver not available on initial request.

X—Specifies if DTMF digit collection timer fired.

X = 0—DTMF digit collection timer did not fire.

X = 1—DTMF digit collection timer fired.

Y—Specifies if the first digit timer fired before the first DTMF digit was received.

Y = 0—DTMF first-digit collection timer did not fire.

Y = 1—DTMF first-digit collection timer fired.

Z—Specifies if this report contains a valid DTMF digit string.

Z = 0—No DTMF digits reported.

Z = 1—DTMF digits reported.

Field Designator/Digit String (byte offset 12) – When the “Enable Digit Field Reporting” feature is enabled from the System Features screen of the System Configuration menu, this byte indicates into what field the system stores the reported digits (refer to the *Cisco VCO/4K System Administrator's Guide*). This byte is always present; if the feature is disabled, or if Z = 0 in the DTMF Status byte, then this byte is set to $05. Possible values are as follows:

00—ANI Field.

01—Field 1.

02—Field 2.

03—Field 3.

04—Field 4.

05—Not stored in any field.

Number of Digits (byte offset 13)—Specifies the number of digits contained in this report. This byte is set to $00 if Z = 0 in the DTMF status byte to indicate that there are no digits to be reported.

Digit String (byte offsets 14 – n)—The remaining bytes contain the DTMF digits collected. Digits are represented as 0 to 9, A to D, E (*), and F (#). Each byte in the digit string contains two digits. If the report contains an odd number of digits, the last nibble is set to $0; there is no digit string terminator.

The Digit string is included only when Z = 1 in the DTMF status byte to indicate that there are digits to be reported.

Examples

Example 5-11 $D1 (Enhanced) Report

The following report shows that a DTMF receiver at address $52 collected seven DTMF digits (1 to 7) from the port at address $18. The "Enable Digit Field Reporting" feature has not been enabled.

```
04 05060708 09 10 1112 13 14 15 16
D1 00180000 00 52 9107 12 34 56 70
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0018

Report Status = 00000000

V = 0 (no voice prompt abort performed)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 10000001

E = 1 (enhanced DTMF digit report)

T = 0 (interdigit timer did not fire)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer did not fire)

Z = 1 (DTMF digit string reported)

Digit String = 1234567 (0 marks end of byte)

Example 5-12 $D1 (Enhanced) Report

The following report shows that a DTMF receiver at address $52 was enabled to collect digits from the port at address $18. One digit was received before the DTMF interdigit timer fired, so there is only one digit in this report. The "Enable Digit Field Reporting" feature has not been enabled.

```
04 05060708 09 10 1112 13
D1 00180000 00 52 C101 90
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0018

Report Status = 00000000

V = 0 (no voice prompt abort performed)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 11000001

E = 1 (enhanced DTMF digit report)

T = 1 (interdigit timer fired)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer fired)

Z = 1 (DTMF digit string reported)

Digit String = 9 (0 marks end of byte)

Example 5-13 $D1 (Enhanced) Report

The following report shows that a DTMF receiver at address $35 has received the first digit of a string and is reporting it to the host. A voice prompt was aborted when the first digit was received. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 05060708 09 10 1112 13
D1 00214000 00 52 9101 50
```

Function ID = D1 (DTMF Digit)

Controlling Port Address = 0021

Report Status = 01000000

V = 1 (voice prompt aborted when first digit received)

D = 0 (no outgoing detach performed)

T = 0 (no supervision timer fired)

A = 0 (no digit field overflow)

Supervision = 00 (supervision timer is not set in the $67 command or the timer did not fire)

DTMF Receiver Address = 0052

DTMF Status = 10010001

E = 1 (enhanced DTMF digit report)

T = 0 (interdigit timer fired)

V = 1 (first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer fired)

Z = 1 (DTMF digit string reported)

Digit String = 5 (0 marks end of byte)

Permanent Signal Condition ($D2) Report

Report Type

Resource Control

Destination VCA

$44

Description

The Permanent Signal Condition ($D2) report informs the host that a line or trunk port has not released within 30 seconds of a release by the system. The report is also sent when a line/trunk that was in Permanent Signal Condition (PSC) goes back on hook.

Action Causing Report Generation

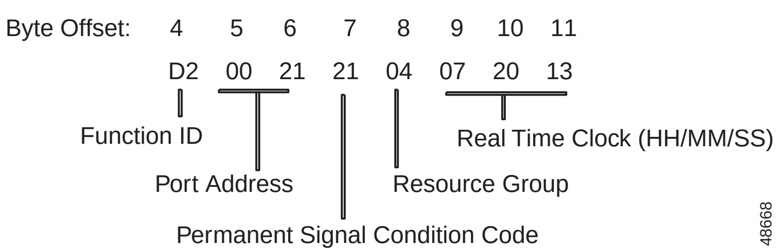
The $D2 report is generated if the system has tried to release a line/trunk and that port is still off hook after 30 seconds of inactivity. It is generated with a PSC code of $00 when line/trunk finally does release. When port goes on hook, this report may be accompanied by an Incoming Port Change of State ($DB) or Outgoing Port Change of State ($DA) report, depending upon the settings in the Incoming Port Control ($6A) or Outgoing Port Control ($69) command used in the call. Refer to Chapter 4, "System Commands," for more information.

The $D2 reports are never generated for ports with a class of service = A.

Format

Figure 5-8 shows the byte formatting for this report.

Figure 5-8 $D2 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Port Address (byte offsets 5 and 6)—Hexadecimal representation of the port for which this report was generated.

Permanent Signal Condition Code (byte offset 7)—Specifies the reason this report was sent. If this byte = $00, the port has gone back on hook and the PSC no longer exists. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
ABCDEFGH
```

A—Specifies if Permanent Signal processing started because one end of a stable call disconnected (on hook/hung up).

A = 0—PSC was not due to on hook.

A = 1—PSC was due to on hook.

B—Specifies if Permanent Signal processing started due to an error condition, outgoing port supervision error, port out of service, card out of service.

B = 0—PSC was not due to error condition.

B = 1—PSC was due to error condition.

C—Specifies if Permanent Signal processing was started because the host did not respond to an initial call report (host setup timing feature enabled).

C = 0—Host timeout was not responsible for PSC.

C = 1—Host timeout was caused PSC by not responding to initial call report.

D—Specifies if Permanent Signal Condition processing was started because host command released port or caused a forced disconnect.

D = 0—Host command was not responsible for PSC

D = 1—Host command caused PSC.

E—Specifies if Permanent Signal processing was started because there are no available MF receivers to satisfy a command or inpulse rule.

E = 0—MF receiver resource limitation was not responsible for PSC.

E = 1—PSC was caused by MF receiver resource limitation.

F—Specifies if PSC processing was started because of a system internal problem.

F = 0—System internal problem was not responsible for PSC.

F = 1—PSC was caused by a system internal problem.

G—Specifies if PSC processing was started because of garbled MF digits or an MF collection timeout.

G = 0—PSC was not caused by MF garbled digits/timeout.

G = 1—PSC was caused by MF garbled digits or timeout.

H—Indicates if a PSC exists.

H = 0—PSC was cleared; all other Permanent Signal Condition Code bits should also = 0.

H = 1—PSC was exists; reason for PSC specified in other Permanent Signal Condition Code bits.

Resource Group (byte offset 8)—Specifies the resource group number to which the port belongs; convert byte from hexadecimal to decimal for the group number (1 to 63 inclusive).

Real Time Clock (byte offset 9 to 11)—24-hour system clock indicating the time the status change occurred; hours, minutes, and seconds are represented separately in hexadecimal. Convert each byte from hexadecimal to decimal for the time.

Examples

Example 5-14 $D2 Report

Assume an incoming port was linked to an outgoing port in resource group 5 and at address $0028. When the incoming port went back on hook to end the call, the outgoing port did not release within 30 seconds. The following report shows a PSC for the outgoing trunk.

```
04 0506 07 08 091011
D2 0028 81 05 121E00
```

Function ID = D2 (Permanent Signal Condition)

Port Address = 0028

Permanent Signal Condition Code = 10000001

A = 1 (other port that was on hook hung up)

B = 0 (PSC was not due to an error)

C = 0 (host was not responsible for the PSC)

D = 0 (host command was not responsible for the PSC)

E = 0 (MF Receiver limitation was not responsible for the PSC)

F = 0 (System internal problem was not responsible for the PSC)

G = 0 (MF garbled digits/timeout was not responsible for the PSC)

H = 1 (PSC exists)

Resource Group = 5

Real Time Clock = 6:30:00 pm ($12 = 18; $1E = 30; $00 = 00)

Example 5-15 $D2 Report

The following report indicates that the outgoing port in Example 5-14 released, clearing the PSC.

```
04 0506 07 08 091011
D2 0028 01 05 122911
```

Function ID = D2 (Permanent Signal Condition)

Port Address = 0028

Permanent Signal Condition Code = 00000001

A = 0 (PSC was not due to on hook)

B = 0 (PSC was not due to an error)

C = 0 (host was not responsible for the PSC)

D = 0 (port was not responsible for the PSC)

E = 0 (MF Receiver limitation was not responsible for the PSC)

F = 0 (System internal problem was not responsible for the PSC)

G = 0 (MF garbled digits/timeout was not responsible for the PSC)

H = 1 (PSC was cleared)

Resource Group = 5

Real Time Clock = 6:41:17 pm ($12 = 18; $29 = 41; $11 = 17)

System Port Status ($D3) Report

Report Type

System Status

Destination VCA

$40

Description

The System Port Status ($D3) report informs the host of an attempted change in the status of a system resource port. The attempted change can be the result of the following:

- Activating or deactivating a port using the system administration Card Maintenance screen **P** command (refer to the *Cisco VCO/4K System Administrator's Guide*).
- Activating or deactivating a port using the Change Port Status ($90) command.
- Setting a voice path between ports using the system administration Set Up Paths screen and Port Reset screen (refer to the *Cisco VCO/4K System Administrator's Guide*).
- Detecting an inward seize for a port with COS = O or COS = 2 and internal COS = U; port is busied out by connected equipment.
- Using the Auto Makebusy feature; port is busied out after the specified number of supervision errors (1 to 255) have been detected for it (refer to the *Cisco VCO/4K System Administrator's Guide*).

Action Causing Report Generation

This report is generated when a change occurs in the operating status of an individual resource port on a system card. Status changes can be caused by an action at the system administrative console, an internally detected fault, or a host command.

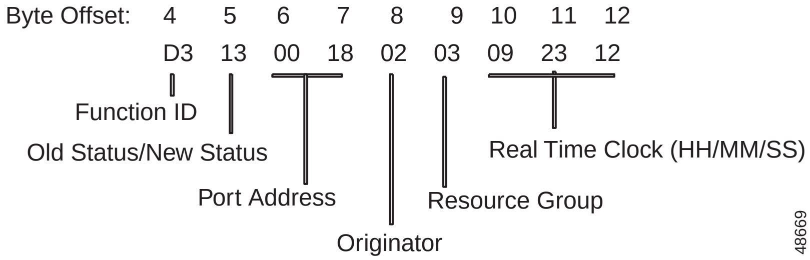
A report indicating a port's availability may be returned from a card in active, maintenance, diagnostic, or maintenance busy mode. When the card is in standby mode or out of service, the port cannot be used for a call and no $D3 reports are generated for the port.

Any $D3 report generated for the first port on the DTG card will always indicate no status change (this port is not supported and remains deactivated at all times). Also, port status changes applied to DTG ports are only performed on the ports residing on the active tone card. Although the ports on the standby tone card are assigned the same logical addresses as the ports on the active card, the $D3 report represents the status of the active tone card port.

Format

Figure 5-9 shows the byte formatting for this report.

Figure 5-9 $D3 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Old Status/New Status (byte offset 5)—Specifies the status of the port before the change occurred and the present status of the port. Convert the byte from hexadecimal to binary and interpret the bits as follows.

```
MMMMNNNN
```

MMMM—Specifies the status of the port before the change occurred.

MMMM = 0001—Resource was unavailable (out of service).

MMMM = 0011—Resource was on line and available.

NNNN—Specifies the current status of the port.

NNNN = 0001—Resource is currently unavailable (out of service).

NNNN = 0011—Resource currently on line and available.

Port Address (byte offsets 6 and 7)—Hexadecimal representation of port address for which the report is generated.

Originator (byte offset 8)—Specifies whether the change in status was originated by the system or the host and the reason for the change. Interpret the byte as follows:

01—Reason for change unknown; caused by host.

02—Reason for change unknown; caused by system.

12—Port busied out with the system administration Card Maintenance screen.

22—Port busied out with the system administration Set Up Paths screen.

32—Port busied out from distant end.

42—Port busied out because auto makebusy error threshold reached.

52—Port busied out due to internal card error (currently SRC only).

61—Port status changed by host ($90) command.

Resource Group (byte offset 9)—Specifies the resource group number to which the port belongs; convert byte from hexadecimal to decimal for the group number (1 to 63).

Real Time Clock (byte offsets 10 to 12)—A 24-hour system clock indicating the time the status change occurred; hours, minutes, and seconds are represented separately in hexadecimal. Convert each byte from hexadecimal to decimal for the time.

Examples

Example 5-16 $D3 Report

The following report indicates that the port at address $18, in resource group 3, is currently available due to a change originated by the system.

```
04 05 0607 08 09 101112
D3 13 0018 02 03 092312
```

Function ID = D3 (System Port Status)

Old Status/New Status = 00010011

MMMM = 0001 (resource was unavailable)

NNNN = 0011 (resource is currently on line and available)

Port Address = 0018

Originator = 02 (port was returned to service by the system)

Resource Group = 3

Real Time Clock = 9:35:18 am ($09 = 9; $23 = 35; $12 = 18)

Example 5-17 $D3 Report

The following report indicates that the port at address $21, in resource group 3, is currently unavailable because it has been busied out from the distant end.

```
04 05 0607 08 09 101112
D3 31 0021 32 03 0D2D00
```

Function ID = D3 (System Port Status)

Old Status/New Status = 00110001

MMMM = 0011 (resource was on line and available)

NNNN = 0001 (resource is currently unavailable)

Port Address = 0021

Originator = 32 (port was busied out from distant end)

Resource Group = 3

Real Time Clock = 1:45:00 pm ($0D = 13; $2D = 45; $00 = 00)

Spoken Digit ($D4) Report

Report Type

Resource Control

Destination VCA

$40

Description

The Spoken Digit ($D4) report transfers spoken digit collection information from the system to the host. The report indicates the following:

- Valid digit report.
- A wait-for-supervision time out.
- Incorrect supervision was received.
- A collection timer expired.

If a timeout occurs, any digits collected up to that point are reported.

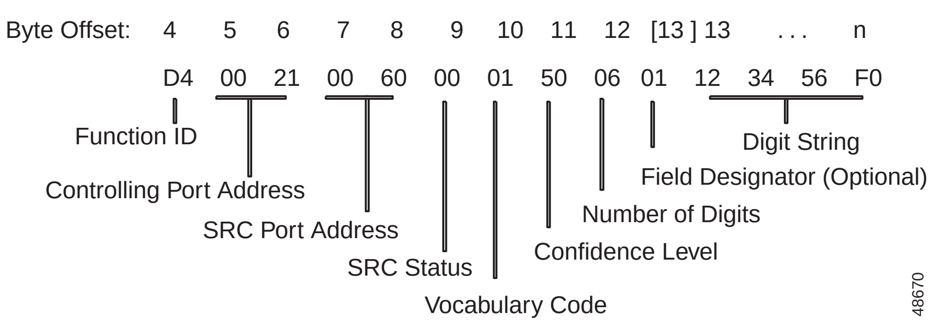
Action Causing Report Generation

The $D4 report is generated in response to a Speech Collection Control ($6E) command.

Format

Figure 5-4 shows the byte formatting for this report.

Figure 5-10 $D4 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the circuit address to which the SRC port is attached.

SRC Port Address (byte offsets 7 and 8)—Hexadecimal representation of the SRC port processing the digits.

SRC Status (byte offset 9)—Indicates the status of the digit report; convert byte from hexadecimal to binary and interpret the bits as described below.

```
00WSCIFD
```

W—Specifies if a supervision event other than what was expected was received. When W = 1, no digits are included in the report because the command specified to wait for supervision before enabling the SRC.

W = 0—Unexpected supervision event was not received.

W = 1—Unexpected supervision event was received; no digit string attached.

S—Specifies if no supervision event was detected before the wait for supervision timer fired; no digits are included in the report because the command specified to wait for supervision before enabling the SRC.

S = 0—The wait for supervision timer did not fire.

S = 1—The wait for supervision timer fired; no digit string attached.

C—Specifies if the field timer fired before all expected digits were received.

C = 0—Field timer did not fire.

C = 1—Field timer fired; digit string may be attached.

I—Specifies if the interdigit timer fired before all expected digits were received; at least one digit is reported in the digit string attached.

I = 0—Interdigit timer did not fire.

I = 1—Interdigit timer fired; digit string is attached.

F—Specifies if first digit timer fired before the first digit was received; no digits are included in this report.

F = 0—First digit timer did not fire.

F = 1—First digit timer fired; no digit string attached.

D—Specifies if valid digits were collected; digit string attached.

D = 0—Digit collection invalid; no digit string attached.

D = 1—Digit collection valid; digit string attached.

Vocabulary Code (byte offset 10)—Indicates if the SRC collected a digit string (0 to 9 and “oh”) or a word (yes or no). Interpret the byte as follows:

00—Digit string collected.

01—Word collected.

Confidence Level (byte offset 11)—Hexadecimal representation calculated by the SRC to represent the degree to which it believes the information contained in the report to be accurate. Convert to decimal for the per cent confidence level (0 to 99%, with 0 indicating no indication was received and 99 indicating almost complete accuracy).

Number of Digits (byte offset 12)—Hexadecimal representation of the number of digits included in the attached digit string. If 00, no digit string attached and this is the final byte of the report.

Optional Field Designator/Digit String (byte offset 12)—When the “Enable Digit Field Reporting” feature is enabled from either the Data Base Administration Menu or Maintenance Menu of the System Administrator database, the byte at offset 12 indicates into what field the system stores the reported digits or words (refer to the *Cisco VCO/4K System Administrator's Guide*). Possible values are as follows:

00—ANI Field.

01—Field 1.

02—Field 2.

03—Field 3.

04—Field 4.

05—Not stored in any field.

Digit String (byte offsets 13 to n)—The spoken digits/word collected. Digits are nibble packed; each nibble in the hexadecimal byte represents a single digit/word. When the Vocabulary Code = 00, digits are represented from 1 to 9, and 0 ($A). When the Vocabulary Code = 01, possible values are “Yes” (1) and “No” (0). The digit string always ends with an $F. If the “Enable Digit Field Reporting” feature is not enabled, then the Digit String bytes begin at byte offset 12. The Optional Field Designator and Digit String are included only when D = 1 in the SRC Status byte.

Examples

Example 5-18 $D4 Report

The following report indicates that the SRC port at port address $29 has collected seven spoken digits with an 84% confidence level. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 0506 0708 09 10 11 12 13 141516
D4 0060 0029 01 00 84 07 62 54A5AF
```

Function ID = D4 (Spoken Digit)

Controlling Port Address = 0060

SRC Port Address = 0029

SRC Status = 00000001

W = 0 (unexpected supervision event not received)

S = 0 (wait for supervision timer did not fire)

C = 0 (field timer did not fire)

I = 0 (interdigit timer did not fire)

F = 0 (first digit timer did not fire)

D = 1 (digit collection valid; digit string attached)

Vocabulary Code = 00 (digit string collected)

Confidence Level of Collection = 54 (84 percent, decimal)

Number of Digits = 07

Spoken Digits Collected = 6254A5A (F marks end of digit string)

Example 5-19 $D4 Report

The following example shows a typical $D4 report for a “Yes” or “No” speech recognition attempt on an SRC port located at port address $2A. The “Enable Digit Field Reporting” feature has not been enabled.

```
04 0506 0708 09 10 11 12 13
D4 0062 002A 01 01 63 01 1F
```

Function ID = D4 (Spoken Digit)

Controlling Port Address = $0062

SRC Port Address = 002A

SRC Status = 00000001

W = 0 (unexpected supervision event not received)

S = 0 (wait for supervision timer did not fire)

C = 0 (field timer did not fire)

I = 0 (interdigit timer did not fire)

F = 0 (first digit timer did not fire)

D = 1 (digit collection valid; digit string attached)

Vocabulary Code = 01 (word collected)

Confidence Level of Collection = $63 (99%, decimal)

Number of Digits = 01

Spoken Digits Collected = 1F (“Yes” was recognized)

Resource Limitation ($D6) Report

Report Type

System Status

Destination VCA

$44

Description

Use the Resource Limitation ($D6) report to inform the host when a resource limitation condition has been detected or cleared. When the condition is detected, the system informs the host there are no units in a specific resource group available to satisfy an allocation request (resource control command, inpulse rule, outpulse rule, etc.). This report is sent only the first time a limitation condition is detected for a resource group. No subsequent limitation condition reports are sent until after the condition has cleared. If the report is generated in response to a resource control command, the original command packet with the appropriate status ($1F in the network status byte) is returned.

For the resource limitation to clear, the system informs the host that resources in a group for which a $D6 report was generated have been successfully allocated for three consecutive requests.

Action Causing Report Generation

The $D6 report is generated for the first occurrence in a specific group until the condition clears. A limitation condition is declared in response to a host resource control command, inpulse rule processing, or outpulse rule processing when all resources of the type requested are busy or otherwise unavailable. The command must specify to hunt a resource group instead of requesting a specific port address.

For the Conference Control ($6D) command, this report is generated when all ports in the conference resource group are busy or unavailable.

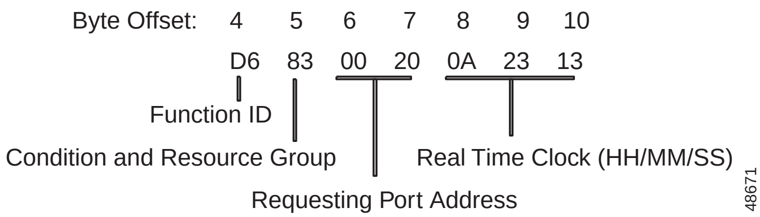
For internal service circuits (DRCs, MRCs, DVCs, IPRCs, DCCs, and CPAs), if no group exists that contains the resource type requested, this report is not sent.

This report is also generated after three consecutive successful allocations have occurred from a resource group for which allocation attempts have previously failed.

Format

Figure 5-11 shows the byte formatting for this report.

Figure 5-11 $D6 Command Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Condition (byte offset 5)—Specifies whether a limitation condition is present and the resource group for which the request was made. Convert the byte from hexadecimal to binary and interpret the bits as follows.

```
C0GGGGGG
```

C—Specifies if a limitation condition is present.

C = 0—Limitation condition is clear.

C = 1—Limitation condition is present; resource unavailable.

GGGGGG—Specifies the resource group; convert binary to decimal for group number (1 to 63).

Requesting Port Address (byte offsets 6 and 7)—Hexadecimal representation of the port specified in the resource control command, inpulse rule, or outpulse rule for which a resource was requested. For a conference control command, this byte is the hexadecimal representation of the conference number for which the port was requested. If the port address is in the range $80 00 to $80 FF. The requesting port is a virtual port.

Real Time Clock (byte offsets 8 to 10)—A 24-hour system clock indicating the time the $D6 report was generated. Hours, minutes, and seconds are represented separately in hexadecimal. Convert each byte from hexadecimal to decimal for the time.

Examples

Example 5-20 $D6 Report

The following report indicates that all ports in resource group 3 are unavailable. This report is sent the first time an allocation attempt fails for this group until the condition has cleared.

```
04 05 0607 080910
D6 83 0020 0A2313
```

Function ID = D6 (Resource Limitation)

Condition and Resource Group = 10000011

A = 1 (limitation condition present)

GGGGGG = 3 (resource group 3)

Requesting Port Address = 0020

Real Time Clock = 10:35:19am ($0A = 10; $23 = 35; $13 = 19)

Example 5-21 $D6 Report

The following report indicates that the limitation condition reported in Example 5-20 has cleared (three consecutive allocations from this group have been successfully performed).

```
04 05 0607 080910
D6 03 0038 0A3522
```

Function ID = D6 (Resource Limitation)

Condition and Resource Group = 00000011

  A = 0 (limitation condition cleared)

  GGGGGG = 3 (resource group 3)

Requesting Port Address = 0038

Real Time Clock = 10:53:34am ($0A = 10; $35 = 53; $22 = 34)

System Card Status ($D9) Report

Report Type

System Status

Destination VCA

$40

Description

The System Card Status ($D9) report informs the host of a change in the status of a system resource card. The card location is represented both by the port address and the physical rack, level, slot (R-L-S) address.

Action Causing Report Generation

The $D9 report is generated when a change occurs in the operating status of a system card. Status changes can be caused by an action at the System Administration console, a host command, or physical removal and/or replacement of the card. The report is also sent for each card in the system as it comes on line after a system boot.

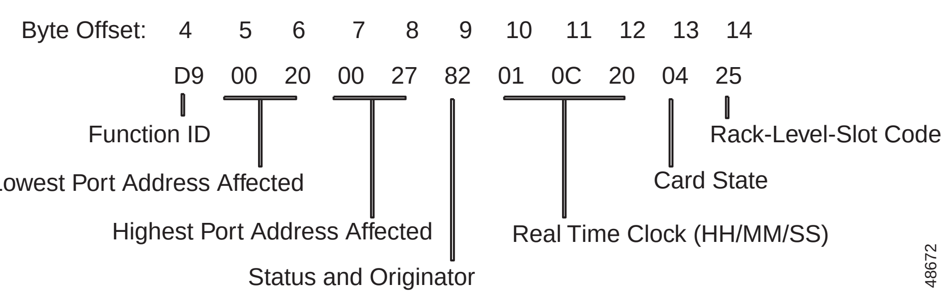
For T1, the card is reported as on line when the carrier and remote carrier alarms clear. If either the carrier alarm or remote carrier alarm reoccurs, the card is reported as being off line.

For DVC and IPRC, the card is reported as on line when the card download is complete.

Format

Figure 5-12 shows the byte formatting for this report.

Figure 5-12 $D9 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Lowest Port Address Affected (byte offsets 5 and 6)—Hexadecimal representation of the first port address on the card for which the report is sent.

Highest Port Address Affected (byte offsets 7 and 8)—Hexadecimal representation of the last port address on the card for which the report is sent.

Status and Originator (byte offset 9)—Specifies if the card is on line or off line, if the card was just added to or deleted from the database, and whether the change in status was originated by the system or the host. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
LDA000SH
```

L—Specifies if card is on line or off line.

L = 0—Card is on line.

L = 1—Card is off line.

D—Specifies if card was just deleted from the database.

D = 0—Card is not deleted from the database.

D = 1—Card was just deleted from the database.

A—Specifies if card was just added to the database.

A = 0—Card is not added to the database.

A = 1—Card was just added to the database.

S—Specifies if the change was due to some action by the system (such as an alarm/error condition or change made via system administration).

S = 0—System was not responsible for the change.

S = 1—System originated the change.

H—Specifies if the change was due to some action by the host computer.

H = 0—Host was not responsible for the change.

H = 1—Host originated the change.

Real Time Clock (byte offsets 10 to 12)—A 24-hour system clock indicating the time the status change occurred. Hours, minutes, and seconds are represented separately in hexadecimal. Convert each byte from hexadecimal to decimal for the time.

Card State (byte offset 13)—Indicates the present status of the card for which the report is generated. Interpret this byte as follows:

00—Card is in an unknown state.

01—Card is in the active state.

02—Card is in the maintenance state.

03—Card is in the diagnostic state (not valid for BRC).

04—Card is in the out of service state.

05—Card is in the standby state (valid for BRC and DTG only).

06—Card is in the camped on state. An attempt was made to place the card into the diagnostics state with the system administration Card Maintenance screen. The card remains in this state until further system administration action. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information.

Rack-Level-Slot Code (byte offset 14)—Specifies the rack, level, and slot in which the card is located. Convert the byte from hexadecimal to binary and interpret as follows:

```
LLLSSSSS
```

LLL—Rack and level on which the card is located; interpret as follows:

001—Rack 1, Level 1.

010—Rack 1, Level 2.

011—Rack 1, Level 3.

100—Rack 2, Level 0.

101—Rack 2, Level 1.

110—Rack 2, Level 2.

111—Rack 2, Level 3.

SSSSS—Slot number in which the card is located. Convert the value from binary to decimal for the slot number (1 to 21).

Note For a multispan card, the command includes a port range of 24 channels. If the card is removed or deleted, the report is issued multiple times.

Examples

Example 5-22 $D9 Report

The following report indicates that the card at rack 1, level 1, slot 5 was taken out of service through a System Administration console command.

```
04 0506 0708 09 101112 13 14
D9 0020 0027 82 010C20 04 25
```

Function ID = D9 (System Card Status)

Lowest Port Address Affected = 0020

Highest Port Address Affected = 0027

Status and Originator = 10000010

L = 1 (card off line)

D = 0 (card not deleted from database)

A = 0 (card not added to database)

S = 1 (system originated change)

H = 0 (host not responsible for change)

Real Time Clock = 1:12:32 am ($01 = 1; $0C = 12; $20 = 32)

Card State = 04 (card out of service)

Rack-Level-Slot Code = 00100101

LLL = 001 (rack 1, level 1)

SSSSS = 5 (Slot 5)

Example 5-23 $D9 Report

The following report indicates that the card at rack 2, level 0, slot 20 was added to the system database but is still off line.

```
04 0506 0708 09 101112 13 14
D9 0018 001F A2 142D00 04 94
```

Function ID = D9 (System Card Status)

Lowest Port Address Affected = 0018

Highest Port Address Affected = 001F

Status and Originator = 10100010

L = 1 (card off line)

D = 0 (card not deleted from database)

A = 1 (card added to database)

S = 1 (system originated change)

H = 0 (host not responsible for change)

Real Time Clock = 8:45:00 pm ($14 = 20; $2D = 45; $00 = 00)

Card State = 04 (card out of service)

Rack-Level-Slot Code = 10010100

LLL = 100 (rack 2, level 0)

SSSSS = 20 (Slot 20)

Outgoing Port Change of State ($DA) Report

Note Unless otherwise stated, the MF processing described in this section applies to both MF and MFCR2 processing.

Report Type

Resource Control

Destination VCA

$40

Definition

In MF processing, the Outgoing Port Change of State ($DA) report informs the host of a change in the hardware state of an outgoing system port. Note that in-band signaling is only detected during outpulse rule processing when a CPA port is attached. This report can also be issued to indicate that an outpulse rule has successfully completed for the outgoing port.

Supervision errors are indicated by the appropriate value in the Change byte. The Change byte also indicates when a rehunt of an outgoing port is performed. When a rehunt occurs, the new outgoing port is indicated in byte offsets 14 and 15.

For the system to generate this report indicating outpulse rule completion, a REP END token must be contained in the outpulse rule.

In MFCR2 processing, this report indicates the final backward supervision tone detected to the host as part of the R2 signaling on outgoing trunks. This tone is indicated in the Answer Supervision Code (byte offset 9). Values of 33 xx indicate the backward supervision tone, where xx indicates the Group-A or Group-B tone (the tone meaning is subject to the context of the call).

The supervision template (byte offset 13) indicates the number of the outpulse rule used during MFCR2 outpulsing.

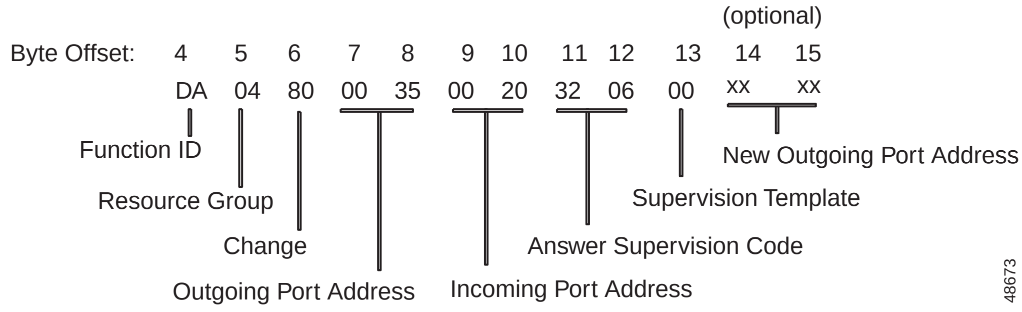
Action Causing Report Generation

The $DA report is generated in response to a change in the hardware state of an outgoing port or the end of outpulse rule processing (REP END in outpulse rule).

Format

Figure 5-13 shows the byte formatting for this report.

Figure 5-13 $DA Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Resource Group (byte offset 5)—Specifies the resource group number to which the port belongs; convert byte from hexadecimal to decimal for the group number (1 to 63).

Change (byte offset 6)—Type of change detected. The following list provides a general indication of the change that occurred for the outgoing port.

01—Call attempt failed (FAIL token in answer supervision template).

02—Outgoing port rehunt performed due to supervision error; new outgoing port address supplied in byte offsets 14 and 15 (ERROR token in answer supervision template).

04—Outpulse rule processing has completed for this port; rule number specified in byte offset 11 (REP END in outpulse rule).

05—Outpulse rule processing aborted (QUIT token in answer supervision template).

08—Supervision detected outside of a rule (prior to executing a supervision control outpulse rule token or after the token is satisfied).

10—Supervision detected during rule processing (REP, OKREP or ANSREP token in answer supervision template).

20—Supervision error detected; no rehunt performed (ERROR token in answer supervision template).

40—Port became inactive (on hook).

80—Port became active (went off hook or REP, OKREP or ANSREP token in answer supervision template).

Outgoing Port Address (byte offsets 7 and 8)—Hexadecimal representation of the address of the port for which the state change was detected.

Incoming Port Address (byte offsets 9 and 10)—Hexadecimal representation of the incoming port address to which this outgoing port was connected.

Answer Supervision Code (byte offset 11 and 12)—For Change = 01, 02, 05, 08, 10, 20, or 80, indicates the type of answer supervision activity present on this outgoing port. If Change = 40, these bytes are set to 00 00. If Change = 04, byte offset 11 contains the number of the outpulse rule processed; byte offset 12 is set to 00.

Table 5-7 lists the standard supervision codes for MF/MFCR2 processing.

Table 5-7 Standard Supervision Codes for MF/MFCR2 Processing

Code	Meaning
30 01	Simultaneous seizure at both ends of a trunk (glare condition).
30 02	Attempt made to answer a non-ringing port.
30 04	Supervision timer expired.
30 05	No current on line.
31 01	Reorder tone detected.
31 02	Busy signal detected.
31 03	Ringback detected.
31 04	Dial tone detected.
31 05	SIT tones detected.
31 06	Pager cue tone detected.
31 07	ISUP tone detected.
31 08	ISUP tone cessation.
32 01	Grace time completed.
32 02	Ringback cessation.
32 03	Wink detected.
32 04	Hook flash detected.
32 06	True answer detected.
32 07	Voice detected.
32 08	Voice cessation.
32 09	Outgoing port returned to CP_SETUP.

Table 5-8 lists the R2 backward signaling codes for MFCR2 processing.

Table 5-8 R2 Backward Signaling Codes for MFCR2 Processing

Code	Backward Tone Detected
33 00	A-10/B-10
33 01	A-1/B-1
33 02	A-2/B-2
33 03	A-3/B-3
33 04	A-4/B-4
33 05	A-5/B-5
33 06	A-6/B-6
33 07	A-7/B-7
33 08	A-8/B-8
33 09	A-9/B-9
33 0B	A-11/B-11

Table 5-8 R2 Backward Signaling Codes for MFCR2 Processing (continued)

Code	Backward Tone Detected
33 0C	A-12/B-12
33 0D	A-13/B-13
33 0E	A-14/B-14
33 0F	A-15/B-15

Supervision Template (byte offset 13)—For MFCR2 processing, this byte indicates the outpulse rule used for R2 outdialing.

For MF processing, this byte indicates whether the outgoing port is considered answered (ANS condition token processed in answer supervision template or FINAL SUP [xx] outpulse rule token satisfied), and specifies the number of the answer supervision template used. The byte is set to 00 for call failures and supervision errors. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
A0NNNNNN
```

A—Indicates whether the outgoing port is considered answered.

A = 0—Outgoing port is not considered answered.

A = 1—Outgoing port is considered answered.

NNNNNN—Specifies the answer supervision template used. Convert the value from binary to decimal for the template number. When this value is zero, either the A template or W template was used. If the $DA report indicates the port is either on-hook or off-hook and A = 0, the W (wink) template was applied. If the $DA report indicates the port is off-hook and A = 1, the A (answer) template was applied.

New Outgoing Port (byte offset 14 and 15)—For Change = 02, indicates new Outgoing Port selected by the system as a result of a rehunt operation (outgoing supervision error encountered). The type of error is indicated in the Answer Supervision Code bytes. Not included unless Change = 02.

Examples

Example 5-24 $DA Report

The following report indicates that the outgoing port which is at address $35 and connected to the incoming port at address $20 has gone off hook. Answer supervision has been detected (SLIC, T1, E+M, or UTC only).

```
04 05 06 0708 0910 1112 13
DA 04 80 0035 0020 3206 00
```

Function ID = DA (Outgoing Port Change of State)

Resource Group = 4

Change = off hook ($80)

Outgoing Port Address = 0035

Incoming Port Address = 0020

Answer Supervision Code = 3206 (true answer detected - answered with reversal)

Supervision Template = 00 (no answer supervision template used)

Example 5-25 $DA Report

The following report indicates that the outgoing port which is at address $35 and was connected to the incoming port at address $20 has gone on hook.

```
04 05 06 0708 0910 1112 13
DA 04 40 0035 0020 0000 00
```

Function ID = DA (Outgoing Port Change of State)

Resource Group = 4

Change = on hook ($40)

Outgoing Port Address = 0035

Incoming Port Address = 0020

Answer Supervision Code = 00 00 (because Change = $40)

Supervision Template = 00 (no answer supervision template used)

Example 5-26 $DA Report

The following report indicates that a supervision error occurred on an outgoing port at address $35 that was being connected to the incoming port at address $20. The outgoing port ($35) is removed from the call and the incoming port ($20) is placed into CP_SETUP state (no rehunt performed). Answer supervision template #2 specifies detection of SIT tones as an error condition.

```
04 05 06 0708 0910 1112 13
DA 04 20 0035 0020 3105 02
```

Function ID = DA (Outgoing Port Change of State)

Resource Group = 4

Change = supervision error detected ($20) Outgoing Port Address = $0035

Incoming Port Address = 0020

Answer Supervision Code = 31 05 (SIT tones detected)

Supervision Template = 02 (answer supervision template used)

Example 5-27 $DA Report

The following report indicates that supervision was received outside of outpulse rule processing. The circuit at 00 35 is a T1 port.

```
04 05 06 0708 0910 1112 13
DA 04 08 0035 0020 3203 00
```

Function ID = DA (Outgoing Port Change of State)

Resource Group = 4

Change = supervision detected outside an outpulse rule ($08)

Outgoing Port Address = 0035

Incoming Port Address = 0020

Answer Supervision Code = 32 03 (wink detected)

Supervision Template = 00 (no answer supervision template used)

Example 5-28 $DA Report

The following report indicates that a supervision error caused the system to rehunt to replace the outgoing port at address $035. The new outgoing port is supplied in the final two bytes.

```
04 05 06 0708 0910 1112 13 1415
DA 04 02 0035 0020 3101 00 0038
```

Function ID = DA (Outgoing Port Change of State)

Resource Group = 4

Change = outgoing rehunt performed; new outgoing port in final two bytes

Outgoing Port Address = 0035

Incoming Port Address = 0020

Answer Supervision Code = 3101 (reorder signal detected)

Supervision Template = 00 (no answer supervision template used)

New Outgoing Port Address = 0038

Incoming Port Change of State ($DB) Report

Report Type

Resource Control

Destination VCA

$40

Definition

The Incoming Port Change of State ($DB) report informs the host of a change in the hardware state of an incoming system port. Also indicates if an outpulse rule has been processed for the incoming port. This report can be included as a report segment in an Inpulse Rule Complete ($DD) report.

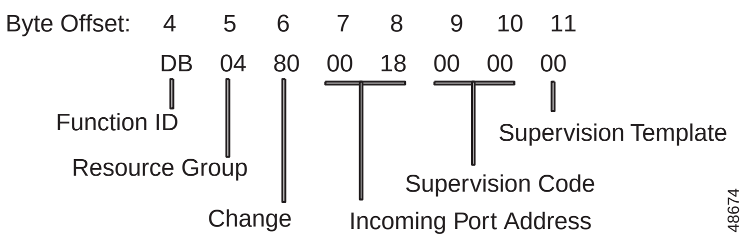
Action Causing Report Generation

The $DB report is generated in response to a change in the hardware state of an incoming port or completion of an outpulse rule.

Format

Figure 5-14 shows the byte formatting for this report.

Figure 5-14 $DB Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Resource Group (byte offset 5)—Specifies the resource group number to which the port belongs; convert byte from hexadecimal to decimal for the group number (1 to 63 inclusive). Omitted if the report is included as a segment in a $DD report.

Change (byte offset 6)—Type of change detected. Interpret the byte as follows:

01—Call attempt failed (FAIL token in answer supervision template).

02—Outgoing port rehunt was performed due to a supervision error; a new outgoing port address is supplied in byte offsets 14 and 15 (ERROR token in answer supervision template).

04—Outpulse rule processing has completed for this port; rule number is specified in byte offset 9 (REP END token in outpulse rule).

05—Outpulse rule processing was aborted (QUIT token in answer supervision template).

08—Supervision detected outside of a rule (prior to executing a supervision control outpulse rule token or after the token is satisfied).

10—Supervision was detected during rule processing (REP, OKREP or ANSREP token in answer supervision template).

20—Supervision error was detected; no rehunt performed (ERROR token in answer supervision template).

40—Port became inactive (on hook).

80—Port became active (went off hook or REP, OKREP or ANSREP token in answer supervision template).

Incoming Port Address (byte offsets 7 and 8)—Hexadecimal representation of the address of the port for which the state change was detected. Omitted if the report included as a segment in a $DD report.

Answer Supervision Code (byte offsets 9 and 10)—Specifies the supervision error or the number of the outpulse rule completed. If Change = 40, these bytes are set to 00 00. When Change = 01, 02, 05, 08, 10, 20, or 80, interpret the bytes as follows:

30 01—Simultaneous seizure at both ends of a trunk (glare condition).

30 02—Attempt made to answer a non-ringing port.

30 04—Supervision timer expired.

30 05—No current on line.

31 01—Reorder tone detected.

31 02—Busy signal detected.

31 03—Ringback detected.

31 04—Dial tone detected.

31 05—SIT tones detected.

31 06—Pager cue tone detected.

31 07—ISUP tone detected.

31 08—ISUP tone cessation.

32 01—Grace time completed.

32 02—Ringback cessation.

32 03—Wink detected.

32 04—Hook flash detected.

32 06—True answer detected.

32 07—Voice detected.

32 08—Voice cessation.

32 09—Outgoing port returned to CP_SETUP.

When Change = 04, byte offset 9 specifies the outpulse rule number completed; byte offset 10 is set to 00. Convert from hexadecimal to decimal for the rule number.

Supervision Template (byte offset 11)—Specifies the number of the answer supervision template used. The byte is set to 0 for call failures and supervision errors. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
A00NNNNNN
```

A—Indicates whether the outgoing port is answered.

A = 0—Outgoing port not answered.

A = 1—Outgoing port answered.

NNNNNN—Specifies the answer supervision template used. Convert from binary to decimal for the template number. When this value is zero, either the A template or W template was used. If an associated $DB report indicates the port is off-hook and A = 0, the W (wink) template was applied. If an associated $DB report indicates the port is off-hook and A = 1, the A (answer) template was applied.

Examples

Example 5-29 $DB Report

The following report indicates that the port at address $20 has gone off hook.

```
04 05 06 0708 0910 11
DB 04 80 0020 0000 00
```

Function ID = DB (Incoming Port Change of State)

Resource Group = 4

Change = off hook ($80)

Incoming Port Address = 0020

Supervision Code = 00 00

Supervision Template = 00 (no answer supervision template used)

Example 5-30 $DB Report

The following report indicates that the port at address $20 has gone on hook.

```
04 05 06 0708 0910
DB 04 40 0020 0000
```

Function ID = DB (Incoming Port Change of State)

Resource Group = 4

Change = on hook ($40)

Incoming Port Address = 0020

Supervision Code = 00 00

Supervision Template = 00 (no answer supervision template used)

Example 5-31 $DB Report

The following report indicates that the system attempted to answer a nonringing incoming port. This port must be a UTC circuit (only UTC ports report this condition).

```
04 05 06 0708 0910 11
DB 04 20 0020 3002 00
```

Function ID = DB (Incoming Port Change of State)

Resource Group = 4

Change = supervision error ($20)

Incoming Port Address = 0020

Supervision Code = 30 02

Supervision Template = 00 (no answer supervision template used)

Example 5-32 $DB Report

The following report indicates that an outpulse rule has completed processing for the port at $0020. The outpulse rule included a REP END to generate this report.

```
04 05 06 0708 0910 11
DB 04 04 0020 0500 00
```

Function ID = DB (Incoming Port Change of State)

Resource Group = 4

Change = Outpulse rule complete ($04)

Incoming Port Address = 0020

Supervision Code = Outpulse rule 5

Supervision Template = 00 (no answer supervision template used)

Active/Standby Mode ($DC) Report

Report Type

Configuration Control

Destination VCA

$40

Description

The Active/Standby Mode ($DC) report informs the host of a system boot, system initialization, or transfer in control between the active and standby sides of a redundant system. It also reports when a link between the host and the system becomes established. In a redundant system, both the active and standby sides report a transfer.

Action Causing Report Generation

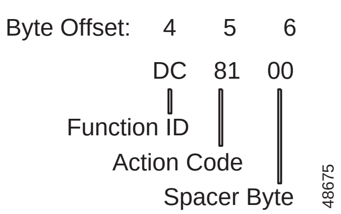
A $DC report is sent when system boots, system initialization is complete, or when a transfer of control occurs. Transfer could be caused by a Change Active Controllers ($C0 01) command or an event internal to the system.

The $DC report is also sent over a host-system link when that link becomes active. A report is sent by each link in the system. System reboot causes all links to reset.

Format

Figure 5-15 shows the byte formatting for this report.

Figure 5-15 $DC Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Action Code (byte offset 5)—Specifies why the report is sent, which side sent the report, and whether that side is active or standby. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
RI0000SM
```

R—Specifies the reason the report is sent, either system boot/data link established or a run-time transfer.

R = 0—Run-time transfer.

R = 1—System boot or data link established.

I—Specifies that system initialization is complete and the system can process calls.

I = 1—System initialization complete.

S—Specifies the side of the system from which the report originated.

S = 0 —Report is from system A side.

S = 1—Report is from system B side.

M—Specifies whether the system side originating the report is currently the active or standby side

M = 0—Reporting side is currently standby.

M = 1—Reporting side is currently active.

Spacer Byte (byte offset 6)—Reserved for future enhancements; always = $00.

Examples

Example 5-33 $DC Report

The following report indicates a system boot for a redundant system with a link on each side. When the system initially comes on line, the Alarm Arbiter Card (AAC) determines which processor is active (in this example, the A side). The first report shows the event from the A side, the second from the B side.

```
04 05 06
DC 81 00
```

Function ID = DC (Active/Standby Mode)

Action Code = 10000001

R = 1 (system has booted or link is established)

S = 0 (report is from the A side)

M = 1 (reporting side is currently active)

Spacer Byte = 00 (no meaning) DC 82 00

Function ID = DC (Active/Standby Mode)

Action Code = 10000010

R = 1 (system has booted or link is established)

S = 1 (report is from the B side)

M = 0 (reporting side is currently standby)

Spacer Byte = 00 (no meaning)

Example 5-34 $DC Report

The following reports reflect a change in active and standby sides initiated by a host command or an action at the administrative console or the Alarm Arbiter Card.

```
04 05 06
DC 00 00
```

Function ID = DC (Active/Standby Mode)

Action Code = 00000000

R = 0 (run-time transfer)

S = 0 (report is from the A side)

M = 0 (reporting side is currently standby)

Spacer Byte = 00 (no meaning)

```
04 05 06
DC 03 00
```

Function ID = DC (Active/Standby Mode)

Action Code = 00000011

R = 0 (run-time transfer)

S = 1 (report is from the B side)

M = 1 (reporting side is currently active)

Spacer Byte = 00 (no meaning)

Example 5-35 $DC Report

The following report indicates that one of the host-to-system links has just become active.

Note This report is not interpreted as a system reboot when received from only one link.

```
04 05 06
DC 81 00
```

Function ID = DC (Active/Standby Mode)

Action Code = 00000000

R = 1 (system has booted or link is established)

S = 0 (report is from the A side)

M = 1 (reporting side is currently active)

Spacer Byte = 00 (no meaning)

Inpulse Rule Complete (Macro) ($DD) Report

Report Type

Resource Control

Destination VCA

$40

Description

The Inpulse Rule Complete (Macro) ($DD) report informs the host that an inpulse rule has been processed. The content of the report is controlled by the type of reporting specified in the inpulse rule. If REP EACH is specified, the report will indicate only that inpulse rule processing has ended. If REP END is specified, the report is a macro containing Resource Control reports (segments) to represent all actions taken during inpulse rule execution. Resource report segments included in the macro can include the following:

- Incoming Port Change of State ($DB)
- DTMF Digit ($D1)
- MF Digit ($D0)

Segments are reported in the following order:

- Incoming Port Change of State ($DB)
- Digit report for field 1
- Digit report for field 2
- Digit report for field 3
- Digit report for field 4
- Digit report for field ANI (originating number field)

Digit segments follow the general format for their report, but the Controlling Port Address and Spacer bytes are omitted in MF collections, and the Controlling Port Address, Report Status and Supervision bytes are omitted in DTMF collections. Incoming Port Change of State segments contain only the function ID and Change Code.

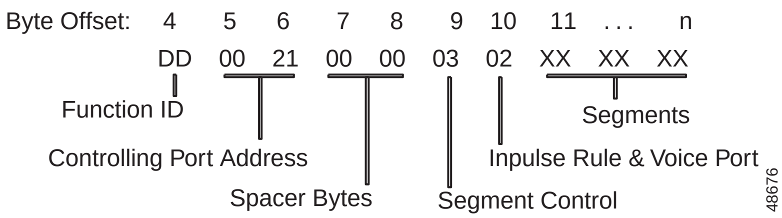
Action Causing Report Generation

This report is generated when inpulse rule processing is terminated. Termination can be caused by: the successful completion of the rule; an error in rule processing; a looping rule which only contains setup to reporting tokens; a host command overriding the rule; or by the controlling port going on hook.

Format

Figure 5-16 shows the byte formatting for this report.

Figure 5-16 $DD Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the port for which the inpulse rule is being executed.

Spacer Bytes (byte offsets 7 and 8) – Reserved for future enhancements; always returned as 00 00.

Segment Control (byte offset 9)—Specifies the number of segments included in this report, if the rule was processed for an incoming or outgoing port and if the TeleRouter overlay performed a routing action. Convert the byte from hexadecimal to binary and interpret the bits as described below. If inpulse rule executed specified REP EACH, this byte will be $00, indicating there are no segments.

```
ABC00NNN
```

A—Specifies if inpulse rule was processed for an incoming or outgoing port.

A = 0—Inpulse rule was processed for an incoming port.

A = 1—Inpulse rule was processed for an outgoing port.

B—Specifies if a looping rule was aborted.

B = 0—Rule not aborted because of looping.

B = 1—Looping rule was aborted automatically (S = 1 in byte offset 10).

C—Specifies if the TeleRouter overlay performed a routing action (ROUTE [Tx] token in inpulse rule).

C = 0—No routing performed.

C = 1—Routing action was performed by TeleRouter; a Routing Action ($D5) report follows the $DD report once the action is complete.

NNN—Specifies the number of segments included in this report; if inpulse rule specifies a REP EACH token, these bits are zero indicating there are no segments attached.

Inpulse Rule/Voice Port (byte offset 10)—Specifies the inpulse rule number executed, whether it completed normally or was aborted, whether rule was aborted due to outpulse channel exhaust (DO ORULE token in inpulse rule), and whether a voice port was available on the first attempt as required by that rule. Convert the byte from hexadecimal to binary and interpret the bits as follows:

```
ASTRRRRR
```

A—Specifies if a voice port was available when initially requested.

A = 0—Voice port was available on initial request.

A = 1—Voice port was not available on initial request.

S—Specifies if inpulse rule processing completed normally or was aborted; error conditions that can cause inpulse rule processing to abort are:

- MF receiver was unavailable.
- DTMF receiver was unavailable.
- Digit collection error or timeout (MF, DTMF, or DP).
- Voice port was unavailable.
- Host command was received.
- Port goes on hook (call abandon).
- Rule specifies digit collection but no DTMF or MF token was in rule.
- No outpulse channel was available (when rule includes DO ORULE token).
- Looping rule was detected.

S = 0—Inpulse rule processing completed normally.

S = 1—Inpulse rule processing was aborted.

T—When S = 1, specifies if rule was aborted because no outpulse channel was available; DO ORULE token was in rule.

T = 0—Rule was not aborted due to outpulse channel exhaust condition.

T = 1—Rule was aborted due to outpulse channel exhaust condition.

RRRRR—Specifies the inpulse rule that was executed; convert binary to decimal for the rule number (1 to 30).

Segments (byte offset 11 to n)—Resource report segments included in this macro; segment format follows that of the report the segment represents, with the following exceptions: the Controlling Port Address and Spacer Bytes are omitted in MF ($D0) collections, and the Controlling Port Address, Report Status and Supervision bytes are omitted in DTMF ($D1) collections, and Incoming Port Change of State ($DB) segments contain only the Function ID and Change Code.

Examples

Example 5-36 $DD Report

The following report indicates that inpulse rule 3 was executed on the incoming port at address $28. Three MF digits (1, 2, 3) and seven DTMF digits were collected (1, 2, 3, 4, 5, 6, 7).

```
04 0506 0708 09 10 1112131415161718192021222324
DD 0028 0000 02 03 00003401123FD10052011234567F
```

Function ID = DD (Inpulse Rule Complete (macro))

Controlling Port Address = 0028

Spacer Bytes = 00 00

Segment Control = 00000010

A = 0 (Inpulse rule processed for incoming port)

NNN = 2 (2 segments attached)

Inpulse Rule/Voice Port = 00000011

A = 0 (voice port available on initial request)

S = 0 (Inpulse rule processing completed normally)

T = 0 (rule not aborted due to Outpulse Channel exhaust condition)

RRRRR = 3

Segment 1 is as follows:

Function ID = MF Digit ($D0)

Controlling Port Address = omitted

Spacer Bytes = omitted

MF Receiver Address = 0034

MF Status = 00000001

V = 0 (report not garbled)

S = 0 (no meaning since V and Y = 0)

X = 0 (MF receiver available on initial request)

Y = 0 (MF digit collection timer did not fire)

Z = 1 (valid MF digit string collected)

Digit String = 123 (F marks end of string)

END OF SEGMENT 1

Segment 2 is as follows:

Function ID = D1 (DTMF Digit)

Controlling Port Address = omitted

Report Status = omitted

Supervision = omitted

DTMF Receiver Address = 0052

DTMF Status = 00000001

T = 0 (interdigit timer did not fire)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 0 (DTMF digit collection timer did not fire)

Y = 0 (DTMF first-digit collection timer did not fire)

Z = 1 (DTMF digit string reported)

Digit String = 1234567 (F marks end of string)

END OF SEGMENT 2

Example 5-37 $DD Report

The following report indicates that the incoming port at address $35 went off hook and executed inpulse rule 16. During the execution of that rule, the system made two attempts before allocating a voice port (processing a SPEAK token). Three DTMF digits (4, 4, 2) were collected.

```
04 0506 0708 09 10 1112131415161718
DD 0035 0000 02 90 DB80D1003505442F
```

Function ID = DD (Inpulse Rule Complete (macro))

Controlling Port Address = 0035

Spacer Bytes = 00 00

Segment Control = 00000010

A = 0 (Inpulse rule processed for incoming port)

NNN = 2 (2 segments attached)

Inpulse Rule/Voice Port = 10010000

A = 1 (voice port was not available on initial request)

S = 0 (Inpulse rule processing completed normally)

T = 0 (rule was not aborted due to an Outpulse Channel exhaust condition)

RRRRR = 16

Segment 1 is as follows:

Function ID = Incoming Port Change of State ($DB)

Resource Group = omitted

Change = off hook ($80)

Incoming Port Address = omitted

Supervision Code = omitted

END OF SEGMENT 1

Segment 2 is as follows:

Function ID = D1 (DTMF Digit)

Controlling Port Address = omitted

Report Status = omitted

Supervision = omitted

DTMF Receiver Address = 0035 (SLIC, DID, or UTC port with onboard receiver)

DTMF Status = 00000101

T = 0 (interdigit timer did not fire)

V = 0 (not a first digit report)

W = 0 (DTMF receiver available on initial request)

X = 1 (DTMF digit collection timer fired

Y = 0 (DTMF first-digit collection timer did not fire)

Z = 1 (DTMF digit string reported)

Digit String = 442 (F marks end of string)

END OF SEGMENT 2

Voice Port Status ($DE) Report

Report Type

Resource Control

Destination VCA

$40

Description

The Voice Port Status ($DE) report indicates when all voice prompts specified in a Voice Port Control ($6C) command have completed. This reporting is controlled by a bit setting in the $6C command.

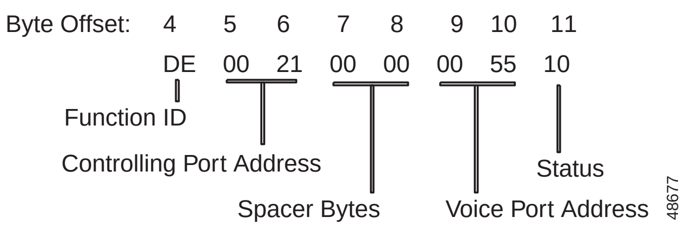
Action Causing Report Generation

The $DE report is generated when all voice prompts specified in a $6C command have completed if specified in the command.

Format

Figure 5-17 shows the byte formatting for this report.

Figure 5-17 $DE Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the incoming port to which the voice prompts were played.

Spacer Bytes (byte offsets 7 and 8)—Reserved for future enhancements; always returned as 00 00.

Voice Port Address (byte offsets 9 and 10)—Hexadecimal representation of the port used to present prompts.

Status (byte offset 11)—Indicates the status of the digit report. A byte value of 10 indicates that all specified voice prompts have been presented.

Example

Example 5-38 $DE Report

A $6C command specified to present five voice prompts and report to the host upon completion. The following report shows that all specified prompts have been presented.

```
04 0506 0708 0910 11
DE 0042 0000 0056 10
```

Function ID = DE (Voice Port Status)

Controlling Port Address = 0042

Spacer Bytes = 00 00

Voice Port Address = 0056

Status = all prompts presented ($10)

ISDN Port Change of State ($EA) Report

Report Type

Resource Control

Destination VCA

$40

Definition

Use the ISDN Port Change of State ($EA) report to inform the host of a change in the state of an ISDN call. Both the controlling and associated ports are represented. The port can be represented by B-channel, or by D-channel and Call ID.

In interworking scenarios, a pair of reports is produced when a port change of state affects both an ISDN port and a non-ISDN port. A non-ISDN port can be either the controlling port or the associated port. If the port is non-ISDN, the appropriate Incoming Port Change of State ($DB) or Outgoing Port Change of State ($DA) report is generated. Use the $EA report for ISDN-related events only.

The $EA report may be truncated if the network header segment, base report, and IEs exceed 255 bytes in length. No indication of truncation is provided to the host.

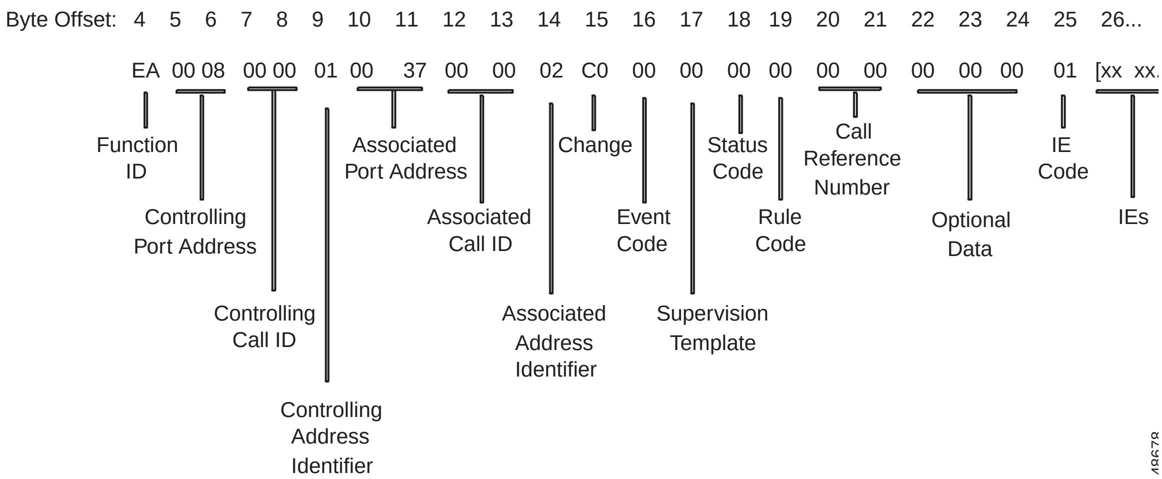
Action Causing Report Generation

The $EA report is generated in response to a change in the state of an ISDN call or B-channel.

Format

Figure 5-18 shows the byte formatting for this report.

Figure 5-18 $EA Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the controlling port circuit address for which the report is sent. If the Controlling Address Identifier (byte offset 9) is $01, these bytes represent the specific B-channel assigned to the call or a non-ISDN port. If the Controlling Address Identifier is $02, these bytes represent the D-channel; the Controlling Call ID is identified in byte offset 7 and 8.

Controlling Call ID (byte offsets 7 and 8)—Specifies the ISDN Call ID for the controlling port. Use Call ID only when the controlling port is specified by the D-channel. You must set the Controlling Address Identifier (byte offset 9) to $02.

Controlling Address Identifier (byte offset 9)—Specifies whether the controlling port is identified by D-channel and Call ID or by B-channel/non-ISDN port address. Interpret the byte as follows:

01—Controlling port specified by B-channel or non-ISDN port address; Controlling Call ID = 00 00 for non-ISDN port address.

02—Controlling port specified by D-channel and Call ID.

Associated Port Address (byte offsets 10 and 11)—Hexadecimal representation of the report's associated (outgoing) port circuit address. If the Associated Address Identifier (byte offset 14) is $01, these bytes represent the specific B-channel used. If the Associated Address Identifier is $02, these bytes represent the D-channel and Call ID.

Associated Call ID (byte offsets 12 and 13)—Specifies the ISDN Call ID for the associated (outgoing) port.

Associated Address Identifier (byte offset 14)—Specifies whether the associated (outgoing) port is identified by D-channel or by B-channel/non-ISDN port/resource group. Interpret the byte as follows:

00—No associated port.

01—Associated port specified by B-channel or non-ISDN port address; Call ID = 00 00 for non-ISDN port address.

02—Associated port specified by D-channel.

Change (byte offset 15)—Specifies the type of change detected. The following list indicates the change that occurred for the outgoing port.

00—No change; report was issued to report an ISDN D-channel message (contained in Event byte).

01—Call attempt failed (FAIL token in the ISDN supervision template or ISDN protocol violation).

02—Reserved for future enhancements.

04—Outpulse rule processing has completed for this port; rule number specified in byte offset 19 (REP END in outpulse rule).

05—Quit token was processed in an ISDN supervision template.

08—Supervision was detected outside of a rule.

10—Supervision was detected during rule processing (REP, OKREP, ANSREP, or PRPREP token in ISDN supervision template).

20—Supervision error was detected (ERROR token in ISDN Supervision Template).

40—Port became inactive.

80—Port became active (SETUP received and processed or REP, OKREP, ANSREP, or PRPREP token in ISDN Supervision Template).

Event Code (byte offset 16)—Specifies the D-channel message received. Codeset 0 Q.931 message coding is used for all event codes. Interpret the byte as follows:

00 — Failed call attempt (error in template processing or no D-channel message was processed).

01 — ALERTING message was received.

02 — CALL PROCEEDING message was received.

03 — PROGRESS message was received.

05 — SETUP message was received.

07 — CONNECT message was received.

0C — SETUP ACKNOWLEDGE message was received.

0F — CONNECT ACKNOWLEDGE message was received.

20 — USER INFORMATION message was received.

45 — DISCONNECT message was received.

46 — RESTART message was received.

4D — RELEASE message was received.

5A — RELEASE COMPLETE message was received.

62 — FACILITY message was received.

6E — NOTIFY message was received.

Note If the system receives a NOTIFY message from the network and the ISDN state is ACTIVE (10), the system passes the NOTIFY message to the host in bytes 26 to n. In all other states, the system ignores network NOTIFY messages.

79 — CONGESTION message was received.

FF — Timeout (in ISDN supervision template processing).

Supervision Template (byte offset 17)—Specifies whether the outgoing port is considered answered (ANS condition token processed in ISDN supervision template) and the number of the ISDN supervision template used. If no ISDN supervision template is being used, or call failures and errors occur, set the byte to 00. Convert the byte from hexadecimal to binary and interpret the bits according to the following descriptions:

```
A0NNNNNN
```

A—Indicates whether or not the Associated (outgoing) port is considered answered.

A = 0—Outgoing port not considered answered.

A = 1—Outgoing port considered answered.

NNNNNN—Specifies the ISDN supervision template used. Convert the value from binary to decimal for the template number.

Status Code (byte offset 18)—Indicates if an error was encountered. Interpret the byte as follows:

01—No error.

80—Inpulse rule processing was aborted.

81—RELEASE message was received over the D-channel; call has been abandoned.

82—RELEASE message was transmitted over the D-channel; call could not be processed.

83—B-channel was unavailable.

86—Not all requested IEs were present in the D-channel message.

87—Looping inpulse rule was detected; rule processing was aborted.

88—B-channel is in wrong call processing state for requested action.

89—DTMF collection failure or timeout.

8A—MF collection failure or timeout.

8B—D-channel failure.

8C—Glare condition was detected; outgoing port has released, incoming port in CP_SETUP state.

8F—Report has been truncated; report and IEs exceeded 255 bytes.

90—Digit collection timeout.

91—No digit collection mode was chosen in rule; digit collection failure.

A1—Host SETUP Timer fired; call has been cleared.

A2—Card or port in maintenance mode; call has been cleared.

A3—Looping outpulse rule was detected; rule processing was aborted.

A4—ISDN protocol violation.

C1—MF receiver was unavailable.

C2—DTMF receiver was unavailable.

C4—CPA port was unavailable.

C5—Outpulse channel was unavailable.

Rule Code (byte offset 19)—For Change = 04, indicates the number of the outpulse rule processed. Otherwise, this byte is 00.

Call Reference Number (byte offsets 20 and 21)—Indicates a call reference number that is reported to the host; call references are numbered sequentially.

Note Set the Enable Host Call Reference feature flag to Y in the System Features administration screen when using the Call Reference Number bytes to enable the reporting of a call reference number to the host. Refer to the *Cisco VCO/4K System Administrator's Guide* for further information on the Enable Host Call Reference feature and feature flag setting instructions.

Optional Data (byte offsets 22 to 24)—Reserved for future enhancements.

IE Code (byte offset 25)—Indicates the number of IEs included in this report. IE reporting is controlled by ISDN message templates. A value of $00 indicates that no IEs follow this byte. IEs are reported exactly as they were received from the D-channel.

IEs (byte offsets 26 to n)—For IE Code > 00, these bytes contain any IEs received over the specified D-channel. Each IE has either a multibyte or single-byte format. Figure 5-19 shows the multibyte format and Figure 5-20 shows the single-byte format.

Figure 5-19 Multibyte IE Format

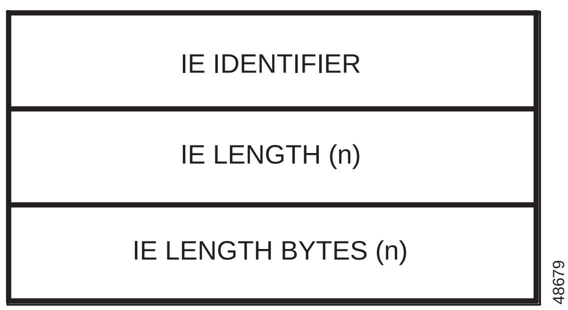


Figure 5-20 Single-Byte IE Format

Note Single-byte IEs have bit 8 set to 1.

ISDN Inpulse Rule Complete ($ED) Report

Report Type

Resource Control

Destination VCA

$40

Description

Use the ISDN Inpulse Rule Complete ($ED) report to inform the host that an inpulse rule has been processed either in response to a SETUP message received over the D-channel or for a specific B-channel. Digits collected in-band can also be included in this report. The content of the report is controlled by the type of reporting you specify in the inpulse rule and in the ISDN Receive Message Template. Information included in this report can include:

- DTMF Digit ($D1)
- MF Digit ($D0)
- Received IEs

Received IEs are reported in the same format as they were received.

Digit segments are presented in the following order:

- Digit report for field 1
- Digit report for field 2
- Digit report for field 3
- Digit report for field 4
- Digit report for field ANI (originating number field)

Digit segments follow the general format for their report, but the Controlling Port Address and Spacer Bytes are omitted in MF collections, and the Controlling Port Address, Report Status and Supervision bytes are omitted in DTMF collections.

This report may be truncated if the network header segment, base report, digit segments, and IEs exceed 255 bytes in length. Indication of truncation is provided as an Inpulse Rule Status byte value of 8F (byte offset 12-n).

Action Causing Report Generation

This report is generated when inpulse rule processing is terminated. Termination can be caused by:

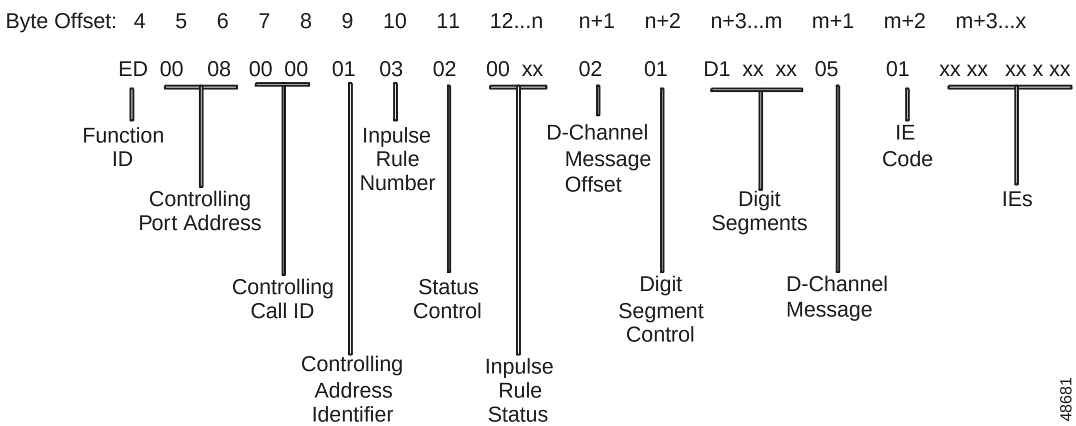
- Successful completion of the rule
- An error in rule processing
- A looping rule which only contains setup and reporting tokens

- A host command overriding the rule
- The controlling port being released

Format

Figure 5-21 shows the byte formatting for this report.

Figure 5-21 $ED Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header; uniquely identifies the report from the system.

Controlling Port Address (byte offsets 5 and 6)—Hexadecimal representation of the controlling port circuit address for which the report is sent. If the Controlling Address Identifier (byte offset 9) is $01, these bytes represent the specific B-channel assigned to the call or a non-ISDN port. If the Controlling Address Identifier is $02, these bytes represent the D-channel; the Controlling Call ID is identified in byte offset 7 and 8.

Controlling Call ID (byte offsets 7 and 8)—Specifies the ISDN Call ID for the controlling port.

Controlling Address Identifier (byte offset 9)—Specifies whether the controlling port is identified by D-channel and Call ID or by B-channel/non-ISDN port address. Interpret the byte as follows:

01—Controlling port was specified by the B-channel.

02—Controlling port was specified by the D-channel and Call ID.

Inpulse Rule Number (byte offset 10)—Specifies the inpulse rule number executed. Convert from hexadecimal to decimal for the inpulse rule.

Status Control (byte offset 11)—Specifies the number of Inpulse Rule Status bytes that follow. At least one Inpulse Rule Status byte is included in the report. The maximum number of status bytes allowed in a report is 10.

Inpulse Rule Status (byte offsets 12 to n)—Specifies whether the inpulse rule completed normally or was aborted due to error condition. Multiple status bytes can be included in a single report; the number of status bytes is indicated by the Status Control value. Interpret the bytes as follows:

01—No error.

81—RELEASE message was received over the D-channel; call has been abandoned.

82—RELEASE message was transmitted over the D-channel; call could not be processed.

83—B-channel was unavailable.

86—Not all requested IEs were present in the D-channel message.

87—Looping inpulse rule was detected; rule processing was aborted.

88—B-channel is in wrong call processing state for the requested action.

89—DTMF collection failure or timeout.

8A—MF collection failure or timeout.

8F—Report has been truncated; report and IEs exceeded 255 bytes.

A3—Looping outpulse rule was detected; rule processing was aborted.

A4—ISDN protocol violation.

C1—MF receiver was unavailable.

C2—DTMF receiver was unavailable.

C4—CPA port was unavailable.

C5—Outpulse channel was unavailable.

D-Channel Message Offset (byte offset n + 1)—Specifies the number of hexadecimal bytes until the D-Channel Message byte (offset m + 1). This byte always contains a value of at least $02 to account for a Digit Segment Control byte (assuming no Digit Segments are included in the report).

Digit Segment Control (byte offset n + 2)—Specifies the number of DTMF or MF Digit report segments that follow. If this byte = 00, no digit segments are included in this report.

Digit Segments (byte offset n + 3 - m)—Optional DTMF and MF Digit report segments included in this macro; segment format follows that of the report the segment represents, with the exclusion of the Incoming Port Address byte.

D-Channel Message (byte offset m + 1)—Specifies the received D-channel message. When Digit Segment Control = 00, this byte immediately follows it. Otherwise, it appears after the final digit segment. Interpret this byte as follows:

00—No D-channel message was processed (rule without D-channel processing).

01—ALERTING message was received.

02—CALL PROCEEDING message was received.

03—PROGRESS message was received.

05—SETUP message was received.

07—CONNECT message was received.

0C—SETUP ACKNOWLEDGE message was received.

0F—CONNECT ACKNOWLEDGE message was received.

20—USER INFORMATION message was received.

45—DISCONNECT message was received.

5A—RELEASE COMPLETE message was received.

62—FACILITY message was received.

6E—NOTIFY message was received.

Note If a NOTIFY message from the network is received by the system and the ISDN state is ACTIVE (10), the system passes the NOTIFY message to the host in bytes 26 through n. In all other states, the system ignores NOTIFY messages from the network.

79—CONGESTION message was received.

IE Code (byte offset m + 2)—Indicates the number of IEs included in this report. IE reporting is controlled by ISDN Message Templates. A value of $00 indicates that no IEs follow this byte. IEs are reported exactly as they were received from the D-channel.

IEs (byte offset m + 3 - x)—For IE Code > 00, these bytes contain any IEs received over the specified D-channel. Each IE has either a multibyte format or a single-byte format. Figure 5-22 shows the multibyte format and Figure 5-23 shows the single-byte format.

Figure 5-22 Multibyte IE Format

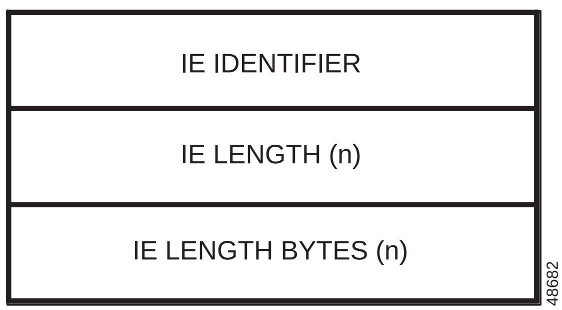


Figure 5-23 Single-Byte IE Format

Note Single-byte IEs have bit 8 set to 1.

Alarm Condition ($F0) Report

Report Type

System Status

Destination VCA

$44

Description

The Alarm Condition ($F0) report indicates the presence or clearance of a system alarm. Additionally, alarm severity and the number of occurrences is reported.

Action Causing Report Generation

The report is generated upon alarm detection (any occurrence), severity change, or clearance. Additionally, an alarm is set or cleared for:

- A host link (including the TeleRouter overlay); the additional data identifies the host link as defined from the system administration Host Configuration screen.
- A port interface or service circuit card; the additional data identifies the card's Rack-Level-Slot position.

Because multiple occurrences of one card alarm are normal during system initialization, reports of card alarms that were set during system initialization do not supply a card's physical location. Similar alarms are reported in one $F0 report; the number of occurrences reflects the number of cards for which the alarm was detected. When a card becomes active, an $F0 report is generated; use the additional data bytes to indicate the Rack, Level, Slot location, and the span number.

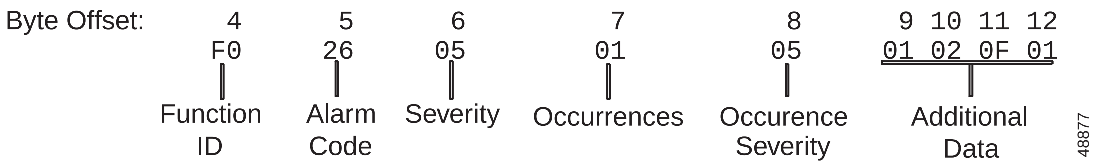
The No Alarm Reports During System Initialization feature lets you enable/disable Disable alarm reporting during system initialization. Y disables system alarm reports until the system comes into service; N enables the system alarm reports. Access the System Feature Configuration screen from the Main menu.

From the System Feature Configuration screen, define the alarm severity for the No Hosts alarm ($0B) as wether Major or Fatal. If the Fatal Alarm for No Hosts feature=Y, all failed host links cause the affected system controller to reset after system initialization.

Format

Figure 5-24 shows the byte formatting of this report.

Figure 5-24 $F0 Report Format



Function ID (byte offset 4)—Byte immediately following the Network Header that identifies the report.

Alarm Code (byte offset 5)—Identifies the reported alarm. The system alarms, their meanings, and severity levels are described in Table 5-9. For more information on system alarms, refer to the *Cisco VCO/4K System Administrator's Guide* and *Cisco VCO/4K System Messages*.

Table 5-9 System Alarm Messages

Value	Alarm Message	Alarm Severity
01	ALM001: Insufficient Timed IPC Memory	Minor
02	ALM002: Network Manager Failure	Fatal
03	ALM003: Host Manager Failure	Fatal
04	ALM004: Redundancy Manager Failure	Minor
0A	ALM010: Host Communications Failure	Minor
0B	ALM011: No Hosts Available	Major
0C	ALM012: ADLC Sub-System Failure	Major
0D	ALM013: Ethernet Sub-System Failure	Major
0E	ALM014: Overlay Sub-System Failure	Major
0F	ALM015: Resource Group Limitation Pending	Minor
10	ALM016: Resource Group Limitation Exists	Minor
11	ALM017: Internet Host Ping Failure	Major
14	ALM020: Start Record Exhaust	Major
15	ALM021: End Record Exhaust	Major
16	ALM022: D-Channel Pool Exhaust	Major
17	ALM023: NBC Does Not Respond	Fatal
18	ALM024: NBC DMA Output Failure	Fatal
19	ALM025: CP Transmit Overrun	Critical
1A	ALM026: No NBC In System	Critical
1B	ALM027: NBC Failure	Fatal
1C	ALM028: NBC Loss of Internal Sync.	Fatal
1D	ALM029: NBC Comm. Bus Failure	Minor
1E	ALM030: No Tone Card In System	Critical
1F	ALM031: Rack 1, Level 2 Failure	Critical
20	ALM032: Rack 1, Level 3 Failure	Critical
21	ALM033: Rack 2, Level 0 Failure	Critical

Table 5-9 System Alarm Messages (continued)

Value	Alarm Message	Alarm Severity
22	ALM034: Rack 2, Level 1 Failure	Critical
23	ALM035: Rack 2, Level 2 Failure	Critical
24	ALM036: Rack 2, Level 3 Failure	Critical
25	ALM037: Redundant Controller Failure	Minor
26	ALM038: PRI D-Channel Failure	Major
27	ALM039: PRI/T1/E1 Carrier Lost	Major
28	ALM040: PRI/T1/E1 Card Failure	Major
29	ALM041: PRI/T1/E1 Remote Alarm	Major
2A	ALM042: PRI/T1/E1 Out Of Frame	Major
2B	ALM043: PRI/T1/E1 Signaling Bit Alarm	Minor
2C	ALM044: PRI/T1/E1 Slip Maint. Threshold	Minor
2D	ALM045: PRI/T1/E1 OOF Maint. Threshold	Minor
2E	ALM046: PRI/T1/E1 BPV Maint. Threshold	Minor
2F	ALM047: Loss Of All Call Progress Analyzers	Minor
30	ALM048: Loss Of All Speech Recognizers	Minor
31	ALM049: Loss Of All MF Receivers	Minor
32	ALM050: Loss Of All DTMF Receivers	Minor
33	ALM051: Loss Of Announcement Capability	Minor
34	ALM052: Card Failure In System	Minor
35	ALM053: Fatal Host Alarm	Fatal
36	ALM054: Critical Host Alarm	Critical
37	ALM055: Major Host Alarm	Major
38	ALM056: Minor Host Alarm	Minor
39	ALM057: Aux-1 Host Alarm	Aux 1
3A	ALM058: Aux-2 Host Alarm	Aux 2
3B	ALM059: NFAS D-Channel Failure	Critical
3C	ALM060: Loss of All MFCR2 Transceivers	Minor
3D	ALM061: T1/E1 Blue Alarm	Minor
3E	ALM062: E1 CRC Error	Minor
3F	ALM063: Loss of All Subrate Functionality	Major
40	ALM064: Loss of Subrate Redundancy	Major
41	ALM065: Subrate Timeslot Threshold	Major
42	ALM066: Subrate Timeslot Exhausted	Major
43	ALM067: All Ports on Card Deactivated	Minor
44	ALM068: DS0 Port Slip Maintenance Threshold	Minor
45	ALM069: DS0 Port Loss of Clock	Major

Table 5-9 System Alarm Messages (continued)

Value	Alarm Message	Alarm Severity
46	ALM070: NBC Loss of External Synchronization	Major
47	ALM071: Wrong Hardware Installed	Major
48	ALM072: Interface Hardware Failure	Major
49	ALM073: Module Hardware Failure	Major
4A	ALM074: Loss of All SPC OUTPULSERS	Minor
4B	ALM075: No SPC Static Tone In System	Minor
4C	ALM076: Incoming Timing Changed to Internal	Minor
4D	ALM077: ICC Card Congestion Alarm	Minor
50	ALM080: Update Channel Failure	Minor
51	ALM081: UPD DMA Output Failure	Non-alarm event
52	ALM082: UPD Transmit Overrun	Minor
53	ALM083: UPD Receive Overrun	Minor
54	ALM084: UPD Receive Timeout	Non-alarm event
55	ALM085: UPD DMA Output Timeout	Non-alarm event
5A	ALM090: Printer Offline	Non-alarm event
5D	ALM093: Available Disk Space Less Than 30 MB	Major
5E	ALM094: Available Disk Space Less Than 15 MB	Major
5F	ALM095: Failed to Create 30 MB of Available Disk Space	Major
60	ALM096: Trace File Exceeded 1 MB Size	Major
61	ALM097: Log File Exceeded 1 MB Size	Major
64	ALM100: Queue Overflow	Fatal
65	ALM101: Queue Overflow	Critical
66	ALM102: Queue Overflow	Major
67	ALM103: Queue Overflow	Minor
68	ALM104: Queue Overflow	Non-alarm event
69	ALM105: Memory Allocation Failure	Fatal
6A	ALM106: Memory Allocation Failure	Critical
6B	ALM107: Memory Allocation Failure	Major
6C	ALM108: Memory Allocation Failure	Minor
6D	ALM109: Memory Allocation Failure	Non-alarm event
96	ALM150: Live Upgrade Start	Non-alarm event
97	ALM151: Live Upgrade Software Installed	Non-alarm event
98	ALM152: Optional S/W Configuration Initiated	Non-alarm event
99	ALM153: Rebooting Generic with New Release	Non-alarm event
9A	ALM154: Card Cutover Initiated	Non-alarm event
9B	ALM155: Live Upgrade Failed	Non-alarm event

Table 5-9 System Alarm Messages (continued)

Value	Alarm Message	Alarm Severity
9C	ALM156: Live Upgrade Successful	Non-alarm event
9D	ALM157: Live Upgrade Aborted by User	Non-alarm event

Severity (byte offset 6)—Indicates an alarm's severity. Possible severity levels are as follows:

00—Alarm has cleared.

01—Severity not applicable; nonalarmed event is being reported.

02—AUX 1 host alarm; set in response to a Set/Reset Host Alarm ($C0 03) command.

03—AUX 2 host alarm; set in response to a Set/Reset Host Alarm ($C0 03) command.

04—Minor alarm.

05—Major alarm.

06—Critical alarm.

07—Fatal alarm.

Occurrences (byte offset 7)—Indicates the number of alarm occurrences in hexadecimal. Convert to decimal for the number of occurrences.

Occurrence Severity (byte offset 8)—Indicates an alarm's occurrence severity. Possible severity levels are as follows:

00—Alarm has cleared.

01—Severity not applicable; nonalarmed event is being reported.

02—Aux 1 host alarm; set in response to a Set/Reset Host Alarm ($C0 03) command.

03—Aux 2 host alarm; set in response to a Set/Reset Host Alarm ($C0 03) command.

04—Minor alarm.

05—Major alarm.

06—Critical alarm.

07—Fatal alarm.

Additional Data Bytes (byte offsets 9 to 12)—Supplies additional information for the following alarm codes. Additional information bytes are not supplied for alarms set during system initialization processing. Refer to the “Action Causing Report Generation” section on page 5-82.

If byte offset 5 = 0A—Use byte offset 9 to indicate the host for which the alarm is being reported. In this case, possible values for byte offset 9 are as follows:

00—TeleRouter Overlay

08 to F—Host links configured from the Host Configuration screen. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information.

If byte offset 5 = 26 to 2D, 33, or 34—Use byte offsets 9 to 12 to indicate the rack, level, and slot location, and the span number of the card for which the report is generated. Convert the bytes from hexadecimal to decimal for the physical location.

If byte offset 5 = 4C—The length of the $F0 report is truncated to nine byte offsets and byte offset 9 indicates the reason that the incoming timing source changed to internal clock timing. Possible values of byte offset 9, and their associated meanings, are as follows:

01—T1 card Slip Maintenance reached report was received.

02—PRI card Slip Maintenance reached report was received.

03—T1 card OOF condition present report was received.

04—PRI card OOF condition present report was received.

05—T1 card Loss of Carrier condition report was received.

06—PRI card Loss of Carrier condition report was received.

07—T1 card Remote Carrier Alarm Detected report was received.

08—PRI card Remote Carrier Alarm Detected report was received.

09—T1 card Signaling bit alarm report was received.

0A—T1 card OOF Maintenance Limit reached report was received.

0B—PRI card OOF Maintenance Limit reached report was received.

0C—NBC loss of synchronization—external reference.

0D—Change in T1 synchronization source. Host sent T1 Synchronization Control ($C0 02) command.

0E—NBC incoming reference signal is not present.

0F—NBC loss of synchronization—incoming reference.

10—NBC loss of incoming reference.

11—NBC external reference signal is not present.

12—NBC cannot synchronize on the external reference.

13—NBC cannot synchronize on the incoming reference.

14—ICC hardware change has been detected. Possibilities include the insertion or removal of an I/O module, or a mismatch between hardware type and configuration.

Note Byte 12 is optional and used for multispan cards only.

Examples

Example 5-39 $F0 Report

At system initialization, the following report is generated to indicate a card alarm set for 20 T1 cards as part of normal processing. This reporting assumes the No Alarm Reports During System Initialization feature is disabled (set to N).

```
04 05 06 07 08
F0 27 05 14 05
```

Function ID = F0 (Alarm Condition)

Alarm Code = 27 (ALM039: PRI/T1/E1 Carrier Loss)

Severity = 05 (Major)

Occurrences = 14 (20 occurrences)

Occurrence Severity = 05 (Major)

No Additional Data Bytes

Example 5-40 $F0 Report

The following report indicates the T1 card located at the R-L-S position 1,2,21 comes into service following system initialization (the card out of service condition is cleared). The location is indicated in the additional data bytes.

```
04 05 06 07 08 091011
F0 27 00 01 00 010215
```

Function ID = F0 (Alarm Condition)

Alarm Code = 27 (ALM039: PRI/T1/E1 Carrier Loss)

Severity = 00 (Alarm Cleared)

Occurrences = 01 (1 occurrence)

Occurrence Severity = 00 (Alarm Cleared)

Additional Data Bytes = 01 02 15 (1, 2, 21)

APPENDIX A

DTMF/MF Frequencies

Table A-1 shows the frequencies and hexadecimal values used for DTMF inpulsing and outpulsing.

Note Hexadecimal values used to represent the DTMF digits in system DTMF digit commands and reports are contained in the ( ).

Table A-1 DTMF Frequencies and Hexadecimal Values

Low Frequency	High Frequency			
	1209	**1336**	**1477**	**1633**
697	1(1)	2(2)	3(3)	A(A)
770	4(4)	5(5)	6(6)	B(B)
852	7(7)	8(8)	9(9)	C(C)
941	S(E)	0(0)	#(F)	D(D)

Table A-2 shows the frequencies and hexadecimal values used for MF inpulsing and outpulsing.

Table A-2 MF Frequencies and Hexadecimal Values

Low Frequency	High Frequency				
	900	**1100**	**1300**	**1500**	**1700**
700	1(1)	2(2)	4(4)	7(7)	ST3P(E)
900	—	3(3)	5(5)	8(8)	STP(C)
1100	—	—	—	6(6)	9(9)KP(0)
1300	—	—	—	—	0(A)ST2P(D)
1500	—	—	—	—	ST(B)

APPENDIX B

Decimal/Hexadecimal/Binary Conversion

Figure B-1 provides a quick reference (for decimal numbers 1 to 127, inclusive) to simplify your conversion efforts when interpreting VCO/4K system commands and reports.

Figure B-1 Decimal/Hexadecimal/Binary Conversion—Decimal Values 1 to 127, Inclusive

DEC	HEX	BIN	DEC	HEX	BIN	DEC	HEX	BIN
0	00	00000000	43	2B	00101011	86	56	01010110
1	01	00000001	44	2C	00101100	87	57	01010111
2	02	00000010	45	2D	00101101	88	58	01011000
3	03	00000011	46	2E	00101110	89	59	01011001
4	04	00000100	47	2F	00101111	90	5A	01011010
5	05	00000101	48	30	00110000	91	5B	01011011
6	06	00000110	49	31	00110001	92	5C	01011100
7	07	00000111	50	32	00110010	93	5D	01011101
8	08	00001000	51	33	00110011	94	5E	01011110
9	09	00001001	52	34	00110100	95	5F	01011111
10	0A	00001010	53	35	00110101	96	60	01100000
11	0B	00001011	54	36	00110110	97	61	01100001
12	0C	00001100	55	37	00110111	98	62	01100010
13	0D	00001101	56	38	00111000	99	63	01100011
14	0E	00001110	57	39	00111001	100	64	01100100
15	0F	00001111	58	3A	00111010	101	65	01100101
16	10	00010000	59	3B	00111011	102	66	01100110
17	11	00010001	60	3C	00111100	103	67	01100111
18	12	00010010	61	3D	00111101	104	68	01101000
19	13	00010011	62	3E	00111110	105	69	01101001
20	14	00010100	63	3F	00111111	106	6A	01101010
21	15	00010101	64	40	01000000	107	6B	01101011
22	16	00010110	65	41	01000001	108	6C	01101100
23	17	00010111	66	42	01000010	109	6D	01101101
24	18	00011000	67	43	01000011	110	6E	01101110
25	19	00011001	68	44	01000100	111	6F	01101111
26	1A	00011010	69	45	01000101	112	70	01110000
27	1B	00011011	70	46	01000110	113	71	01110001
28	1C	00011100	71	47	01000111	114	72	01110010
29	1D	00011101	72	48	01001000	115	73	01110011
30	1E	00011110	73	49	01001001	116	74	01110100
31	1F	00011111	74	4A	01001010	117	75	01110101
32	20	00100000	75	4B	01001011	118	76	01110110
33	21	00100001	76	4C	01001100	119	77	01110111
34	22	00100010	77	4D	01001101	120	78	01111000
35	23	00100011	78	4E	01001110	121	79	01111001
36	24	00100100	79	4F	01001111	122	7A	01111010
37	25	00100101	80	50	01010000	123	7B	01111011
38	26	00100110	81	51	01010001	124	7C	01111100
39	27	00100111	82	52	01010010	125	7D	01111101
40	28	00101000	83	53	01010011	126	7E	01111110
41	29	00101001	84	54	01010100	127	7F	01111111
42	2A	00101010	85	55	01010101			

48684

Figure B-2 provides a quick reference (for decimal numbers 128 to 255, inclusive) to simplify your conversion efforts when interpreting VCO/4K system commands and reports.

Figure B-2 Decimal/Hexadecimal/Binary Conversion—Decimal Values 128 to 255, Inclusive

DEC	HEX	BIN	DEC	HEX	BIN	DEC	HEX	BIN
128	80	10000000	171	AB	10101011	214	D6	11010110
129	81	10000001	172	AC	10101100	215	D7	11010111
130	82	10000010	173	AD	10101101	216	D8	11011000
131	83	10000011	174	AE	10101110	217	D9	11011001
132	84	10000100	175	AF	10101111	218	DA	11011010
133	85	10000101	176	B0	10110000	219	DB	11011011
134	86	10000110	177	B1	10110001	220	DC	11011100
135	87	10000111	178	B2	10110010	221	DD	11011101
136	88	10001000	179	B3	10110011	222	DE	11011110
137	89	10001001	180	B4	10110100	223	DF	11011111
138	8A	10001010	181	B5	10110101	224	E0	11100000
139	8B	10001011	182	B6	10110110	225	E1	11100001
140	8C	10001100	183	B7	10110111	226	E2	11100010
141	8D	10001101	184	B8	10111000	227	E3	11100011
142	8E	10001110	185	B9	10111001	228	E4	11100100
143	8F	10001111	186	BA	10111010	229	E5	11100101
144	90	10010000	187	BB	10111011	230	E6	11100110
145	91	10010001	188	BC	10111100	231	E7	11100111
146	92	10010010	189	BD	10111101	232	E8	11101000
147	93	10010011	190	BE	10111110	233	E9	11101001
148	94	10010100	191	BF	10111111	234	EA	11101010
149	95	10010101	192	C0	11000000	235	EB	11101011
150	96	10010110	193	C1	11000001	236	EC	11101100
151	97	10010111	194	C2	11000010	237	ED	11101101
152	98	10011000	195	C3	11000011	238	EE	11101110
153	99	10011001	196	C4	11000100	239	EF	11101111
154	9A	10011010	197	C5	11000101	240	F0	11110000
155	9B	10011011	198	C6	11000110	241	F1	11110001
156	9C	10011100	199	C7	11000111	242	F2	11110010
157	9D	10011101	200	C8	11001000	243	F3	11110011
158	9E	10011110	201	C9	11001001	244	F4	11110100
159	9F	10011111	202	CA	11001010	245	F5	11110101
160	A0	10100000	203	CB	11001011	246	F6	11110110
161	A1	10100001	204	CC	11001100	247	F7	11110111
162	A2	10100010	205	CD	11001101	248	F8	11111000
163	A3	10100011	206	CE	11001110	249	F9	11111001
164	A4	10100100	207	CF	11001111	250	FA	11111010
165	A5	10100101	208	D0	11010000	251	FB	11111011
166	A6	10100110	209	D1	11010001	252	FC	11111100
167	A7	10100111	210	D2	11010010	253	FD	11111101
168	A8	10101000	211	D3	11010011	254	FE	11111110
169	A9	10101001	212	D4	11010100	255	FF	11111111
170	AA	10101010	213	D5	11010101			

48685

System Digitized Voice Card Prompts

Table C-1 lists the prompts available in V1.08 of the Digitized Voice Card (DVC) voice prompts diskette. The prompt number is shown in both decimal (for use in inpulse rules) and hexadecimal (for use in commands). If your voice prompt version differs, contact Cisco TAC.

Table C-1 Digitized Voice Card Prompts

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message
1	$01	one
2	$02	two
3	$03	three
4	$04	four
5	$05	five
6	$06	six
7	$07	seven
8	$08	eight
9	$09	nine
10	$0A	zero
11	$0B	oh
12	$0C	hundred
13	$0D	thousand
14	$0E	Your credit card number cannot be used with the carrier you have selected.
15	$0F	Your credit card has expired.
16	$10	Your credit card is invalid.
17	$11	Please dial the number you wish to reach.
18	$12	Please select a carrier.
19	$13	Your call cannot be completed as dialed. Please hang up and call again.
20	$14	Please slide your credit card as shown.
21	$15	Please select another carrier.

Table C-1 Digitized Voice Card Prompts (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message
22	$16	Please slide your credit card again.
23	$17	Your number was dialed incorrectly. Please dial again.
24	$18	The carrier you have selected cannot complete your call.
25	$19	Please wait. We are processing your credit card information.
26	$1A	This telephone can be used for long distance calls only.
27	$1B	Please check the dialing instructions displayed and try your call again.
28	$1C	Please use one of the credit cards shown.
29	$1D	Please hang up and call again.
30	$1E	The credit card that you have selected cannot be used for this call.
31	$1F	You have made an invalid selection.
32	$20	The button that you pressed is not a valid selection.
33	$21	Your credit card number was not received correctly.
34	$22	Please slide your card again or dial your credit card number.
35	$23	Please slide a different card through the slot as shown.
36	$24	Use this telephone to charge your call to one of the pictured credit cards. Simply slide your card through the slot as shown.
37	$25	Then dial your call when requested to do so.
38	$26	Thank you.
39	$27	Your calling card number must be entered manually.
40	$28	Calls within this Area Code can not be presently billed to a credit card.
41	$29	The call you have made will be handled by your local operating company.
42	$2A	unless you select an alternative carrier.
43	$2B	You can save money and pay less than daytime calling card rates by using any of the major credit cards shown above.
44	$2C	This phone does not accept telephone company calling cards.
45	$2D	Your call is being processed.
46	$2E	(three seconds of silence)
47	$2F	We're sorry...
48	$30	...you are not authorized to use this service.

Table C-1 Digitized Voice Card Prompts (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message
49	$31	...the following service is not available for 800 numbers.
50	$32	...this service is not available for...
51	$33	...calls inside the local service area.
52	$34	...operator service is not available through this service.
53	$35	...international calls.
54	$36	...all connections to the selected carriers are busy.
55	$37	Please hang up and call again in a few minutes.
56	$38	For assistance, dial...
57	$39	ten
58	$3A	eleven
59	$3B	twelve
60	$3C	thirteen
61	$3D	fourteen
62	$3E	fifteen
63	$3F	sixteen
64	$40	seventeen
65	$41	eighteen
66	$42	nineteen
67	$43	twenty
68	$44	thirty
69	$45	forty
70	$46	fifty
71	$47	sixty
72	$48	seventy
73	$49	eighty
74	$4A	ninety
75	$4B	At the sound of the tone
76	$4C	please
77	$4D	enter
78	$4E	re-enter
79	$4F	your credit card number
80	$50	the number you are calling
81	$51	For operator assistance
82	$52	press
83	$53	dial

Table C-1 Digitized Voice Card Prompts (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message
84	$54	thank you for using...
85	$55	press the star when complete
86	$56	...or pound sign to begin over
87	$57	our service
88	$58	for an operator
89	$59	number
90	$5A	area code
91	$5B	(one second of silence)
92	$5C	(Reserved)
93	$5D	circuits
94	$5E	are busy
95	$5F	all
96	$60	operators
97	$61	Please hang up and try again
98	$62	again
99	$63	later
100	$64	for
101	$65	your credit card
102	$66	(Reserved)
103	$67	...must be entered manually
104	$68	selection
105	$69	Please hold
106	$6A	your call
107	$6B	is being processed
108	$6C	We're sorry, this service is not available.
109	$6D	using a one
110	$6E	before the
111	$6F	or a
112	$70	(Reserved)
113	$71	number
114	$72	(Reserved)
115	$73	to place an international call
116	$74	10288 plus
117	$75	the number
118	$76	operator service

Table C-1 Digitized Voice Card Prompts (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message
119	$77	You have made an invalid
120	$78	Reserved
121	$79	Reserved
122	$7A	Direct
123	$7B	Reserved
124	$7C	International

APPENDIX D

Network Status Byte Definitions

Table D-1 describes the hexadecimal network status bytes (NSBs) encountered during the operation of the VCO/4K switch.

Table D-1 Network Status Bytes and Meanings

NSB	Meaning
$00	Message sourced due to autonomous event on sender. Correct byte value for commands to the system and reports to the host. No corrective action required.
$01	Command processing successful. Indicates command sent to the system has been processed successfully. Returned only when return all is specified in the command's network control byte. No corrective action required.
$02	Invalid command function ID. Indicates the value specified in the command's function ID byte (byte offset 4) does not correspond to any system command. Check byte value in byte offset 4.
$03	Syntax error in command. Indicates one or more of the values specified in the command are invalid or that the command specifies no action or improper switching actions within the SAPR bit settings. For example, if a Request Resource Control ($80) command specifies to attach a resource, it must also specify switching. Specifying values in spacer bytes or bytes reserved for future development may also cause syntax errors. Check all byte values in command.
$04	Incorrect destination source virtual communications address (VCA) in command network header. Indicates the value specified in the destination VCA byte (byte offset 1) does not correspond to any known system VCA. Check byte value in byte offset 1.
$05	Reserved for call number/sequence number error.
$06	Incoming port specified in command is not idle. Indicates the circuit identified by the port address specified in the command is not in the CP_IDLE major state (MState) and the command cannot be processed. Refer to Appendix F, “Call Processing States,” for information about MStates. Change port address in command or select a port from appropriate resource group.
$07	Voice port specified in command is not idle. Indicates the circuit identified by the port address specified in the command is not in the CP_IDLE major state (MState) and the command cannot be processed. Refer to Appendix F, “Call Processing States,” for information about MStates. Change port address in command or select a port from appropriate resource group.
$08	Command received was received by standby side but can only be processed on the active side.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$09	Invalid Digitized Voice card (DVC) or Integrated Prompt and Record card (IPRC) port address—not in valid range. Indicates the port address specified in the command is not within the range of system port addresses or if port address is specified without access code of $00. Check port address or select a port from appropriate resource group.
$0A	Receiver port specified in command is not idle. Indicates the circuit identified by the port address specified in the command is not in the CP_IDLE major state (MState) and the command cannot be processed. Refer to Appendix F, "Call Processing States," for information about MStates. Change port address in command or select a port from appropriate resource group.
$0B	Unable to start/reserve conference because maximum number of conferences are already active. Indicates that there are already 128 simultaneous conferences in progress (active or reserved) on the system.
$0C	No active conference with conference number specified in command. Indicates the conference number byte value (byte offset 5) specified in the command does not correspond to any currently active conferences. Check conference number.
$0D	Invalid resource group number. Indicates the resource group specified in the command is 0 or greater than 63 ($20). Check resource group number.
$0E	Invalid controlling port address—not in valid range. Indicates the port address specified in the command is not within the range of system port addresses or that port address is not assigned. Check port address.
$0F	Call or conference is not controlled by this host. Indicates the host port from which this command was received does not correspond to the port controlling the call.
$10	Invalid incoming port address (not in valid range). Indicates the port address specified in the command is not within the range of system port addresses. Check port address or select a port from appropriate resource group.
$11	Port in command is idle but should not be. Indicates the circuit identified by the port address specified in the command (usually a controlling port or incoming port) is in the CP_IDLE major state (MState) and the command cannot be processed. Refer to Appendix F, "Call Processing States," for information about MStates. Check for correct port address.
$12	Port address in command is not a line or trunk. Indicates the circuit identified by the port address specified in the command is not a network interface circuit. Change port address in command or select a port from appropriate resource group.
$13	Invalid dual tone multifrequency (DTMF) receiver port address—not in valid range. Indicates the port address specified in the command is not within the range of system port addresses. Check port address or select a port from appropriate resource group.
$14	Invalid multifrequency (MF) receiver port address—not in valid range. Indicates the port address specified in the command is not within the range of system port addresses. Check port address or select a port from appropriate resource group.
$15	Invalid outgoing port address—not in valid range. Indicates the port address specified in the command is not within the range of system port addresses. Check port address or select a port from appropriate resource group.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$16	No resource of this type/group in the call's resource chain. Indicates a Request Resource Control ($80) command specified to hunt without switching and the required resource was not already in the call's resource chain. Resources, such as dual tone multifrequency (DTMF) receivers, can remain linked into a chain for the duration of a call. Can also indicate that a previous attempt to attach the resource failed or the resource has already been detached.
$17	Port address specified in command is not in this call's resource chain. Indicates the circuit identified by the port address specified in the command is not participating in this call. Either the port address is incorrect, the host previously attempted to attach a resource to this call and the attempt failed, or the resource has already been detached by a previous command.
$18	Port address specified in command is the wrong type, resource group, or class of service (COS). Indicates that the circuit identified by the port address specified in the command is not of the correct type for this command. Check port address.
$19	Port address specified in command is not on a T1 card. Indicates the circuit identified by the port address specified in the command is not a T1 channel. Returned only in response to an incorrect T1 Synchronization Control ($C0 02) command.
$1A	Invalid time/date specified. Indicates the byte values for hours/minutes/seconds is not within the appropriate range for the Configure VCA/Set System Clock ($C0 00) command. Check byte values.
$1B	This feature is not enabled. Indicates the Host Call Load Control ($C0 04) command has not been enabled.
$1C	Line/trunk port in conference. Indicates the circuit identified by the port address is participating in a conference.
$1D	Line/trunk port not in this conference. Indicates the circuit identified by the port address specified to be removed or adjusted is not in this conference. Check the port address and conference number byte values.
$1E	Line/trunk port in wrong state to be added to conference. Indicates the circuit identified by the port address specified to be added to this conference is not in the CP_SETUP, CP_STAB, CP_IDLE (COS = A and off hook only) or CP_WANS (COS = O or U only) major state (MState) and the command cannot be processed. Refer to Appendix F, “Call Processing States,” for information about MStates. Check for correct port address.
$1F	Unable to find an available port in resource group specified in command or internal resource group implied by the command type. Returned to indicate a resource limitation condition exists, the resource hunt was unsuccessful, and the command cannot be processed. A Resource Limitation ($D6) report is sent to the host when this condition occurs.
$20	Outgoing port specified in command is not idle. Indicates the circuit identified by the port address specified in the command is not in the CP_IDLE major state (MState) and the command cannot be processed. Three methods are used to enable processing: • Change port address in command. • Select a port from appropriate resource group. • Remove any resources attached to the port. Refer to Appendix F, “Call Processing States,” for information about MStates.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$21	Line/trunk port not off hook. Issued in response to the Conference Control ($6D) command to indicate that the circuit identified by the port address specified to be added to the conference is not off hook and the command cannot be processed. Also issued in response to the Incoming Port Control (Macro) ($6A) command if the port specified in the command is on hook. Check port address.
$22	Port of a particular type or group is already linked into this call's resource chain. Indicates which command was specified to attach a resource (usually a receiver port) into a call where that resource is already attached. Correct command to use existing resource.
$23	Invalid port address specified in command. Indicates the port address byte values do not fall within the range $00 00 through $07 FF. Can be received in response to the following commands: Voice Path Control ($66), Port Supervision Control ($72), T1 Synchronization Control ($C0 02). Check port address.
$24	Port address specified in command is for a port or card that is not active. The circuit identified by the port address specified in the command is not active (P command in system administration card maintenance), out-of-service, or on a card that has been placed in maintenance or diagnostic mode. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information. Change port address in command or select a port from appropriate resource group.
$25	All tone channels are busy. Returned in response to an Outgoing Port Control ($69) command segment or Incoming Port Control ($6A) command outpulsing segment to indicate a resource limitation condition exists and the outpulsing specified cannot be processed.
$26	Port is in an uncontrollable state (CP_MBUSY, CP_GARD, CP_RDR, CP_DISC). The circuit identified by the port address specified in the command is unavailable because of reorder processing, permanent signal processing, guard timing, or busied out. Change port address in command or select a port from appropriate resource group.
$27	Either too many voice prompts were specified in Voice Port Control ($6C) command, or zero was specified. Check values for prompt control byte (byte offset 9) and phrase bytes (byte offsets 10 to n).
$28	Cannot begin new statistics reporting period.
$29	Internal error—command cannot be completed. Indicates an system processing error. Resend command.
$2A	Primary and secondary T1 synchronization values on same T1 card. Indicates that a T1 Synchronization Control ($C0 02) command has specified primary and secondary port addresses that reside on the same card. Check values and resend command with correct values.
$2B	The inpulse or outpulse rule number specified in the command is out of the range for a rule (1 to 20). Check value and resend command with correct value.
$2C	An invalid number of digits was specified, either too few or too many, for collection in a DTMF Digit Collection (Enhanced) ($6C) command. Check value and resend command with correct value.
$2D	This network status byte is not enabled for the current software package.
$2E	Value entered for one of the timers in the DTMF Collection Control (Enhanced) ($67) command is outside the valid range.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$2F	An invalid enabling parameter was specified in the DTMF Collection Control (Enhanced) ($67) command.
$30	An error has occurred in the DTMF Collection Control (Enhanced) ($67) command processing; the call is not stable.
$33	Required resources could not be allocated to process the DTMF Collection Control (Enhanced) ($67) command. One of the resource types required to process the command (IPRC port, etc.) was not available.
$34	Invalid digit storage control byte in DTMF Collection Control (Enhanced) ($67) command. Both store and append, or an invalid field number was specified in the digit storage control byte.
$35	The virtual port specified in the command is in the wrong state for the action specified in the following commands: Outgoing Port Control ($69), Incoming Port Control (Macro) ($6A), or Change Incoming Port ($6B). Refer to the appropriate command description for valid virtual port states.
$36	System switchover ordered by the Change Active Controllers ($C0 01) command has been queued until file synchronization processing has been completed. The $C0 01 command is also queued when the standby system cannot communicate with the active system.
$37	Indicates that both an inpulse and outpulse rule were specified for execution in an Outgoing Port Control ($69) command, or an Incoming Port Control (Macro) ($6A) command. Only one type of rule can be specified in a single command.
$38	A command has been received for an incoming port for which the current call has not yet been reported to the host. Could indicate the host considers a previously active call for this port to still be connected. No processing can take place for the new call until it has been reported to the host.
$39	Resource group specified for hunting is of the wrong resource type.
$3A	Call Progress Analyzer (CPA) card ports were not available to process the command.
$3B	The Change Port Status ($90) command could not be processed because maintenance is currently being performed on the card the ports reside on (from the system administration console).
$3C	One of the eleven resource control commands ($6x), or the Port Supervision Control ($72) command was received before the host issued a Host Call Load Control ($C0 04) command to begin call processing. The $C0 04 command is used when the enable host control of call load feature is set to Y. Instructions for setting this feature are contained in the *Cisco VCO/4K System Administrator's Guide*.
$3D	The D-channel is currently switching over.
$3E	Invalid hook state is in the Port Hook State Control ($70) command.
$3F	An invalid class of service (COS) is specified in the Port Hook State Control ($70) command.
$40	An invalid rule control byte is specified in the Port Hook State Control ($70) command.
$41	The host command length is invalid.
$42	The specified port is not in a valid state to execute an inpulse or outpulse rule.
$43	Invalid prompt control. Generated if the prompt control byte is not valid.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$44	Invalid control code. Generated if the playback or record control code byte is not valid.
$45	Invalid library ID. Generated if the library code is not valid.
$46	Invalid prompt ID. Generated if any of the prompt ID values are not valid.
$47	Invalid maximum record time byte. Generated if the maximum record time value specified in the command is invalid.
$48	Unsupported library. Generated if the command specifies an explicit Integrated Prompt and Record card (IPRC) port which does not support the specified prompt library, or the command specified an IPRC resource already in the call chain which does not support the specified library.
$49	Invalid access code. Generated if the access code byte is not valid.
$4A	Invalid rack, level, slot (R-L-S) code. Generated if the R-L-S code byte does not correspond to a valid Integrated Prompt and Record card (IPRC), or if the R-L-S code is specified without an access code of $01.
$4B	Voice Prompt Maintenance Control ($91) command processing completed successfully.
$4C	Voice Prompt Maintenance Control ($91) command processing error encountered.
$4D	The conference specified in a start or reserve command is already allocated.
$4E	An invalid release complete message has been created for the call's current state.
$4F	Digit collection for fourth column dual tone multifrequency (DTMF) is requested but the system feature is not enabled. See the *Cisco VCO/4K System Administrator's Guide* for more information on setting the system features.
$50	In the DTMF Collection Control (Enhanced) ($67) command, fourth column dual tone multifrequency (DTMF) digits were found but the D bit is not set.
$51	The dual tone multifrequency (DTMF) receiver does not support fourth column DTMF digit collection.
$52	An invalid rack, level, slot (R-L-S) range was specified in the Card Status ($82) command. This could be because the ending R-L-S is sequentially lower than the starting R-L-S.
$53	An invalid span was specified in the Card Status ($82) command, or the Port Status ($83) command. This is the return code for single-span cards, if the span specifier greater than one, or for multispan cards with a specifier greater than four.
$54	An invalid count was specified in the Conference Control ($6D) command.
$55	Duplicate ports were specified in the Conference Control ($6D) command.
$56	Bearer channel not attached to subrate switch card (received only when command specifies to detach bearer channel).
$57	Bearer channel cannot be attached to subrate switch due to timeslot exhaustion.
$58	Connection request rejected, no subrate switch card in service.
$59	Connection request rejected, card redundancy switchover in process.
$5A	Connection request rejected, subrate switch card source and destination bearer subchannel overlap.
$5B	Path removal failed, no such path exists.
$5C	The previous dual tone multifrequency (DTMF) was not completed.

Table D-1 Network Status Bytes and Meanings (continued)

NSB	Meaning
$5D	Path removal failed, path is one-way when the host specified two-way, or two-way when the host specified one-way.
$5E	Returned from a Change Active Controllers ($C0 01) command to indicate that a host-initiated switchover request was denied due to a live upgrade in progress.
$5F	Subrate channel width must be greater than zero and less than or equal to eight.
$60	Subrate channel crosses bearer channel boundary.
$61	The D+I port specified in the Voice Path Control ($66) command was busy.

APPENDIX E

Tone Values

Table E-1 lists the tones along with their corresponding decimal and hexadecimal values, and port addresses. These numerical values and port addresses are used with the following:

- Inpulse rules
- Voice Path Control ($66) command ($66)
- DTMF Collection Control ($67) (Enhanced) command

Table E-1 Tones, Values, and Port Addresses

Tone	Decimal Value	Hex Value	Port Address
Beep	0	00	None
Quiet	1	01	04C0
1 kHz	2	02	04C1
Dial Tone	3	03	04C2
380 Hz	4	04	04C3
440 Hz	5	05	04C4
480 Hz	6	06	04C5
1400 Hz	7	07	04C6
1000 Hz @ max CODEC output	8	08	04C7
913.8 Hz SIT	9	09	04C8
404 Hz	10	0A	04C9
1004 Hz	11	0B	04CA
2804 Hz	12	0C	04CB
Steady Ring Back	13	0D	04CC
1760 Hz Pay Phone Trigger	14	0E	04CD
Digital Test Pattern	15	0F	04CE
Unused	16	10	04CF
Ringback (2 seconds on/4 seconds off)	17	11	04D0
Line Busy (0.5 second on/0.5 second off)	18	12	04D1
Reorder (0.25 second on/0.25 second off)	19	13	04D2

Table E-1 Tones, Values, and Port Addresses (continued)

Tone	Decimal Value	Hex Value	Port Address
NAK tone (380 Hz, 1 second on/0.1 second off)	20	14	04D3
BONG (Operator Access)	21	15	04D4
Unused	22–24	16–18	04D5–04D7
1780 Hz	25	19	04D8
2010 Hz	26	1A	04D9
Unused	27–32	20	04DA–04DF
DTMF digit 0 (steady	33	21	04E0
DTMF digit 1 (steady)	34	22	04E1
DTMF digit 2 (steady)	35	23	04E2
DTMF digit 3 (steady)	36	24	04E3
DTMF digit 4 (steady)	37	25	04E4
DTMF digit 5 (steady)	38	26	04E5
DTMF digit 6 (steady)	39	27	04E6
DTMF digit 7 (steady)	40	28	04E7
DTMF digit 8 (steady)	41	29	04E8
DTMF digit 9 (steady)	42	2A	04E9
DTMF digit A (steady)	43	2B	04EA
DTMF digit B (steady)	44	2C	04EB
DTMF digit C (steady)	45	2D	04EC
DTMF digit D (steady)	46	2E	04ED
DTMF digit * (steady)	47	2F	04EE
DTMF digit # (steady)	48	30	04EF
MF digit 0 (steady)	49	31	04F0
MF digit 1 (steady)	50	32	04F1
MF digit 2 (steady)	51	33	04F2
MF digit 3 (steady)	52	34	04F3
MF digit 4 (steady)	53	35	04F4
MF digit 5 (steady)	54	36	04F5
MF digit 6 (steady)	55	37	04F6
MF digit 7 (steady)	56	38	04F7
MF digit 8 (steady)	57	39	04F8
MF digit 9 (steady)	58	3A	04F9
MF digit KP (steady)	59	3B	04FA
MF digit ST (steady)	60	3C	04FB
MF digit STP (steady)	61	3D	04FC

Table E-1 Tones, Values, and Port Addresses (continued)

Tone	Decimal Value	Hex Value	Port Address
MF digit ST2P (steady)	62	3E	04FD
MF digit ST3P (steady)	63	3F	04FE

APPENDIX F

Call Processing States

The system internal processing uses a simple state machine representation to track the current condition of all resources in the system. Transitions between states occur as a result of externally generated events (incoming calls, for example), commands from the host, or inpulse/outpulse rule processing.

Two variables are maintained on a per-port basis to track the current state of a port: Major states (MStates) and Supplementary States (SStates). MStates represent points within specific call processing routines. SStates monitor detailed activity within those routines. Because of the structure of the state machine and the nature of call processing activity, several SStates can exist simultaneously under a single MState.

The current MState and SState for a port can be viewed using the system Diagnostics Port Display screen (refer to the *Cisco VCO/4K System Administrator's Guide*). This screen is especially useful in the debugging process because it shows what actions are being performed for a specific port, any inpulse/outpulse rule processing activity, and all links and voice paths associated with that port.

This appendix contains a listing of all MStates and SStates. Each state is defined and indicates which resource types may be in that state.

Major States (MStates)

CP_ANALYZE

Resource Types: CPA ports only.

Definition: CPA port is linked into a call and is set to detect call progress tones or presence of voice. An outpulse rule that involves tone detection (WAIT SUP or FINAL SUP token being processed) is being executed.

SStates: None.

CP_ATT

Resource Types: Service circuits, outgoing ports (all types).

Definition:

- CPA port, DTMF receiver, DVC port, IPRC port, MF receiver, outpulse channel—Port is linked into a call, with no other action taking place (i.e. not set to detect digits tones, present voice prompts, or outpulse digits). An inpulse/outpulse rule or Resource Control command is being processed.

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- DCC port—Port is linked into a call but not being used. Either the DCC port is reserved but has no associated line/trunk port, or the DCC port plus its associated line/trunk port are being placed into a conference (intermediate step). A reserved port returns to this state after use until the entire conference is torn down by host command. One or more Conference Control ($6D) commands have been processed. Specific state of the port is indicated by the SState.
- Outgoing port—Port is linked into a call, with no other action taking place (i.e. outpulse rule processing has not started and port is not off hook). An Outgoing Port Control ($69) command is being processed.

SStates:

- CPA port, DVC port, IPRC port, MF receiver—None.
- DTMF receiver—DLY_ANS (8), DLY_TIME (1), DLY_TONE (2), DLY_WINK (4).
- DCC port—CF_SET (SET), CF_ACK (ACK), CF_RSVR (R).

CP_CONF

Resource Types: DCC ports only.

Definition: DCC port has an associated line/trunk port and is actively participating in a conference. One or more Conference Control ($6D) commands have been processed. Associated line/trunk port is in CP_SETUP MState.

SStates: CF_SET (SET), CF_ACK (ACK), CF_RSVR (R), CF_1WAY (1), CF_2WAY (2).

CP_CPAMON

Resource Types: CPA ports only.

Definition: CPA port is being monitored for end of call tone.

SStates: None.

CP_DCON

Resource Types: All port types.

Definition: Call disconnect state; applicable to all unused ports.

SStates: None.

CP_DELAY

Resource Types: All port types.

Definition: DTMF collection is delayed for an event.

SStates: None.

CP_DIAG

Resource Types: CPA port, DTMF receiver, MF receiver.

Definition: Port is being used by either the Service Circuit or T1 Test utility.

SStates: None.

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CP_DIAL

Resource Types: All port types.

Definition: Dialing state.

SStates: None.

CP_DIG

Resource Types: DTMF receiver, MF receiver.

Definition:

- DTMF receiver—Port is linked into a call, is enabled, has received the first digit, and is collecting the remainder of the digit string. A DTMF Collection Control ($67) command is being processed.
- MF receiver—Port is linked into a call, is enabled, and is collecting the digit string. An MF Collection Control ($68) command is being processed.

SStates: None.

CP_DISC

Resource Types: Incoming ports (all types except COS = A, when the port is off hook, hardware, and idle software), outgoing ports (all types except COS = A, when the port is off hook, hardware, idle software, and UTC with COS = O).

Definition: A physical release has been performed on the port and Permanent Signal processing is taking place. The specific action being performed is indicated by the SState. A port remains in this MState until it goes on hook.

SStates: RDR_DONE, RDR_FBUSY, RDR_QUIET.

CP_DONECOLLECT

Resource Types: All port types.

Definition: One of three possible meanings:

- DTMF collection has completed—either a success or failure.
- A resource has been released.
- An inpulse rule has been aborted.

SStates: None.

CP_DTMF

Resource Types: Incoming ports (all types), outgoing ports (all types).

Definition: DTMF digits are being collected from the incoming/outgoing port, and a DTMF receiver is linked into the call. A DTMF Collection Control ($67) command is being processed for the incoming/outgoing port.

SStates: None.

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CP_FDIG

Resource Types: DTMF receiver only.

Definition: Port is linked into a call, is enabled, and is waiting to receive the first digit. A DTMF Collection Control ($67) command is being processed for the incoming/outgoing port.

SStates: None.

CP_GARD

Resource Types: Incoming ports (all types), outgoing ports (all types).

Definition:

- UTC, T1, E+M—Guard timing is being performed for the port as a result of an on hook or the port being activated via the Card Maintenance screen P command or the Change Port Status ($90) command. If guard timing is due to an on hook, the SState is GD_NORMAL and the port goes to an MState of CP_IDLE after 150 ms. If guard timing is due to port activation, the SState is either GD_WTRLS or GD_WTRLSH. If on hook, the port goes to an MState of CP_IDLE after 150 ms. If off hook, the port remains in this state until an on hook is detected. The port has gone on hook and guard timing is being performed. The port goes to CP_IDLE state after 150 ms.
- SLIC, DID—Guard timing is being performed for the port as a result the port being activated via the Card Maintenance screen P command or the Change Port Status ($90) command. The SState is either GD_WTRLS or GD_WTRLSH. If on hook, the port goes to an MState of CP_IDLE after 150 ms. If off hook, port remains in this state until an on hook is detected.

SStates: GD_NORMAL, GD_WTRLS, GD_WTRLSH.

CP_FEXC

Resource Types: All port types.

Definition: Call was passed to final exception handling. This MState is not available for customer use at this time.

SStates: None.

CP_HOST

Resource Types: Incoming ports with COS = A (all types) and virtual ports.

Definition: Forced origination for an idle, off hook port with COS = A (always off hook) or a virtual port. An Incoming Port Control ($6A) command has been performed.

SStates: None.

CP_IDLE

Resource Types: All port types.

Definition: No activity on the port.

SStates: None.

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CP_INPULSE

Resource Types: Incoming ports, outgoing ports.

Definition: An inpulse rule is being executed for the port. Processing involving digit collection, rehunting a service circuit, presenting a voice prompt or beep tone, or waiting a specified amount of time is indicated by the SState.

SStates: DIALING (02), WT_ANNC (04), WT_BEEP (08), WT_DTMF (01), WT_MFÊ(80), WT_TALK (10), WT_TIM (40).

CP_MBUSY

Resource Types: All.

Definition:

- Service circuits—The port is in the maintenance busy state (busied out) and is out of service. This state is due to either port failure or the port has been taken out of service using the system administration Card Maintenance screen P command or the Change Port Status ($90) command.
- Incoming ports, outgoing ports—The port is in the maintenance busy state (busied out) and is out of service. This state is due to port failure, inward seize on an outgoing port, or the port has been taken out of service using the system administration Card Maintenance screen P command or the Change Port Status ($90) command.

SStates: DIAG_AUTO, DIAG_CMAINT, DIAG_IDLE, DIAG_INTERN, DIAG_OEND, DIAG_PATH.

CP_MF

Resource Types: All port types.

Definition: Waiting for MF receiver to be available. This MState is not available for customer use at this time.

SStates: None.

CP_MFWT

Resource Types: Incoming ports, outgoing ports.

Definition: MF digits are being collected from the incoming/outgoing port, and an MF receiver is linked into the call. An MF Collection Control ($68) command is being processed for the incoming/outgoing port.

SStates: None.

CP_MON

Resource Types: All port types.

Definition: Port is being monitored with the CPMON tool. This MState is not available for customer use at this time.

SStates: None.

CP_NOTINDB

Resource Types: All port types.

Definition: Port address is not allocated in the database (invalid port status requested by the host)—notifies the host that the card on which this port resides is in the NOTINDB state. This MState is not available for customer use at this time; it cannot be used to display the port status on the software administration's Port Display screen.

SStates: None.

CP_OOS

Resource Types: All port types.

Definition: Card containing the port is OOS—notifies the host that the card on which this port resides is in the OOS state. This MState is not available for customer use at this time; it cannot be used to display the port status on the software administration's Port Display screen.

SStates: None.

CP_OUTPULSE

Resource Types: Incoming ports, outgoing ports.

Definition: An outpulse rule is being executed for the port. Processing involving digit outpulsing, waiting for supervision, and waiting a specified amount of time is indicated by the SState.

SStates: DIAL_DIG, WAIT_SUP, WAIT_TIM.

CP_PRIMARY

Resource Types: All port types.

Definition: Waiting for primary ringback completion. This MState is not available for customer use at this time.

SStates: None.

CP_RDR

Resource Types: Incoming ports (all types except for COS = A), outgoing ports (all types except for COS = A and UTC with COS = O).

Definition: Reorder processing is being performed for the port, and the reorder tone is being presented. This MState always has an SState of WT_PSC.

SStates: WT_PSC.

CP_RECORD

Resource Types: All port types.

Definition: A port, usually an IPRC port, is being used to record a custom prompt.

SStates: None.

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CP_SELFTEST

Resource Types: CPA, SRC.

Definition: Card on which the port resides is conducting internal testing following download of the CPA or SRC application to the card. Ports remain in this state until all tests are passed, then are brought into service (CP_IDLE).

SStates: None.

CP_SETUP

Resource Types: Incoming ports, outgoing ports.

Definition: Port is either off hook and waiting for further host action or is participating in a conference.

SStates: None.

CP_SPEECH

Resource Types: Incoming ports, outgoing ports.

Definition: Spoken digits or yes/no response are being collected from the incoming/outgoing port, and an SRC port is linked into the call. A Speech Collection Control ($6E) command is being processed for the incoming/outgoing port.

SStates: None.

CP_STAB

Resource Types: Incoming ports, outgoing ports.

Definition: Port is involved in a stable call. A call is considered stable when a voice path has been established between an incoming port and an outgoing port. Both ports must be off hook (answered). When a command is received for either port in a stable call, the ports transition out of the stable state while the actions specified in the command are being processed. The state to which they transition is determined by the action being performed.

SStates: None.

CP_TALK

Resource Types: Incoming ports, outgoing ports.

Definition: Voice prompts are being presented to the incoming/outgoing port, and a DVC or IPRC port is linked into the call. A Voice Port Control ($6C) command is being processed for the incoming/outgoing port.

SStates: None.

CP_TONE

Resource Types: Outpulse channels.

Definition: Outpulse channel is linked into a call and digits or tones are being outpulsed.

SStates: None.

CP_WAIT

Resource Types: All port types.

Definition: Waiting for an answer from the far end within an outpulse rule. This MState is not available for customer use at this time.

SStates: None.

CP_WAITACK

Resource Types: All port types.

Definition: DTMF collection is waiting for a SETUP ACK message—DTMF collection is being restarted on this port.

SStates: None.

CP_WANS

Resource Types: Incoming ports only.

Definition: Port is waiting for outgoing port to complete outpulse rule processing or receive final answer supervision from the far end. An outgoing port is linked into the call; the outgoing port is waiting for final supervision or an outpulse rule is being executed.

SStates: None.

CP_WTFSUP

Resource Types: Incoming and outgoing ports.

Definition: Port is waiting for final answer supervision from the distant end. An outpulse rule has been processed for the port (may be outpulse rule 0 – null rule).

SStates: None.

CP_WTIM

Resource Types: All port types.

Definition: Waiting for unspecified period of time. This MState is not available for customer use at this time.

SStates: None.

CP_WTONE

Resource Types: All port types.

Definition: Port is waiting for a tone. This MState is not available for customer use at this time.

SStates: None.

CP_WWINK

Resource Types: All incoming/outgoing port types.

Definition: Waiting for a wink within an outpulse rule.

SStates: None.

Supplementary States (SStates)

Several SStates can exist simultaneously under a single MState. When more than one SState is present, the Diagnostics Port Display screen combines the names or abbreviations of the SStates. The character(s) that appear next to the SState name indicate the abbreviation that may be seen on the screen for each SState.

CF_1WAY (1)

Resource Types: DCC ports only.

Definition: Port is being used for a one-way voice path from a conference. One or more associated line/trunk ports are linked to this DCC port. The DCC port is also linked to a resource chain containing all DCC ports involved in the conference.

MStates: CP_CONF.

CF_2WAY (2)

Resource Types: DCC ports only.

Definition: Port is being used for a two-way voice path to/from a conference. One associated line/trunk port is linked to this DCC port. The DCC port is also linked to a resource chain containing all DCC ports involved in the conference.

MStates: CP_CONF.

CF_ACK (ACK)

Resource Types: DCC ports only.

Definition: Port has received instructions from call processing and is acknowledging them.

MStates: CP_ATT, CP_CONF.

CF_RSVR (R)

Resource Types: DCC ports only.

Definition: Port has been reserved for a conference by the host via the Conference Control ($6D) command. The DCC port continues to be in this SState until the entire conference is torn down by the host. For example, if a DCC port has been reserved and is participating in a conference, it retains the SState of CF_RSVR when its associated line/trunk port goes on hook; the DCC port transitions from CP_CONF to CP_ATT and remains reserved (dedicated) for that conference.

MStates: CP_ATT, CP_CONF.

CF_SET (SET)

Resource Types: DCC ports only.

Definition: Port is receiving instructions from call processing as to what action to perform next.

MStates: CP_ATT, CP_CONF.

DIAG_AUTO (4)

Resource Types: Outgoing ports.

Definition: Outgoing port has been busied out by the system because the auto make busy error threshold has been reached. Threshold value is set for all ports in a resource group using the system administration Resource Group Summary screen.

MStates: CP_MBUSY.

DIAG_CMAINT (1)

Resource Types: All.

Definition: Port has been busied out (deactivated) using the system administration Card Maintenance screen P command or the Change Port Status ($90) command.

MStates: CP_MBUSY.

DIAG_IDLE (0)

Resource Types: CPA ports, DVC ports, IPRC ports, T1 channels.

Definition:

- CPA ports, DVC ports, IPRC ports—Port is busied out for an unknown reason. The reason is unknown because the card is being downloaded (application software for CPA, voice prompts for DVC and IPRC). The true SState is displayed when the download is complete.
- T1 channels—Channel is busied out for an unknown reason. The reason is unknown because the card is in maintenance mode due to loss of carrier or loss of framing.

MStates: CP_MBUSY.

DIAG_OEND (3)

Resource Types: Outgoing ports.

Definition: Outgoing port has been busied out by an inward seizure from the far end.

MStates: CP_MBUSY.

DIAG_PATH (2)

Resource Types: All.

Definition: Port has been busied out (deactivated) using the system administration Card Maintenance Submenu “P” command and a voice path has been established between this port and another using the system administration Set Path utility.

MStates: CP_MBUSY.

DIALING (02)

Resource Types: Incoming ports, outgoing ports.

Definition: Port is waiting to receive digits. An inpulse rule IP ANI or IP FIELD token is being processed, and a DTMF or MF receiver port is linked into the call. The incoming/outgoing port remains in this state until all digits are collected or a timeout occurs. A timeout aborts the rule, otherwise rule processing continues.

MStates: CP_INPULSE.

DIAL_DIG (01)

Resource Types: Incoming ports, outgoing ports.

Definition: Digits or tones are being outpulsed over this port. An outpulse rule OP ANI, OP DIGIT or OP FIELD token is being processed, and an outpulse channel is linked into the call. The incoming/outgoing port remains in this state until all digits/tones are outpulsed.

MStates: CP_OUTPULSE.

DLY_ANN (10)

Resource Types: DTMF receivers.

Definition: Speech Collection Control ($6E) or DTMF Collection Control ($67) (Enhanced) command is being processed. The command specified to wait until voice prompts were presented before enabling the DTMF receiver.

MStates: CP_ATT.

DLY_ANS (8)

Resource Types: DTMF receivers.

Definition: Speech Collection Control ($6E) or DTMF Collection Control ($67) (Enhanced) command is being processed. The command specified to wait until true answer supervision is detected before enabling the DTMF receiver.

MStates: CP_ATT.

DLY_TIME (1)

Resource Types: DTMF receivers.

Definition: Speech Collection Control ($6E) or DTMF Collection Control ($67) (Enhanced) command is being processed. The command specified to wait a length of time before enabling the DTMF receiver.

MStates: CP_ATT.

DLY_TONE (2)

Resource Types: DTMF receivers.

Definition: Speech Collection Control ($6E) or DTMF Collection Control ($67) (Enhanced) command is being processed. The command specified to wait until after a tone is presented before enabling the DTMF receiver.

MStates: CP_ATT.

DLY_WINK (4)

Resource Types: DTMF receivers.

Definition: Speech Collection Control ($6E) or DTMF Collection Control ($67) (Enhanced) command is being processed. The command specified to wait until a wink is detected before enabling the DTMF receiver.

MStates: CP_ATT.

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GD_NORMAL (0)

Resource Types: Incoming ports (UTC, T1, E+M), outgoing ports (UTC, T1, E+M).

Definition: Guard timing is being performed for the port as a result of an on hook. The port goes to an MState of CP_IDLE after 150 ms.

MStates: CP_GARD.

GD_WTRLS (1)

Resource Types: Incoming ports (all types), outgoing ports (all types).

Definition: Guard timing is being performed for the port as a result of the port being activated via the Card Maintenance screen P command. If on hook, the port goes to an MState of CP_IDLE after 150 ms. If off hook, the port remains in this state until an on hook is detected.

MStates: CP_GARD.

GD_WTRLSH (2)

Resource Types: Incoming ports (all types), outgoing ports (all types).

MStates: CP_GARD.

Definition: Guard timing is being performed for the port as a result of the port being activated via the Change Port Status ($90) command. If on hook, port goes to an MState of CP_IDLE after 150 ms. If off hook, port remains in this state until an on hook is detected.

RDR_DONE

Resource Types: Incoming ports (all types except for COS = A), outgoing ports (all types except for COS = A and UTC with COS = O).

Definition: Permanent Signal processing has been completed for this port. During this SState, the port is presented with quiet tone until system reset or the port goes on hook. If the port goes on hook at this time, a Permanent Signal Condition ($D2) report is sent to the host, indicating the condition has cleared. A Port Change of State ($DA or $DB) report may be sent as specified if either of the following commands were used in the call:

- Outgoing Port Control ($69) command—Disconnect Control Code setting.
- Incoming Port Control ($6A) command—Incoming Port Control Code setting.

MStates: CP_DISC.

RDR_FBUSY

Resource Types: Incoming ports (all types except for COS = A), outgoing ports (all types except for COS = A and UTC with COS = O).

Definition: A permanent signal condition has been detected for this port. When the port enters this SState, a Permanent Signal Condition ($D2) report is sent to the host indicating the condition exists. During this SState, the port is presented with reorder tone for up to 15 seconds. If port goes on hook at this time, a $D2 report is sent to the host indicating the condition has cleared. An Outgoing Port Change of State ($DA) report or an Incoming Port Change of State ($DB) report may be sent as specified if either of the following commands were used in the call:

- Outgoing Port Control ($69) command—Disconnect Control Code setting.
- Incoming Port Control ($6A) command—Incoming Port Control Code setting.

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MStates: CP_DISC.

RDR_QUIET

Resource Types: Incoming ports (all types except for COS = A), outgoing ports (all types except for COS = A and UTC with COS = O).

Definition: Permanent Signal processing is beginning for this port. When the port enters this SState, a physical release of the port is performed by the system. During this SState, the port is presented with quiet tone for up to 30 seconds. If port goes on hook at this time, a Port Change of State ($DA or $DB) report may be sent as specified if either of the following commands were used in the call:

- Outgoing Port Control ($69) command—Disconnect Control Code setting.
- Incoming Port Control ($6A) command—Incoming Port Control Code setting.

MStates: CP_DISC.

WAIT_SUP (02)

Resource Types: Incoming ports, outgoing ports.

Definition: Port is waiting for signaling/supervision from the distant end. An outpulse rule WAIT SUP [xx] token is being processed. The signaling or supervision for which the port is waiting is determined by the supervision template specified in the data field [xx]. If voice band signaling is specified, a CPA port is linked into the call. The incoming/outgoing port remains in this state until the signaling/supervision is received or a timeout occurs (if specified).

MStates: CP_OUTPULSE.

WAIT_TIM (01)

Resource Types: Incoming ports, outgoing ports.

Definition: Port is waiting a specified length of time. An outpulse rule WAIT TIME token is being processed. The incoming/outgoing port remains in this state until the specified length of time has passed.

MStates: CP_OUTPULSE.

WT_ANNC (04)

Resource Types: Incoming ports, outgoing ports.

Definition: Call processing is attempting to allocate a voice port to link to this call. An inpulse rule SPEAK token is being processed and the first attempt to allocate a voice port failed. Call processing waits 3 seconds, then hunts again for a Voice port (DVC or IPRC). If a voice port is available, it is allocated and rule processing continues. If it is still unavailable, rule processing aborts.

MStates: CP_INPULSE.

WT_BEEP (08)

Resource Types: Incoming ports, outgoing ports.

Definition: A beep tone is being outpulsed over this port. An inpulse rule TONE ENAB, TONE END, TONE CLR, TONE FDIG, or TONE NOW token is being processed, and an outpulse channel is linked into the call. Up to three beeps can be stacked for processing; one beep being processed and two waiting for processing. The incoming/outgoing port remains in this state until all beep tones are presented.

MStates: CP_INPULSE.

WT_DTMF (01)

Resource Types: Incoming ports, outgoing ports.

Definition: Call processing is attempting to allocate a DTMF receiver to link to this call. An inpulse rule IP ANI or IP FIELD token is being processed and the first attempt to allocate a DTMF receiver failed. Call processing waits 3 seconds, then hunts again for a receiver. If a DTMF receiver is available, it is allocated and rule processing continues. If it is still unavailable, rule processing aborts.

MStates: CP_INPULSE.

WT_MF (01)

Resource Types: Incoming ports, outgoing ports.

Definition: Call processing is attempting to allocate an MF receiver to link to this call. An inpulse rule IP ANI or IP FIELD token is being processed and the first attempt to allocate a MF receiver failed. Call processing waits 3 seconds, then hunts again for a receiver. If an MF receiver is available, it is allocated and rule processing continues. If it is still unavailable, rule processing aborts and the call is torn down.

MStates: CP_INPULSE.

WT_PSC

Resource Types: Incoming ports (all types except for COS = A), outgoing ports (all types except for COS = A and UTC with COS = O).

Definition: Reorder processing is being performed for the port. The port is presented with reorder tone for up to 15 seconds. If the port goes on hook, Reorder processing ends and an Incoming Port Change of State ($DA) report or an Outgoing Port Change of State ($DB) report is sent to the host, indicating the port can be used for calls. If no on hook is reported within 15 seconds, a physical release is performed on the port and permanent signal processing begins.

MStates: CP_RDR.

WT_TALK (08)

Resource Types: Incoming ports, outgoing ports.

Definition: A voice prompt is being presented to this port. An inpulse rule SPEAK token is being processed, and a voice port (DVC or IPRC) is linked into the call. Most rule processing, such as digit collection, can occur while the prompt is being presented. Other tokens, such as TONE NOW, WAIT TIME, and subsequent SPEAK tokens are not processed concurrently with presentation of a voice prompt because they would abort the prompt. Rule processing does not end until all voice prompts specified have been presented or aborted.

MStates: CP_INPULSE.

WT_TIM (40)

Resource Types: Incoming ports, outgoing ports.

Definition: Port is waiting a specified length of time. An inpulse rule WAIT TIME token is being processed. The incoming/outgoing port remains in this state until the specified length of time has passed.

MStates: CP_INPULSE.

Integrated Prompt and Record Card Prompt Library

Table G-1 lists Cisco Systems' standard prompt library for use with the Integrated Prompt and Record card (IPRC). The voice-recorded prompts are available in a two-diskette set at no charge to customers. Contact a Cisco sales representative to order the Mu-law or the A-law versions.

Table G-1 lists prompt numbers, in both decimal (for use in inpulse rules) and hexadecimal (for use in commands), and the corresponding messages and uses for the IPRC.

Table G-1 Integrated Prompt and Record Card Prompt Set

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
1	$01	one	
2	$02	two	
3	$03	three	
4	$04	four	
5	$05	five	
6	$06	six	
7	$07	seven	
8	$08	eight	
9	$09	nine	
10	$0A	ten	
11	$0B	eleven	
12	$0C	twelve	
13	$0D	thirteen	
14	$0E	fourteen	
15	$0F	fifteen	
16	$10	sixteen	
17	$11	seventeen	
18	$12	eighteen	
19	$13	nineteen	

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
20	$14	twenty	
21	$15	thirty	
22	$16	forty	
23	$17	fifty	
24	$18	sixty	
25	$19	seventy	
26	$1A	eighty	
27	$1B	ninety	
28	$1C	hundred	
29	$1D	thousand	
30	$1E	million	
31	$1F	zero	
32	$20	oh	
33	$21	January	
34	$22	February	
35	$23	March	
36	$24	April	
37	$25	May	
38	$26	June	
39	$27	July	
40	$28	August	
41	$29	September	
42	$2A	October	
43	$2B	November	
44	$2C	December	
45	$2D	Sunday	
46	$2E	Monday	
47	$2F	Tuesday	
48	$30	Wednesday	
49	$31	Thursday	
50	$32	Friday	
51	$33	Saturday	
52	$34	day	
53	$35	week	
54	$36	month	

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
55	$37	year	
56	$38	the time	(at the tone) **the time** (will be...)
57	$39	minutes	(...twelve o'clock, and thirteen) **minutes**.
58	$3A	seconds	(...twelve thirteen, and twenty) **seconds**.
59	$3B	a.m.	
60	$3C	p.m.	
61	$3D	dollars	
62	$3E	cents	
63	$3F	a	
64	$40	again	
65	$41	to play back	
66	$42	the	
67	$43	is	
68	$44	is not	
69	$45	are	
70	$46	are not	
71	$47	I didn't understand that.	
72	$48	that	
73	$49	will be	
74	$4A	is being	
75	$4B	has been	
76	$4C	of	
77	$4D	and	
78	$4E	you have	**you have** (entered a number...)
79	$4F	your	
80	$50	later	
81	$51	with	
82	$52	or	
83	$53	yes	
84	$54	no	
85	$55	no longer	(are) **no longer** (in service)
86	$56	in service	(are no longer) **in service.**
87	$57	out of service	(is) **out of service.**
88	$58	now	(press one) **now.**

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
89	$59	another	(make) **another** (selection)
90	$5A	to send	
91	$5B	sent	(has been) **sent.**
92	$5C	to receive	
93	$5D	received	(has been) **received.**
94	$5E	at the tone	(please speak your name) **at the tone**.
95	$5F	at the prompt	(please speak your name) **at the prompt.**
96	$60	when you hear the tone	(please speak) **when you hear the tone.**
97	$61	message	(to record a) **message,...**
98	$62	fax	(to send a) **fax,...**
99	$63	today is	**today is** (Tuesday)
100	$64	speed dial	(press # to) **speed dial.**
101	$65	call	(to place a collect) **call,** (press 1)
102	$66	all circuits	**all circuits** (are busy)
103	$67	person	(that) **person** (is not available)
104	$68	name	(speak the) **name** (of the person you are calling)
105	$69	telephone number	(enter your) **telephone number.**
106	$6A	number	(please enter your credit card) **number** (now)
107	$6B	the number you are calling	the number you are calling, (555-1212, is...)
108	$6C	the number you have entered	the number you have entered (is invalid)
109	$6D	pound sign	(press) **pound sign** (when complete)
110	$6E	star	(press) **star** (when complete)
111	$6F	an international	(to place) **an international** (call),
112	$70	a direct call	(to place) **a direct call,**
113	$71	a domestic	(to place) **a domestic** (call),
114	$72	a collect call	(to place) **a collect call,**
115	$73	a person-to-person call	(to place) **a person-to-person call,**

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
116	$74	a long-distance	(to place) **a long-distance** (call),
117	$75	account code	(please enter your) **account code.**
118	$76	authorization code	(please enter your) **authorization code.**
119	$77	calling card	(please enter your) **calling card** (number)
120	$78	credit card	(please enter your) **credit card** (number)
121	$79	P-I-N code	(please enter your) **P-I-N code**.
122	$7A	Social Security Number	
123	$7B	debit card	(please enter your) **debit card** (number)
124	$7C	selection	(please enter your) **selection.**
125	$7D	location code	(please enter your) **location code.**
126	$7E	password	(please enter your) **password.**
127	$7F	mailbox	(please enter your) **mailbox** (number)
128	$80	digit	(please enter your three-) **digit** (number)
129	$81	area code	(please enter your) **area code.**
130	$82	conference call	(to place a) **conference call,** (press)
131	$83	will be with you shortly	(an operator) **will be with you shortly**
132	$84	for additional	**for additional** (assistance)
133	$85	directory	(for) **directory** (assistance)
134	$86	assistance	(for additional) **assistance,** (please stay on the line)
135	$87	information	(for additional) **information,** (please stay on the line)
136	$88	services	(for additional) **services,** (please stay on the line
137	$89	customer service	(for) **customer service,** (press 1)
138	$8A	operator assistance	(for) **operator assistance,** (press 0)
139	$8B	an operator	(to speak with) **an operator,** (press 0)

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
140	$8C	all operators	**all operators** (are busy)
141	$8D	all representatives	**all representatives** (are busy)
142	$8E	a representative	**a representative** (will be with you shortly)
143	$8F	when finished	(press pound) **when finished.**
144	$90	to call beyond the local area	**to call beyond the local area,** (dial 1, 0)
145	$91	press	(for directory assistance) **press** (4,1,1)
146	$92	to place	**to place** (a long distance call)
147	$93	make	(please) **make** (another selection)
148	$94	dial	**dial** (one plus...)
149	$95	please enter	**please enter** (your social security number)
150	$96	try again	(please) **try again**
151	$97	to erase	**to erase** (the message)
152	$98	to record	**to record** (a message)
153	$99	...speak	**...speak** (distinctly)
154	$9A	...speak your name	**...speak your name** (at the prompt)
155	$9B	to speak with...	**to speak with** (an operator, press 0)
156	$9C	if this is	**if this is** (correct, press 2)
157	$9D	correct	(if this is) **correct,** (press 1)
158	$9E	valid	(is no longer) **valid**.
159	$9F	available	(an operator is not) **available** (at this time)
160	$A0	activated	(that service is not) **activated**
161	$A1	are busy	(all circuits) **are busy,...**
162	$A2	is being processed	(your call) **is being processed**
163	$A3	please	**please** (hold)
164	$A4	begin over	(to) **begin over,** (press pound)
165	$A5	please hold	please hold.
166	$A6	please wait	please wait.
167	$A7	please stay on the line.	please stay on the line.
168	$A8	will be right with you	(an operator) **will be right with you**

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
169	$A9	please hang up and try your call again.	
170	$AA	please check the number and call again.	
171	$AB	please call the customer service number located on the back of your card.	
172	$AC	please dial the number you wish to reach.	
173	$AD	please enter your...	**please enter your** (credit card number)
174	$AE	...then dial your call when requested to do so.	
175	$AF	your call cannot be completed at this time...	
176	$B0	your call cannot be completed as dialed...	
177	$B1	the area code and number you wish to call	(please dial) **the area code and number you wish to call.**
178	$B2	we are processing your credit card information	
179	$B3	all connections to the selected carrier are busy	
180	$B4	the credit card that you have selected cannot be used for this call	
181	$B5	calls within this area code cannot be presently billed to a credit card	
182	$B6	you are not authorized to use this service	
183	$B7	the following service is not available for 800 numbers	
184	$B8	calls inside the local service area.	(it is not necessary to dial 1 for) **calls inside the local service area.**
185	$B9	this service is not available	**this service is not available** (to your area code)
186	$BA	operator assistance is not available through this service.	
187	$BB	you have entered an invalid...	

Table G-1 Integrated Prompt and Record Card Prompt Set (continued)

Prompt Number (Decimal)	Prompt Number (Hexadecimal)	Message	Inflection, as used in:
188	$BC	We're sorry...	
189	$BD	...your call will be billed by	**...your call will be billed by** (AT&T)
190	$BE	if you want to record a message to be delivered to this number,	**if you want to record a message to be delivered to this number,** (press 4)
191	$BF	has exceeded the daily use limit	(your credit card) **has exceeded the daily use limit.**
192	$C0	please call customer service at...	
193	$C1	thank you.	
194	$C2	thank you for using...	**thank you for using** (AT&T)
195	$C3	AT&T	
196	$C4	MCI	
197	$C5	Sprint	
198	$C6	LOGICALL	
199	$C7	VT 1	
200	$C8	SITEL	(SIGH-TEL)
201	$C9	VIATEL	(VEE-AH-TEL)
202	$CA	World Phone Card	
203	$CB	For English service, press 1.	
204	$CC	That is not a valid key.	
205	$CD	one, zero, aye tee tee, plus	(pausing as in: **"1, 0, ATT, plus...")**
206	$CE	Welcome to Simon 800 Access	
207	$CF	...using a one.	
208	$D0	the number is	**the number is** (555...)
209	$D1	please speak...	
210	$D2	...you have entered	
211	$D3	o'clock	
212	$D4	...at this time	
213	$D5	(one second of silence)	
214	$D6	(three seconds of silence)	
215	$D7	(Stutter Dial Tone)	